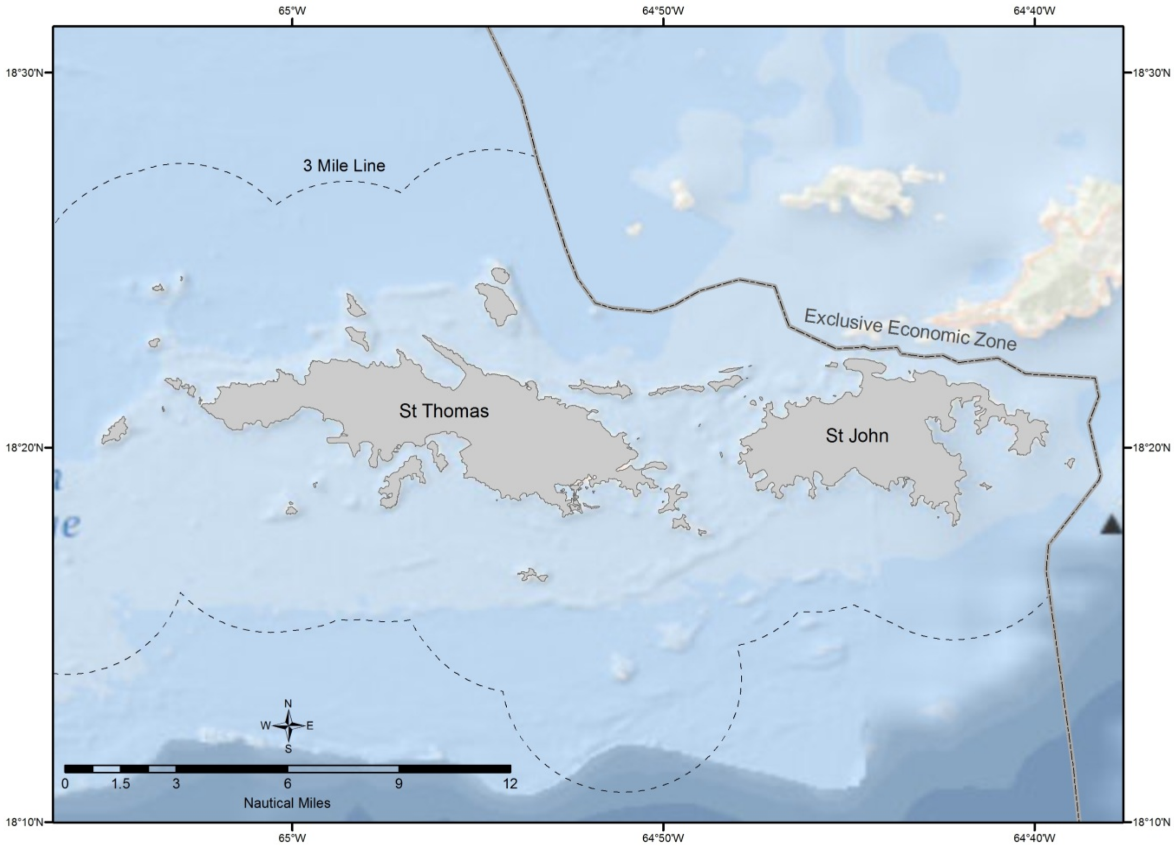

Comprehensive Fishery Management Plan for the St. Thomas/St. John Exclusive Economic Zone

Including Environmental Assessment, Regulatory Impact Review, and Fishery Impact Statement

Final Version

December 2019

Comprehensive Fishery Management Plan for the St. Thomas/St. John Exclusive Economic Zone and Environmental Assessment

Proposed Action: Establish a new Comprehensive Fishery Management Plan (FMP) for the St. Thomas/St. John exclusive economic zone (St. Thomas/St. John FMP) prepared by the Caribbean Fishery Management Council and repeal the existing U.S. Caribbean-wide FMPs with respect measures applicable within the St. Thomas/St. John Exclusive Economic Zone. The action would also modify the composition of the stocks to be managed under the St. Thomas/St. John FMP, organize those stocks for effective management, establish management reference points for managed stocks, establish accountability measures, identify essential fish habitat for stocks new to management, and establish framework measures.

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Table of Contents for the Environmental Assessment

Note to readers: This document is an integrated Fishery Management Plan (FMP)/ Environmental Assessment (EA). The EA evaluates seven actions within the St. Thomas/St. John FMP.

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Abbreviations and Acronyms Used in this Document

ABC	acceptable biological catch
ABC CR	acceptable biological catch control rule
ACL	annual catch limit
ACT	annual catch target
AM	accountability measure
AP	advisory panel
APA	Administrative Procedure Act
CCR	commercial catch report
CEA	cumulative effects analysis
CEQ	Council on Environmental Quality
CFMC	(Council); Caribbean Fishery Management Council
CFR	Code of Federal Regulations
CV	coefficient of variation
CZMA	Coastal Zone Management Act
DAP	District Advisory Panel
DEIS	draft environmental impact statement
DPNR	Department of Planning and Natural Resources of the U.S. Virgin Islands
EA	environmental assessment
EEZ	exclusive economic zone
EFH	essential fish habitat
EIS	environmental impact statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAD	fish aggregation device
FAO	Food and Agriculture Organization (United Nations)
FEIS	final environmental impact statement
FMP	fishery management plan
F_{MSY}	fishing mortality rate yielding MSY
FMC	fishery management council
FMP	fishery management plan
FMU	fishery management unit
FONSI	finding of no significant impact
GDP	gross domestic product
GNI	gross national income
GNP	gross national product
HAPC	habitat area of particular concern
HMS	highly migratory species
ITCZ	inter-tropical convergence zone

MCD	marine conservation district
MFMT	maximum fishing mortality threshold
MMPA	Marine Mammal Protection Act
MRIP	Marine Recreational Information Program
MSA	(Magnuson-Stevens Act); Magnuson-Stevens Fishery Conservation and Management Act
MSST	minimum stock size threshold
MSY	maximum sustainable yield
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	notice of intent
NS	national standard
OFL	overfishing limit
OY	optimum yield
PDF	probability density function
PSA	productivity-susceptibility analysis
RA	Regional Administrator of the National Marine Fisheries Service
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SDC	status determination criteria
SEAMAP	Southeast Area Monitoring and Assessment Program
SEDAR	Southeast data assessment review (stock assessment)
SEFSC	Southeast Fisheries Science Center
SERO	Southeast Regional Office
SFA	Sustainable Fisheries Act
SSC	Scientific and Statistical Committee
SYL	sustainable yield level
USVI	United States Virgin Islands

Chapter 1. Introduction

1.1 What Action is Being Proposed?

The Caribbean Fishery Management Council (Council) is considering shifting from a U.S. Caribbean region-wide management approach to an island-based management approach, applicable to the three separate U.S. Caribbean exclusive economic zone (EEZ) management areas: (1) St. Thomas/St. John, U.S. Virgin Islands (USVI); (2) St. Croix, USVI; and (3) Puerto Rico. Historically, the Council has managed federal fisheries in the U.S. Caribbean EEZ under four U.S. Caribbean region-wide fishery management plans (FMPs): the FMP for the Reef Fish Fishery of Puerto Rico and the USVI (Reef Fish FMP), the FMP for the Spiny Lobster Fishery of Puerto Rico and the USVI (Spiny Lobster FMP), the FMP for the Queen Conch Resources of Puerto Rico and the USVI (Queen Conch FMP), and the FMP for the Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the USVI (Coral FMP). Through the actions proposed in this integrated FMP/environmental assessment (EA), and the parallel integrated FMP/EAs for St. Croix and Puerto Rico, the Council is proposing to repeal the four extant U.S. Caribbean region-wide FMPs and manage fishery resources under three new island-based FMPs: Comprehensive FMP for the St. Thomas/St. John EEZ (St. Thomas/St. John FMP), Comprehensive FMP for the St. Croix EEZ (St. Croix FMP), and Comprehensive FMP for the Puerto Rico EEZ (Puerto Rico FMP). This document concerns the transition as it applies to management in the U.S. EEZ off St. Thomas/St. John (St. Thomas/St. John EEZ). The Council is preparing two additional documents, one concerning the transition for management in the U.S. EEZ off St. Croix (St. Croix EEZ) and one concerning management in the U.S. EEZ off Puerto Rico (Puerto Rico EEZ).

Implementing an island-based FMP for St. Thomas/St. John would allow the Council to manage stocks[1] targeted in federal waters surrounding St. Thomas/St. John, the available markets for the products harvested from U.S. EEZ waters off St. Thomas/St. John, the economies of fishermen and the fishing communities they represent, and the social and cultural attributes unique to the island of St. Thomas/St. John. To complete the transition from U.S. Caribbean-wide management to an island-based approach for St. Thomas/St. John, the Council is considering seven actions to establish and revise the St. Thomas/St. John FMP. These actions provide an opportunity for the Council to update management regulations that are outdated or do not reflect the current state of issues in the St. Thomas/St. John EEZ.

- Action 1 establishes a St. Thomas/St. John FMP based on existing management measures that apply to the St. Thomas/St. John EEZ;

[1] Stock: The term "stock of fish" means a “species, subspecies, geographical grouping, or other category of fish capable of management as a unit.” 16 USC §1802(42).

- Action 2 revises the list of species included for management, focusing on those applicable to the St. Thomas/St. John EEZ;
- Action 3 establishes how the stocks (*i.e.*, species included for management) are grouped into stock complexes based on current information including fishing practices, and identifies indicator stocks for those complexes where appropriate;
- Action 4 establishes maximum sustainable yield (MSY) or an MSY proxy, status determination criteria (SDC), and management reference points for the stocks, stock complexes, or indicator stocks included for management;
- Action 5 establishes accountability measures (AM) to be implemented when landings exceed the annual catch limits (ACL);
- Action 6 identifies and describes essential fish habitat (EFH) for species included in the FMP that have not been previously managed by the Council; and
- Action 7 establishes framework procedures that would allow the Council to adjust reference points and management measures more quickly.

Under the extant Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs, the Council manages the fisheries across the entire U.S. Caribbean. However, with the exception of tilefish and aquarium trade species (discussed in Chapter 2), the Council already applies certain required management measures separately within the three island management areas (i.e., St. Thomas/St. John, St. Croix, and Puerto Rico). For example, through actions taken in the 2010 Caribbean ACL Amendment (CFMC 2011a) and the 2011 Caribbean ACL Amendment (CFMC 2011b), the Council established boundaries (Figure 1.5.1) to define EEZ subdivisions for each island management area and established separate, island-specific ACL values, and AMs within each of those three EEZ subdivisions. Thus, some management measures already apply at specific island or island group levels. However, other components of management, including a proxy for MSY and an overfishing limit (OFL), were maintained at a U.S. Caribbean-wide level. The St. Thomas/St. John FMP would fully transition to island-based management for the St. Thomas/St. John EEZ. As a result, MSY (or a proxy, depending on data availability), SDC, management reference points, and all other management regulations would be set for and applied to the St. Thomas/St. John EEZ.

The proposed actions in this integrated FMP/EA are fully discussed in Chapter 2.

1.2 Why is the Action Being Proposed?

The fisheries and related coastal and marine environments of St. Thomas/St. John are highly valued and remain an important part of the history, culture, and tradition of the island. Fishery resources contribute to the economy, livelihood, food, and recreational enjoyment of the citizens of St. Thomas/St. John. These resources and the habitats upon which they depend are subject to the adverse effects of anthropogenic impacts and environmental degradation. Both federal and state governments work to conserve and manage the fisheries of St. Thomas/St. John, and both entities recognize the role fishermen and others play in conserving, managing, and sustaining the island's fisheries.

The fishermen, fishing community representatives, and the local governments of the USVI and Puerto Rico have frequently requested the Council consider differences among their islands when addressing fisheries management in the U.S. Caribbean to recognize the unique attributes of each U.S. Caribbean island. The Council responded to these requests by initiating an EA of shifting from a U.S. Caribbean-wide management approach to an island-based approach: *Development of Island-Based FMPs in the U.S. Caribbean: Transition from Species-Based FMPs to Island-Based FMPs* (2014 EA) (NMFS 2014). The details of that assessment and process are described in Appendix A. By implementing island-based FMPs, the Council along with the National Marine Fisheries Service (NMFS) concluded they would be better able to account for differences among the U.S. Caribbean islands with respect to environment, culture, markets, gear, seafood preferences, and the ecological impacts that result from these differences.

Tailoring management measures to specific management areas could potentially make fisheries management more effective by ensuring to the greatest possible degree that optimum yield is achieved while minimizing adverse effects to the environment, as discussed in the EA initiating this action (NMFS 2014). The St. Thomas/St. John FMP, in conjunction with the St. Croix and Puerto Rico FMPs, would respond to the Council's decision in their 2014 EA to move forward with island-based management by replacing the U.S. Caribbean-wide FMPs with island-based FMPs.

1.3 Who is Proposing the Action?

The Council proposes the action to establish a new St. Thomas/St. John FMP and repeal the U.S. Caribbean-wide FMPs as they apply to management in federal waters off of St. Thomas/St. John[2], modify the composition of the stocks to be managed under the St. Thomas/St. John FMP, organize those stocks for effective management, establish SDC, management reference points, and AMs for managed stocks, identify EFH for species new to management, and establish framework measures. The Council develops the FMP and submits it to NMFS, who implements the actions in the FMP on behalf of the Secretary of Commerce.

[2] Repealing the U.S. Caribbean-wide FMPs in their entirety, as opposed to repealing them as they apply to fisheries to be managed in federal waters of St. Thomas/St. John alone, requires the Council to take similar action to repeal and replace the U.S. Caribbean-wide management with island based management in the Puerto Rico FMP and the St. Croix FMP. If the Council takes action here to repeal the plans as they apply to federal waters off St. Thomas/St. John, but does not take action to repeal the plans with respect to the other managed areas, the Caribbean-wide FMPs would have to be amended to reflect the Council's decision to manage certain island areas separately (e.g., to reflect that only St. Thomas/St. John would be managed separately, or to reflect that only St. Thomas/St. John and St. Croix would be managed separately).

The National Environmental Policy Act (NEPA) requires federal agencies to conduct an environmental review when proposing major federal actions. Appendix A describes the process that the Council and NMFS used leading up to the preparation of this integrated FMP/EA, which evaluates potential alternative approaches for implementing island-based fishery management in the St. Thomas/St. John EEZ. The new St. Thomas/St. John FMP would then apply the Council's preferred approach, applying the best available scientific information regarding the management of fishery resources in St. Thomas/St. John EEZ waters. Alternatives considered in the EA include a "no action" alternative, which would not transition from U.S. Caribbean-wide management to an island-based approach for St. Thomas/St. John (Action 1). After selecting the "action alternative" in Action 1 and establishing an island-based FMP for St. Thomas/St. John based on existing management measures, Actions 2-7 provide a range of viable alternative approaches for revising the management of fisheries in the St. Thomas/St. John EEZ. The outcomes of the Council's preferred alternatives are listed in Chapter 5: Conservation and Management Measures – Action Plan.

The Council and NMFS considered public comments received on the draft St. Thomas/St. John FMP and associated draft EA before voting to approve the St. Thomas/St. John FMP for submission to NMFS for Secretarial review, approval, and implementation.

NMFS will announce all public comment periods on the St. Thomas/St. John FMP and its proposed implementing regulations in the *Federal Register*. NMFS will consider all public comments received during the Secretarial review period, whether they are on the St. Thomas/St. John FMP or the proposed regulations prior to final agency action.

1.4 Statement of Purpose and Need

The St. Thomas/St. John FMP is one of three island-based FMPs developed by the Council to update management of federal fishery resources in the U.S. Caribbean. The St. Thomas/St. John FMP would incorporate and replace those components of the U.S. Caribbean-wide Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs that pertain to the EEZ surrounding the islands of St. Thomas/St. John (Figure 1.5.1).

The purpose of developing the St. Thomas/St. John FMP/EA is to ensure the continued health of fishery resources occurring in the EEZ surrounding St. Thomas/St. John within the context of the unique biological, ecological, economic, and cultural characteristics of those resources and the communities' dependent upon them by managing on an island basis. The St. Thomas/St. John FMP is intended to ensure productive and sustainable fisheries for the long-term livelihood, enjoyment, economy, and environment of St. Thomas/St. John and the U.S.; conserve and manage the fisheries of St. Thomas/St. John within an island-based approach; and, enhance stewardship among fishermen, residents, and others who value the fishery resources and the marine and coastal environments of St. Thomas/St. John and the U.S.

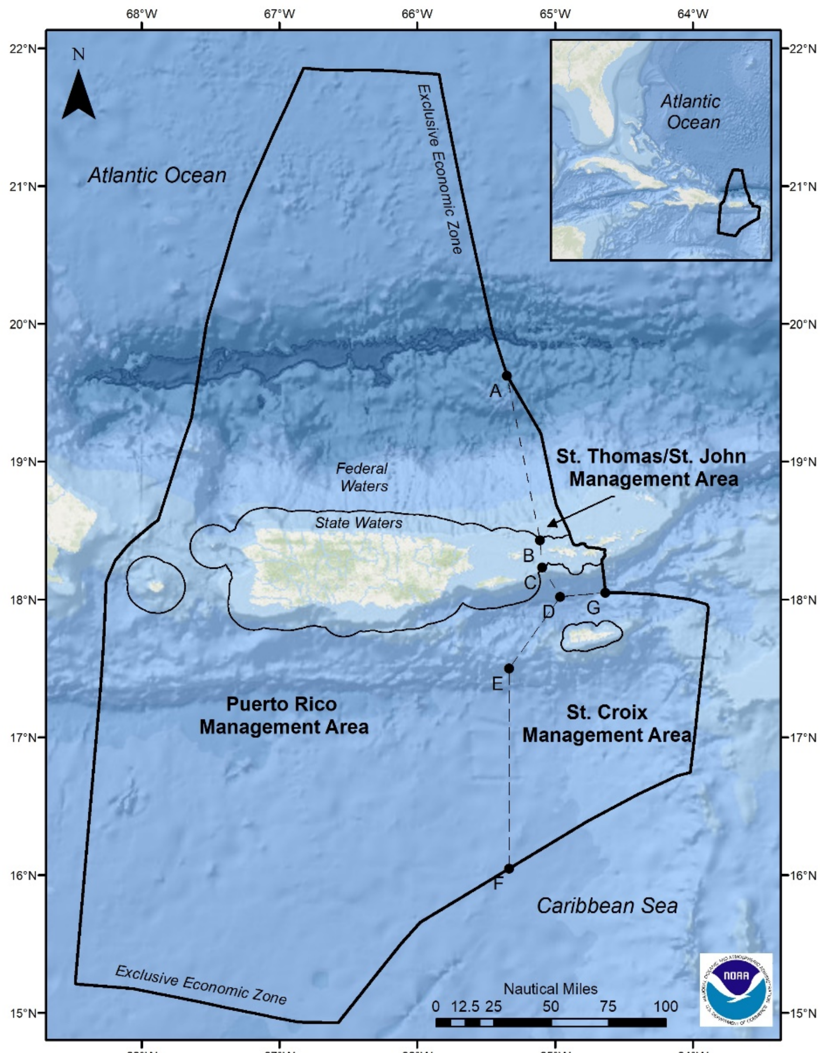
Shifting management from a U.S. Caribbean-wide approach to an island-based approach for St. Thomas/St. John was deemed necessary based on written and verbal comments received from constituents at multiple scoping hearings held on St. Thomas/St. John, and on written comments received in response to notices published in in the *Federal Register*, as described in Appendix A. The commenters agreed that an island-based approach is needed to better focus federal fishery management efforts on issues unique to St. Thomas/St. John (See Section 1.8 for specific Goals and Objectives of the St. Thomas/St. John FMP).

Commenters also recognized a need to update federal management. In particular, it was recognized that the present management plans target many species that occur infrequently, if at all, in federal waters surrounding the island, such that federal management actions have no impact because federal fishery management authority does not extend to state jurisdictional waters. In contrast, some of the species that are the most economically and ecologically important inhabitants of federal waters are not included in those management plans. Thus, the second action considered in this FMP/EA is to develop and apply a rigorous process for identifying those species in need of conservation and management in federal waters surrounding St. Thomas/St. John. A logical next step in that process is to determine how a revised list of managed stocks should be grouped into management complexes, if at all. Regardless of whether managed stocks are grouped into complexes, management reference points and SDC need to be defined for any species newly added to management, either individually, as a group within a complex, or as an indicator stock for a complex. Moreover, the Council also should consider whether it needs to update reference points for previously managed stocks to reflect the best scientific information available.

The next action would allow for existing management controls (i.e., AMs), which prevent ACLs from being exceeded or to constrain future catch if they are, to be updated and for complimentary management controls to be added for stocks new to management. Next, a requirement of the Magnuson-Stevens Act is to identify EFH for all newly managed species. Species that previously have been managed under the U.S. Caribbean-wide FMPs that would be retained in the new St. Thomas/St. John FMP already have EFH described and identified; therefore, EFH needs to be identified and described only for those species new to management in the St. Thomas/St. John FMP, and the Council considered alternative approaches to identifying EFH. Lastly, in order for the Council to more expeditiously adjust reference points and management measures in response to changing fishery conditions, alternative options for framework measures designed to allow for more efficient responses to changing environmental or biological conditions are included in the final action described below.

1.5 Project Location

Fisheries governed by the St. Thomas/St. John FMP are located primarily in the U.S. EEZ surrounding St. Thomas/St. John (*i.e.*, the St. Thomas/St. John EEZ), defined as federal waters ranging from 3 to 200 nautical miles (nm) (6 – 370 kilometers [km]) from the nearest coastline point of the islands of St. Thomas and St. John (Figure 1.5.1). Fishery resources within three nautical miles of the USVI coast are managed by the territorial government of the USVI.



Service Layer Credits: Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

Figure 1.5.1. Jurisdictional boundaries of the Caribbean Fishery Management Council. Latitude and longitude coordinates for the boundary connecting points A-G are listed in the Code of Federal Regulations, part 622 (Fisheries of the Caribbean, Gulf of Mexico, and South Atlantic).

1.6 Regional Fisheries Management

In the U.S. Caribbean region, there are multiple levels of authority in the geo-political arena, making fisheries management in the region quite complex (Schärer-Umpierre et al. 2014). The U.S. federal government has jurisdiction within the USVI EEZ (i.e., those waters from 3 - 200 nm [4.8 - 370 km] from the coast). The Council, NMFS, the National Oceanic and Atmospheric Administration (NOAA), and the U.S. Department of Commerce are responsible for developing and implementing management measures for U.S. Caribbean federal fisheries. Other federal entities, such as the U.S. Department of Interior through the U.S. Fish and Wildlife Service (e.g., National Wildlife Refuges), possess other management responsibilities either solely or in cooperation with local entities. The U.S. Department of Defense, through the Air Force, Army, Navy, and Marine Corps, controls access and use of various marine waters throughout the U.S. Caribbean region. The U.S. Coast Guard, Sector San Juan, oversees all the vessels and facilities that operate in the region's 21 deep draft ports, including two of the busiest cruise ship ports in the world, and protect the marine environment in the over 450 miles of coastline encompassing the many islands of Puerto Rico and the USVI that are home to numerous endangered species[3]. NOAA Line Offices, such as the Coral Reef Conservation Program, support effective management and sound science to preserve, sustain, and restore valuable coral reef ecosystems for future generations.

The Government of the USVI governs those waters from the shore out to 3 nm and manages marine resources within that jurisdiction (*See Section 1.6.2 below for Territorial Fisheries Management*). At present, the USVI manages fisheries resources cooperatively with the Council, although not all regulations are consistent across the state-federal boundary. To conserve and sustain the USVI's fisheries and fishing communities, the federal and territorial governments have worked in consultation with fishermen and other constituents to develop strategies, rules, and laws to conserve and manage these valuable resources. A primary goal of these actions has been to ensure productive, healthy and sustainable ecosystems and fishery resources for the use and enjoyment of USVI fishermen, fishing communities, residents and visitors.

Regulations that implement the management measures that will be contained within the St. Thomas/St. John FMP will be enforced through actions of NOAA's Office of Law Enforcement, the U.S. Coast Guard, and various USVI authorities, as were the regulations implementing the management measures contained within the U.S. Caribbean-wide FMPs that will be incorporated into the St. Thomas/St. John FMP.

[3] Source: http://www.atlanticarea.uscg.mil/Our-Organization/District-7/Units/Sector-San-Juan-PR/

1.6.1 Federal Fisheries Management

Federal fishery management is conducted under the authority of the Magnuson-Stevens Act (16 U.S.C. 1801 et seq.), originally enacted in 1976 as the Fishery Conservation and Management Act. The Magnuson-Stevens Act claims sovereign rights and exclusive fishery management authority over most fishery resources within the U.S. EEZ, an area extending from the seaward boundary of each coastal state to 200 nm from shore, as well as authority over U.S. anadromous species and continental shelf resources that occur beyond the U.S. Caribbean EEZ.

Responsibility for federal fishery management decision-making is divided between the U.S. Secretary of Commerce (Secretary) and eight regional Fishery Management Councils (FMC) that represent the expertise and interests of constituent states/territories. Regional councils are responsible for preparing, monitoring, and revising management plans for fisheries needing management within their jurisdiction. The Secretary is responsible for promulgating regulations to implement proposed plans and amendments after ensuring that management measures are consistent with the Magnuson-Stevens Act, and with other applicable laws summarized in Appendix B. In most cases, the Secretary has delegated this authority to NMFS.

Each FMC is responsible for the EEZ adjacent to its constituent states. The FMCs develop FMPs and management measures for the fisheries within their EEZ. Afterwards, and if approved by the Secretary, NMFS implements these plans and measures.

Caribbean Fishery Management Council

In order to conserve, maintain, and sustain the fisheries and related environment and habitats in the U.S. Caribbean, the goal of the Council is to develop and establish effective conservation and management measures that maintain a healthy fishery that meets the needs of fishermen and the public. These conservation and management measures are based on (1) determining the status of the fisheries stocks and overall biological productivity and capacity to maintain vital fishery resources for the near- and long-term, (2) considering the economic, social and cultural aspects of the fisheries, and (3) determining effective fishing practices, rules, and regulations to ensure sustainable harvest of fishery resources within the context of optimum yield. For more information, please visit the Council website.

The Council is responsible for the conservation and management of fishery stocks within federal waters surrounding Puerto Rico and the USVI, representing the majority of U.S. Caribbean federal fishery resources (highly migratory species are managed directly by NMFS). The Council consists of seven voting members:

- Four voting members appointed by the Secretary of Commerce, at least one of whom is appointed from each of the Commonwealth of Puerto Rico and the Territory of the USVI;

- The principal officials with marine fishery management responsibility and expertise for the Commonwealth of Puerto Rico and the Territory of the USVI, who are designated as such by the Governors of the territories; and
- The Regional Administrator of NMFS for the Southeast Region.

Public interests are also involved in the fishery management process through participation on advisory panels and through Council meetings that, with few exceptions for discussing matters bearing on a national security classification, or matters pertaining to national security, personnel, litigation in which the Council is interested, or other internal administrative matters, are open to the public. In addition, the regulatory process consider matters approved by the Council is conducted in accordance with the Administrative Procedure Act in the form of "notice and comment" rulemaking, which provides extensive opportunity for public scrutiny and comment, and requires consideration of and response to those comments.

Council Committees and Panels

Scientific and Statistical Committee (SSC)

Each FMC establishes, maintains, and appoints members of an SSC to assist it in the development, collection and evaluation of statistical, biological, economic, social and other scientific information relevant to the Council's development of or amendment to any FMP. The SSC provides expert scientific and technical advice to the Council on the development of fishery management policy, on the preparation of FMPs, and on the effectiveness of such plans once in operation. The SSC also provides ongoing scientific advice for fishery management decisions. The SSC aids the Council in identifying scientific resources available for the development of plans, in establishing the objectives of plans, in establishing criteria for judging plan effectiveness and in the review of plans. Scientific and Statistical Committee members also play a key role in developing stock assessments for Council-managed resources through participation in SEDAR, the Southeast Data Assessment and Review program. The SSC is composed of economists, biologists, sociologists and natural resource experts who are knowledgeable about the technical aspects of fisheries in the U.S. Caribbean (MSA 302(g)(1)).

Advisory Panels (AP)

Fishery management councils are authorized to establish APs as necessary or appropriate to assist in carrying out its functions in accordance with the Magnuson-Stevens Act (MSA 3029g)(2)). An AP may include individuals who are not members of the Council. The Council created a District AP, referred to as a DAP, for each of Puerto Rico, St. Thomas/St. John, and St. Croix. The St. Thomas/St. John DAP is composed of fifteen members either actually engaged in the harvest, processing or consumption of fishery resources, or who are knowledgeable of the conservation and management of fishery resources and the ecosystem upon which they depend. The St. Thomas/St. John DAP obtained and transmitted to the Council advice and information from the people most affected by and knowledgeable of fishery management actions and needs.

The St. Thomas/St. John DAP has aided the Council in establishing the goals and objectives of the island-based plan, while also providing a communication link with those who operate under the management regime.

Management of Highly Migratory Species (HMS)

The Fishery Conservation Amendments of 1990 (P.L. 101-627) conferred management authority for Atlantic HMS, including some tunas, oceanic sharks, marlins, sailfishes, and swordfish, to the Secretary. At that time, the Secretary delegated authority to manage these species in the Atlantic Ocean, including the Gulf of Mexico and the U.S. Caribbean Sea, to NMFS. NMFS is responsible for preparing, monitoring, and revising management plans for HMS needing management, while the Secretary is responsible for promulgating regulations to implement proposed plans and amendments after ensuring that management measures are consistent with the Magnuson-Stevens Act, and with other applicable laws as summarized in Appendix B of this document. In 2013, Amendment 4 to the Consolidated Atlantic HMS FMP re-evaluated the management measures for commercial and recreational HMS fisheries operating in the U.S. Caribbean. This action had the purpose of improving permitting of and data collection from vessels operating in the U.S. Caribbean to better manage the traditional small-scale commercial HMS fishing fleet in the U.S. Caribbean region, enhance fishing opportunities, improve profits for the fleet, and provide improved capability to monitor and sustainably manage those fisheries (NMFS 2012). For additional information regarding the HMS management process and authority in the Atlantic, including the U.S. Caribbean, please visit the Atlantic Highly Migratory Species webpage.

1.6.2 Territorial Fisheries Management

The USVI is an unincorporated territory of the United States. The Territory of the USVI has the authority to manage its respective state fisheries in waters extending from shore to 3 nm, with the exception of about 5,650 acres of submerged lands off St. John, which are owned and managed by the National Park Service (Goenaga and Boulon 1992). The Department of Planning and Natural Resources (DPNR) is responsible for the conservation and management of USVI fisheries and enforcement of boating and fishing regulations. The Division of Fish and Wildlife (DFW) is responsible for data collection pertaining to the fisheries of the USVI. The DFW monitors commercial and recreational fisheries and provides recommendations to the Commissioner of DPNR on matters relating to fisheries management. The Division of Environmental Enforcement is responsible for the explanation and enforcement of regulations in matters pertaining to boating, fishing, and the environment. Rules and regulations for the USVI fisheries are codified in the Virgin Islands Code, primarily within Title 48 Chapter 12.

The USVI fishery management agency has a designated seat on the Council for state participation in federal fishery management decision-making. The USVI government has the authority to manage its respective territorial fisheries. The USVI exercises legislative and regulatory authority over its natural resources through discrete administrative units. Although each agency is the primary administrative body with respect to the territory's natural resources, the USVI cooperates with numerous territorial and federal regulatory agencies when managing marine resources. In addition, it promotes the development of compatible regulations between state and federal waters. However, while the USVI has adopted compatible regulations for several management issues, some fishery regulations remain inconsistent. For example, in the EEZ, any yellowtail snapper harvested needs to have a minimum total length of 12 inches, but no such regulation exists in territorial waters. The lack of compatible regulations in territorial waters makes federal regulations difficult to enforce and in some instances hinders the Council's ability to achieve federal management objectives. The Council is working with the USVI fishery managers to increase compatibility of fisheries regulations between federal and USVI waters.

Another aspect where federal and territorial jurisdiction share responsibilities has to do with federal consistency provisions of the Coastal Zone Management Act (CZMA), which requires NMFS to seek consistency to the maximum extent practicable with enforceable policies of the approved coastal management program of the USVI. Federal consistency[4] provides states with an important tool to manage coastal uses and resources and to facilitate cooperation and coordination with federal agencies. Under the CZMA, federal agency activities that have coastal effects are evaluated to ensure they are consistent to the maximum extent practicable with federally approved enforceable policies of a state's coastal management plan. In addition, the statute requires non-federal applicants for federal authorizations and funding to be consistent with enforceable policies of state coastal management plan.

Additional information regarding fishery management in USVI territorial waters can be found in Section 2.1 of the 2005 Caribbean Sustainable Fisheries Act (SFA) Amendment (CFMC 2005), and in the 2010 Caribbean ACL Amendment (CFMC 2011a). Additional information about fisheries in the USVI can be found in Chapter 3 of this document.

1.6.3 International Fisheries Management Pertaining to the U.S. Caribbean

1.6.3.1 U.S. Authority in International Waters

In certain cases, U.S. authority for fishery management extends beyond the boundaries of the U.S. EEZ. Federal regulations (50 CFR 600.310(k)) address international overfishing in the following manner. If the Secretary determines that a fishery is overfished or approaching a condition of being overfished due to excessive international fishing pressure, and for which there

[4] The federal consistency provision of the CZMA provides that federal actions that have reasonably foreseeable effects on any land or water use or natural resource of the coastal zone (also referred to as coastal uses or resources, or coastal effects) should be consistent with the enforceable policies of a coastal state's federally approved coastal management plan to the maximum extent practicable (DOC 2009).

are no management measures (or no effective measures) to end overfishing under an international agreement to which the United States is a party, then the Secretary and/or the appropriate Council shall take certain actions as provided under Magnuson-Stevens Act section 304(i). The Secretary, in cooperation with the Secretary of State, must immediately take appropriate action at the international level to end the overfishing. In addition, within one year after the determination, the Secretary and/or appropriate Council shall effect several actions, as follows. First, develop recommendations for domestic regulations to address the relative impact of U.S. fishing vessels on the stock. Council recommendations should be submitted to the Secretary. Second, develop and submit recommendations to the Secretary of State, and to the Congress, for international actions that would end overfishing in the fishery and rebuild the affected stocks, taking into account the relative impact of vessels of other nations and vessels of the United States on the relevant stock. Councils should, in consultation with the Secretary, develop recommendations that take into consideration relevant provisions of the Magnuson-Stevens Act and National Standard 1 guidelines, including section 304(e) of the Magnuson-Stevens Act and paragraph (j)(3)(iii) of 50 CFR 600.310, and other applicable laws. In assessing the relative impact of U.S. fishing vessels and vessels of other nations, as set forth above, the Secretary or appropriate Council may consider factors that include, but are not limited to domestic and international management measures already in place, management history of a given nation, estimates of a nation's landings or catch (including bycatch) in a given fishery, and estimates of a nation's mortality contributions in a given fishery. Information used to determine the relative impact must be based upon the best available scientific information.

1.6.3.2 International Authorities

The "Wider Caribbean" region, referred to as the Western Central Atlantic (Fishery Statistical Area 31) by the United Nations Food and Agriculture Organization (FAO), includes the northeast coast of South America, the Caribbean Sea, the Gulf of Mexico, and the southeastern Atlantic coast of North America. The region is geopolitically complex with the highest density of separate states per unit area in the world. The Caribbean Community[5] (CARICOM) countries are distributed throughout the region, and their EEZs form a mosaic, which includes most of the marine space in the region. The USVI is not included as a CARICOM entity.

The Western Central Atlantic Fishery Commission (WECAFC) is a regional fishery body (a group of states or organizations that are parties to an international fishery arrangement). The general objective of WECAFC is to "promote the effective conservation, management, and

[5] The Caribbean Community (CARICOM) is an organization of 15 Caribbean nations and dependencies. CARICOM's main purposes are to promote economic integration and cooperation among its members, to ensure that the benefits of integration are equitably shared, and to coordinate foreign policy. Its major activities involve coordinating economic policies and development planning; devising and instituting special projects for the less-developed countries within its jurisdiction; operating as a regional single market for many of its members (Caricom Single Market); and handling regional trade disputes.

development of the living marine resources of the area of competence of the Commission, in accordance with the FAO Code of Conduct for Responsible Fisheries, and address common problems of fisheries management and development faced by members of the Commission". Membership is open to coastal States whose territories are situated wholly or partly within the area of the Commission or States whose vessels engage in fishing in the area of competence of the Commission that notify in writing to the Director-General of the organization of their desire to be considered as members of the Commission. The United States is a member country.

Activities of the WECAFC are arranged under the following four components:

- Promote the application of the FAO Code of Conduct on Responsible Fisheries and its related instruments;
- Support the development and management of responsible small-scale, artisanal and subsistence fisheries and aquaculture;
- Coordinate and cooperate with other relevant international organizations on matters of common interest;
- Manage the work programme and carry-out a strategic reorientation of the functions and mandate of the Commission.

These activities are conducted in addition to the advisory services (policy advice, provision of information, management advice, legal, etc.) that the Commission usually provides.

1.6.4 Ecosystem-based Fisheries Management

On May 23, 2016, NOAA's NMFS rolled out their ecosystem-based fisheries management policy[6]. The purpose of that policy is to define ecosystem-based fisheries management (EBFM), describe the benefits of EBFM, relate EBFM to management of living marine resources, establish the principles guiding the EBFM approach (Figure 1.6.1), and build on past progress with respect to management within an ecosystem context. The EBFM approach is being implemented nationwide by NMFS, with the intent of informing better decisions regarding trade-offs among and between fisheries, aquaculture, protected species, biodiversity, and habitats. Ultimately, an EBFM approach would help to build and maintain resilient and productive ecosystems within the context of the human community dependent upon ecosystem services, while ensuring timely and effective response to a constantly changing environment.

[6] National Marine Fisheries Service Policy 01-120, May 23, 2016, available at: https://www.fisheries.noaa.gov/resource/document/ecosystem-based-fisheries-management-policy

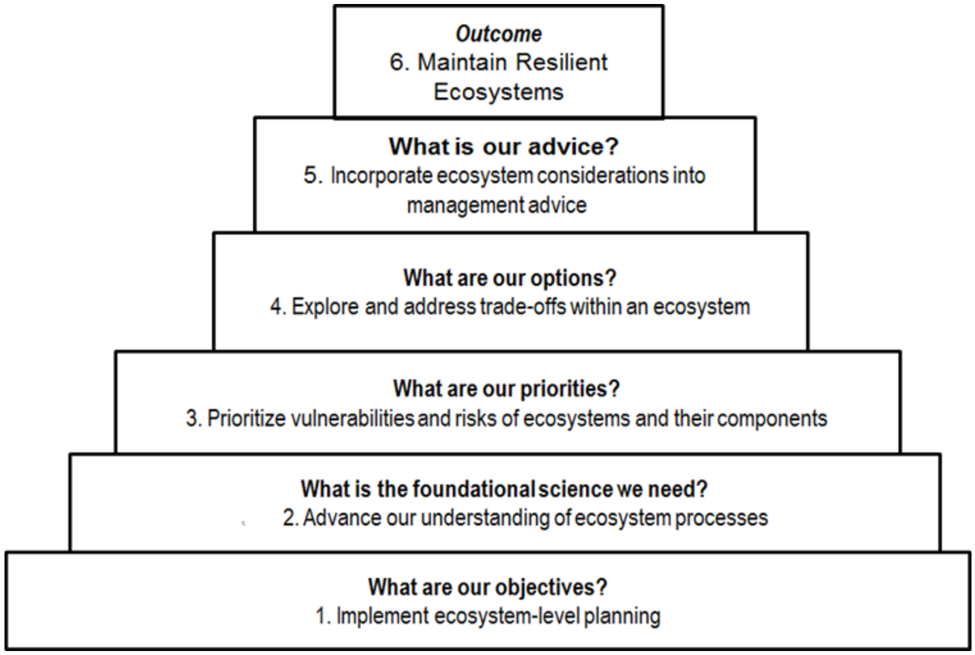


Figure 1.6.1. Hierarchical arrangement of NMFS' six guiding principles for implementation of ecosystem-based fisheries management.
(Source: http://www.nmfs.noaa.gov/op/pds/index.html)

Ecosystem-based fisheries management is defined by NMFS as "a systematic approach to fisheries management in a geographically specified area that contributes to the resilience[7] and sustainability of the ecosystem[8]; recognizes the physical, biological, economic, and social interactions among the affected fishery-related components of the ecosystem, including humans; and seeks to optimize benefits among a diverse set of societal goals." A central tenet of this definition, and of the NMFS approach to management within an ecosystem context, is recognition of the human community as a component of the ecosystem, thereby ensuring a full and equal treatment of economic needs and cultural values. Particularly in the U.S. Caribbean, a region characterized by cultural diversity and subtle economic interrelationships, consideration of the human community is essential.

[7]Resilience is defined as the capacity of an ecosystem to persist or maintain function in the face of exogenous disturbances. That is, the capacity of an ecosystem to tolerate disturbance without collapsing into a different state that is controlled by a different set of processes. This is primarily encapsulated by two elements, resistance to and recovery from pressure.
[8]In the NMFS context, the term "ecosystem" means a geographically specified system of fishery resources, the persons that participate in that system, the environment, and the environmental processes that control that ecosystem's dynamics (c.f. Murawski and Matlock, 2006, NMFS-F/SPO-74). To be clear, fishermen and fishing communities are understood to be included in the definition.

In 2016, the Council initiated their process of evaluating the EBFM approach and implementing it in the region. Their approach to EBFM is hierarchical, considering the ecosystem at the local (e.g., among coasts within an island), island, U.S. Caribbean region, Caribbean basin, and global scales. This hierarchical approach allows a more intensive focus on fine-scale management needs while still allowing consideration of the larger-scale effects of management decisions. The Council intends the process to be open and inclusive. To that end, the Council will conduct frequent public meetings, provide educational opportunities via brochures and web-based information, directly involved the DAPs representing each of the three island management areas (St. Thomas/St. John, Puerto Rico, St. Croix), and present progress reports to the public at every Council meeting. The first step in moving to an EBFM approach is the shift from U.S. Caribbean-wide FMPs to island-based FMPs as described and proposed in this document and the companion documents regarding the St. Croix and Puerto Rico FMPs.

1.7 History of Federal Fisheries Management

Prior to development of the St. Thomas/St. John FMP described herein, stocks and stock complexes in the St. Thomas/St. John EEZ (and throughout the U.S. Caribbean) were managed within the Spiny Lobster FMP (CFMC 1981), the Reef Fish FMP (CFMC 1985), the Coral FMP (CFMC 1995), and the Queen Conch FMP (CFMC 1996), as respectively amended.

The following amendments and documents pertaining to the four previously operational U.S. Caribbean-wide FMPs, are of particular relevance to the development of the St. Thomas/St. John FMP: (1) the Caribbean SFA Amendment (CFMC 2005), implemented in 2005, where the Council took several actions to address required provisions of the Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act of 1996, many of which set the basis for the current management regime in the U.S. Caribbean; (2) the 2010 Caribbean ACL Amendment (CFMC 2011a) and 2011 Caribbean ACL Amendment (CFMC 2011b), both implemented in 2012, where the Council took several actions to comply with the 2007 revisions to the Magnuson-Stevens Act[9], specifically the implementation of ACLs and AMs; and (3) the EA for the Development of Island-Based FMPs in the U.S. Caribbean (NMFS 2014) and Finding of No Significant Impact (FONSI), which evaluated the effects of transitioning management of federal fisheries from U.S. Caribbean-wide FMPs to island-based FMPs and set the basis for the reorganization of management measures under the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs into FMPs for each of the St. Thomas/St. John, St. Croix, and Puerto Rico management areas.

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[9] Magnuson-Stevens Fishery Conservation and Management Act – 2007 Reauthorization – In 2006, Congress passed a significant amendment, the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006, which was signed into law in January 2007. This law was groundbreaking in several respects as it featured a number of new requirements to: prevent overfishing by establishing ACLs and accountability measures; promote market-based management strategies, including limited access privilege programs, such as catch shares; strengthen the role of science through peer review, the Councils' Scientific and Statistical Committees, and the Marine Recreational Information Program; enhance international fisheries sustainability by addressing illegal, unregulated, and unreported fishing and bycatch (http://www.nmfs.noaa.gov/sfa/laws_policies/msa/msa_2007.html).

The amendments and documents mentioned above, as well as the history of management actions taken to date under the U.S. Caribbean-wide FMPs are summarized in Appendix C of this document.

1.8 Goals and Objectives of the St. Thomas/St. John FMP

The overarching *goal* of the St. Thomas/St. John FMP is to ensure the continued health of fishery resources occurring in the EEZ surrounding St. Thomas and St. John, within the context of the unique biological, ecological, economic and cultural characteristics of those resources and the communities that are dependent upon them. Specific fishery management goals for the St. Thomas/St. John EEZ are:

G1. Prevent overfishing while achieving, on a continuing basis, the optimum yield (OY) from each federally managed fishery in St. Thomas/St. John waters, taking into account and allowing for variations among, and contingencies in, fisheries, fishery resources, and catches.

G2. Maintain long-term sustainable use of coral reef fishery resources while preventing adverse impacts to stocks, habitats, protected species, or the reef ecosystem as a whole.

G3. Ensure the continued health of fishery resources occurring in St. Thomas/St. John EEZ waters, which would provide for the sustained participation of the islands' fishing communities as a major endeavor and minimize adverse economic impacts on such communities.

G4. Manage the fisheries within the limits of local ecosystem production so as not to jeopardize a wide range of goods and services provided by a healthy ecosystem, including food, revenue, and recreation for humans.

G5. Account for biological, social, and economic differences among the islands, communities, and fisheries of St. Thomas and St. John.

G6. Foster collaboration among territorial and federal authorities to achieve compatible management of fisheries throughout the waters surrounding St. Thomas and St. John.

To achieve the goals described above, the following *objective*s are defined:

O1. Achieve OY in the utilization of federal fishery resources to include the benefits of food production, recreational opportunities, and protection of marine ecosystems, minimizing impacts to non-target species.

O2. Reduce bycatch and waste in the fishery through the use of measures such as gear restrictions, seasonal closures or marine protected areas that reduce or minimize regulatory and/or economic discards, including measures to minimize the mortality of discarded bycatch that cannot be avoided.

O3. Ensure the metrics upon which OY is based are derived from the best available scientific information and are updated to respond to changing ecological, biological, economic and social conditions.

O4. Promote international cooperation in the management of pan-Caribbean stocks.

O5. Collaborate with domestic and international regional fishery management bodies in the management of coral reefs and reef-associated resources.

O6. Promote fair and equitable use of fishery resources that recognizes the importance of fishing communities as well as differences in local environment, culture, markets, user groups, gear types, and seafood preferences.

O7. Promote awareness of laws and regulations governing marine resource management and science, and to ensure informed public input into the management process.

O8. Ensure through the best data collection practices, the socio-economic health of the fishing communities dependent on federal fishery resources.

O9. Ensure adequate evidence is established to demonstrate spawning aggregations and the habitats supporting those aggregations, in order to protect and ensure the future health of the resource, with the least restrictive measures.

O10. Describe and identify EFH, adverse impacts on EFH, and other actions to conserve and enhance EFH. Adopt management measures that minimize adverse impacts on EFH and promote habitat conservation, including designation of specific habitat areas of particular concern (HAPC) within EFH for more focused management action.

O11. Ensure continued provision of ecosystem services derived from living marine resources, including adequate abundance of forage resources to ensure a healthy and diverse trophic web.

O12. To guide the development of new fisheries, require essential scientific data is gathered and analyzed to ensure sustainability, excluding invasive species.

While most of these goals and objectives are being addressed throughout this plan, some may be addressed through future amendments to the St. Thomas/St. John FMP, as requested by the Council to NMFS.

Chapter 2. Creating a St. Thomas/St. John Fishery Management Plan (FMP) - Proposed Actions and Alternatives

This chapter discusses each proposed management action and the respective alternatives that were considered by the Caribbean Fishery Management Council (Council) in creating a St. Thomas/St. John FMP. The presentation and evaluation of management actions included in this chapter are not mutually exclusive, in that some of the proposed management actions are directly related to the previous action(s) and thus “tier” from one another. As a first step, through Action 1 the Council would decide to either continue managing fisheries at the U.S. Caribbean level under the four U.S. Caribbean-wide FMPs (by selecting the no action alternative), or switch to an island-based approach through the establishment of a St. Thomas/St. John FMP (by selecting the action alternative). To transition to island-based management throughout the U.S. Caribbean, the action alternative must be selected in each of the three island-based FMPs under development. Action 1 thus describes no action at the highest level, which means not taking action to establish the St. Thomas/St. John FMP.

Because the Council decided to establish the new St. Thomas/St. John FMP, it developed and evaluated Actions 2-7, which provide the opportunity to modify the measures in that newly created FMP. The order in which the actions are presented in this chapter reflects the tiered structure the Council used when developing the St. Thomas/St. John FMP (Figure 2.1): Action 2 tiers directly from Action 1, Action 3 tiers directly from Action 2, and Action 4 tiers directly from Action 3. Action 5 follows Action 4, but tiers to both Action 3 and Action 4. Action 6 tiers from Action 2 and Action 7 tiers from Action 1. As a result, the no action alternative in each of Actions 2-7 tiers from the Council’s preferred alternative in one or more prior actions, and reflects not taking further action to adjust the management plan.

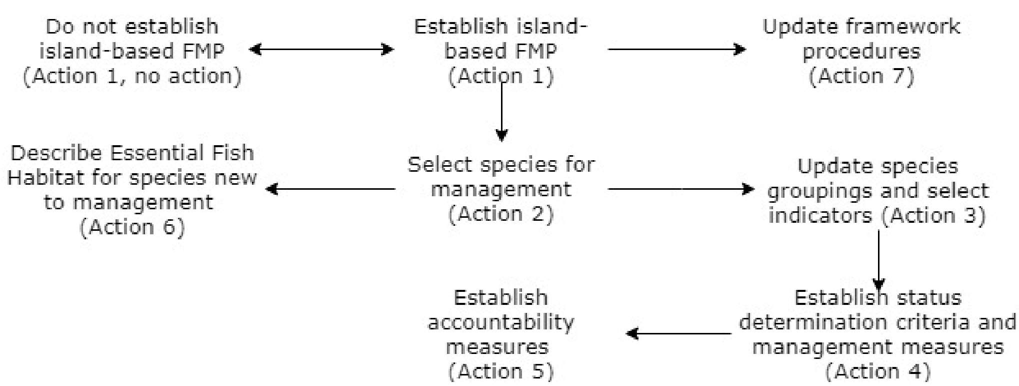

Figure 2.1. Structure of the management actions considered in Chapter 2.

2.1 Action 1: Transition Fisheries Management in the St. Thomas/St. John Exclusive Economic Zone (EEZ) from a U.S. Caribbean-wide Approach to an Island-based Approach

Action 1 provides the actual mechanism for transitioning from U.S. Caribbean-wide management to island-based management in St. Thomas/St. John EEZ waters.

2.1.1 Proposed Alternatives for Action 1

Alternative 1. No Action. The transition from a U.S. Caribbean-wide approach to an island-based approach to management within the St. Thomas/St. John EEZ would not be implemented. Instead, the four U.S. Caribbean-wide FMPs (Reef Fish FMP; Spiny Lobster FMP; Queen Conch FMP; and Coral FMP) would continue to guide federal fishery management in the St. Thomas/St. John EEZ.

Preferred Alternative 2. Establish a new St. Thomas/St. John FMP to manage fishery resources in the St. Thomas/St. John EEZ and repeal the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs as they apply to the St. Thomas/St. John EEZ and replace them with the new St. Thomas/St. John FMP. The new St. Thomas/St. John FMP would include all fishery management measures presently included in the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs that are applicable to the St. Thomas/St. John EEZ.

2.1.2 Discussion of Action 1 Alternatives

Alternative 1 (No Action) would maintain the existing U.S. Caribbean-wide fisheries management approach. The Council would continue to manage federal fisheries in the St. Thomas/St. John EEZ via the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs, as amended. To initially evaluate the environmental effects of shifting from a U.S. Caribbean-wide management approach to an island-based management approach, and to identify the most appropriate aggregation of islands for island-based management, the Council, in partnership with the National Marine Fisheries Service (NMFS), prepared an environmental assessment (EA) that concluded with a Finding of No Significant Impact (FONSI) regarding the management transition (NMFS 2014) (see below for additional information on the 2014 EA).

Additionally, if the current management regime is continued, as noted in the 2014 EA, under **Alternative 1**, the Council would have to develop a new Aquarium Trade Species FMP as recommended by the Council in the 2011 Caribbean Annual Catch Limit (ACL) Amendment (CFMC 2011b).

Preferred Alternative 2 would complete the transition from U.S. Caribbean-wide fishery management to island-based fishery management in the St. Thomas/St. John EEZ as initiated and evaluated in the 2014 EA. The EA evaluated the impact of incorporating the most current regulations under the Council's four U.S. Caribbean-wide FMPs into the St. Thomas/St. John, Puerto Rico, and St. Croix FMPs. With the exception of the management revisions proposed in the subsequent six actions discussed in this FMP/EA (Actions 2-7), shifting from the U.S. Caribbean-wide FMPs to island-based FMPs would only restructure or reorganize the existing management measures and thus would be considered largely an administrative exercise. Moreover, tailoring management measures to specific islands, in this case St. Thomas/St. John, could potentially make fisheries management more effective by ensuring to the greatest possible degree that optimum yield (OY) is achieved while minimizing adverse direct or indirect effects to the environment (NMFS 2014).

The St. Thomas/St. John management area in the St. Thomas/St. John FMP encompasses the boundaries defining the St. Thomas/St. John EEZ subdivision established in the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b). This island-based allocation provided the initial foundation for partitioning the current U.S. Caribbean-wide FMPs into three island-based FMPs. **Preferred Alternative 2** would establish the same management regime chosen by the Council in the 2014 EA and is consistent with the Council's expressed intention in the 2014 EA (i.e., transition to island-based management) and is consistent with the Council's expressed intention in the 2014 EA.

The creation of the new island-based St. Thomas/St. John FMP in **Preferred Alternative 2**, would bring to this new plan all provisions pertinent to the St. Thomas/St. John management area from the U.S. Caribbean-wide plans.

An implicit requirement of transitioning to island-based management throughout the entire U.S. Caribbean is that **Preferred Alternative 2** be implemented for all three island-based management areas: St. Thomas/St. John, St. Croix, and Puerto Rico. The four U.S. Caribbean-wide FMPs were based on certain measures that were established across the entire U.S. Caribbean region. For example, in the 2010 Caribbean ACL Amendment, the maximum sustainable yield (MSY) and overfishing limit (OFL) were set on a U.S. Caribbean-wide basis for managed stocks and stock complexes. In the 2011 Caribbean ACL amendment, two stock complexes (tilefish, aquarium trade) were managed U.S. Caribbean-wide. Removing some, but not all, of those management measures from the four U.S. Caribbean-wide FMPs would undermine the rationale behind those FMPs. Thus, if the Council chose to partially transition to island-based management, implementing island-based management for the St. Thomas/St. John EEZ alone, the U.S. Caribbean-wide FMPs would have to be amended to remove St. Thomas/St. John so that the Council would not have two sets of management measures applicable to the St. Thomas/St. John EEZ. Without amendment, in at least some cases, those management measures would overlap and likely would be contradictory. The effects of such contradictory management would be generally negative, in many cases unenforceable, and would violate the mandates of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

As is noted above, the U.S. Caribbean-wide management measures established in the U.S. Caribbean-wide FMPs are not amenable to being transferred to the island-based FMPs. Thus, after choosing to transition to island-based management, the U.S. Caribbean-wide status determination criteria (SDC), such as MSY and OFL, must be updated. A complete transition to island-based management (for all three island management areas) would be needed, otherwise the Council would need to reevaluate their approach to this proposed management transition.

Comparison of Action 1 Alternatives and Summary of Effects

As described in the 2014 EA, continuing the status quo in **Alternative 1** is an administrative action that would not result in changes to the management of federal fisheries in the U.S. Caribbean EEZ; and therefore, **Alternative 1** would not have any direct effects on the physical or biological/ecological environments. When compared to **Preferred Alternative 2** (establishing a new St. Thomas/St. John FMP), taking no action in **Alternative 1** would benefit the administrative environment in the short-term because it would not require administrative adjustments. However, long-term effects of continuing management under the U.S. Caribbean-wide plans could be negative because this approach would not provide the Council with their preferred mechanism to tailor fisheries management to the different cultural, social, and economic factors that affect the fisheries at the sub-regional (island) level.

Preferred Alternative 2 would have short-term effects to the human environment (physical, biological/ecological, and socio-economic) mostly similar to those described for **Alternative 1** because, based solely on the outcome from Action 1, the applied regulatory environment would not change. An island-based approach proposed by **Preferred Alternative 2** could, in the long-term, potentially minimize impacts to the physical, biological, economic, and social environments from fishing activities by enhancing fisheries management. However, some of the expected benefits are unknown at this time because future impacts to the human environment depend on the nature of the specific future management actions. However, the ultimate outcome from implementing **Preferred Alternative 2**, coupled with implementation of any combination of proposed management actions (except the No Action alternatives) presented and discussed in Actions 2-7, likely would be positive. Even under **Alternative 1**, however, the Council could choose to amend management, with some of the benefits expected under **Preferred Alternative 2**, though the Council expects more beneficial results from managing at an island-level as discussed in the 2014 EA (NMFS 2014).

With the exception of Actions 2-7, all present management measures applicable to the St. Thomas/St. John EEZ would be included (migrated to) in the new plan, and their effect on the human environment would not be expected to be different than status quo. The effects of those regulations have been analyzed and disclosed in previous Council National Environmental Policy Act (NEPA) documents (see Appendix C for the History of Federal Fisheries Management).

2.2 Action 2: Identify Stocks in Need of Federal Conservation and Management

Through Action 2, the Council would determine the species[10] that would be included for management under the new St. Thomas/St. John FMP. This action follows from selecting Alternative 2 in Action 1 and proceeding with establishing a St. Thomas/St. John FMP comprised of measures pertinent to St. Thomas/St. John.

The Magnuson-Stevens Act guidelines for developing and reviewing FMPs state that "stocks that are predominantly caught in federal waters and are overfished or subject to overfishing, or likely to become overfished or subject to overfishing" require conservation and management (50 CFR 600.305(c)(1)). These stocks must be included in an FMP. In addition, the regulations provide the following non-exhaustive factors that may be considered when deciding whether additional stocks require conservation and management and should be included in the FMP (50 CFR 600.305(c)(1)(i)-(x)):

(i) The stock is an important component of the marine environment.

(ii) The stock is caught by the fishery.

(iii) Whether an FMP can improve or maintain the condition of the stock.

(iv) The stock is a target of a fishery.

(v) The stock is important to commercial, recreational, or subsistence users.

(vi) The fishery is important to the Nation or to the regional economy.

(vii) The need to resolve competing interests and conflicts among user groups and whether an FMP can further that resolution.

(viii) The economic condition of a fishery and whether an FMP can produce more efficient utilization.

(ix) The needs of a developing fishery, and whether an FMP can foster orderly growth.

[10] For purposes of this FMP, the term species refers to an animal as it occurs throughout its range. Since species can occur over large geographic areas, they are often managed as separate, but interrelated stocks. The Council and its Scientific and Statistical Committee considered the list of species occurring in the St. Thomas/St. John management area, and selected stocks for management within the St. Thomas/St. John FMP.

(x) The extent to which the fishery is already adequately managed by states, by state/federal programs, or by federal regulations pursuant to other FMPs or international commissions, or by industry self-regulation, consistent with the requirements of the Magnuson-Stevens Act and other applicable law.

In evaluating these factors, the Council considered the specific circumstances of the St. Thomas/St. John fishery, based on the best scientific information available, to determine which species should be selected for federal management in the St. Thomas/St. John FMP.

2.2.1 Proposed Alternatives for Action 2

Alternative 1. No Action. The St. Thomas/St. John FMP, created in Action 1, is composed of all species within the fishery management units presently managed under the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs.

Preferred Alternative 2. For those species for which landings data are available (Appendix D), the Council would follow a stepwise application of a set of criteria to determine if a species should be included for management in the St. Thomas/St. John FMP. The criteria under consideration include, in order:

Criterion A. Include for management those species that are presently classified as overfished in U.S. Caribbean federal waters based on NMFS determination, or for which historically identified harvest is now prohibited due to their ecological importance as habitat (all corals) or habitat engineers (midnight, blue, rainbow parrotfish), or those species for which seasonal closures or size limits apply (Table 2.2.1).

Criterion B. From the remaining species, i.e., those not included via Criterion A, exclude from federal management those species that have been determined to infrequently occur in federal waters based on expert analysis guided by available data (Table 2.2.2).

Criterion C. From the remaining species, i.e., those not included via Criterion A or excluded via Criterion B, include for management those species that are biologically vulnerable, constrained to a specific habitat that renders them particularly vulnerable, or have an essential ecological value, as determined by expert analysis (Table 2.2.3).

Criterion D. From the remaining species, i.e., those not included via Criteria A and C or excluded via Criterion B, include those species possessing economic importance to the national or regional economy based on a threshold of landings or value separately determined for each of the recreational, commercial, and aquarium trade sectors as appropriate (e.g., top 90%) and those representing an important component of bycatch, as established by expert analysis (Table 2.2.4).

Criterion E. From the remaining species, include any other species that the Council determines are in need of conservation and management (Table 2.2.5).

Table 2.2.1. Species included in the St. Thomas/St. John FMP based on Preferred Alternative 2, *Criterion A*.

Family	Scientific Name	Common Name
Lutjanidae -- Snappers	*Apsilus dentatus*	Black snapper
	Lutjanus buccanella	Blackfin snapper
	Lutjanus vivanus	Silk snapper
	Rhomboplites aurorubens	Vermilion snapper
	Lutjanus synagris	Lane snapper
	Lutjanus analis	Mutton snapper
	Ocyurus chrysurus	Yellowtail snapper
Serranidae -- Groupers	*Epinephelus striatus*	Nassau Grouper
	Epinephelus itajara	Goliath grouper
	Epinephelus guttatus	Red hind
	Mycteroperca bonaci	Black grouper
	Epinephelus morio	Red grouper
	Mycteroperca tigris	Tiger grouper
	Mycteroperca venenosa	Yellowfin grouper
	Hyporthodus flavolimbatus	Yellowedge grouper
Scaridae -- Parrotfishes	*Scarus coeruleus*	Blue parrotfish
	Scarus coelestinus	Midnight parrotfish
	Scarus guacamaia	Rainbow parrotfish
Strombidae -- True conchs	*Lobatus gigas*	Queen conch
Palinuridae -- Spiny lobsters	*Panulirus argus*	Caribbean spiny lobster
Corals	All corals (See Appendix E for examples)	

Table 2.2.2. Species that would be excluded from the St. Thomas/St. John FMP based on Preferred Alternative 2, *Criterion B*. Species that were not managed under the Coral and Reef Fish FMPs are noted with a ^.

Family	Scientific Name	Common Name
Lutjanidae -- Snappers	*Pristipomoides aquilonaris*	Wenchman
	Pristipomoides macrophthalmus	Cardinal
	Lutjanus griseus	Gray snapper
	Lutjanus apodus	Schoolmaster
	Lutjanus mahogoni	Mahogany snapper
	Lutjanus jocu	Dog snapper
Serranidae -- Groupers	*Cephalopholis cruentata*	Graysby

Family	Scientific Name	Common Name
	Epinephelus adscensionis	Rock hind
Haemulidae -- Grunts	*Haemulon aurolineatum*	Tomtate
	Haemulon flavolineatum	French grunt
	Anisotremus virginicus	Porkfish
Mullidae -- Goatfishes	*Pseudupeneus maculatus*	Spotted goatfish
	Mulloidichthys martinicus	Yellow goatfish
Holocentridae -- Squirrelfishes	*Myripristis jacobus*	Blackbar soldierfish
	Priacanthus arenatus	Bigeye
	Holocentrus adscensionis	Squirrelfish
Malacanthidae -- Tilefishes	*Caulolatilus cyanops*	Blackline tilefish
	Malacanthus plumieri	Sand tilefish
Carangidae -- Jacks	*Caranx latus*	Horse-eye jack
	Caranx lugubris	Black jack
	Seriola rivoliana	Almaco jack
	Caranx ruber	Bar jack
	Seriola dumerili	Greater amberjack
	Caranx bartholomaei	Yellow jack
	Caranx hippos	Crevalle jack^
	Elagatis bipinnulata	Rainbow runner^
Monocanthidae -- Filefishes	*Aluterus scriptus*	Scrawled filefish
	Cantherhines macrocerus	Whitespotted filefish
Balistidae -- Triggerfishes	*Canthidermis sufflamen*	Ocean triggerfish
	Xanthichthys rigens	Sargassum triggerfish
	Melichthys niger	Black durgon[1]
Ostraciidae -- Boxfishes	*Acanthostracion polygonius*	Honeycomb cowfish
	Acanthostracion quadricornis	Scrawled cowfish
	Lactophrys trigonus	Trunkfish
	Lactophrys bicaudalis	Spotted trunkfish
	Lactophrys triqueter	Smooth trunkfish
Labridae -- Wrasses	*Halichoeres radiatus*	Puddingwife
	Bodianus rufus	Spanish hogfish
Sphyraenidae -- Barracudas	*Sphyraena barracuda*	Great barracuda^
Scombridae -- Mackerels and Tunas	*Euthynnus alletteratus*	Little tunny^
	Thunnus atlanticus	Blackfin tuna^
	Scomberomorus cavalla	King mackerel^
	Scomberomorus regalis	Cero mackerel^
Aquarium Trade Species – Reef Fish FMP	*Antennarius spp.*	Frogfish
	Apogon maculatus	Flamefish
	Astrapogon stellatus	Conchfish
	Ophioblennius atlanticus	Redlip blenny
	Bothus lunatus	Peacock flounder
	Chaetodon aculeatus	Longsnout butterflyfish

Family	Scientific Name	Common Name
	Chaetodon capistratus	Foureye butterflyfish
	Chaetodon ocellatus	Spotfin butterflyfish
	Chaetodon striatus	Banded butterflyfish
	Amblycirrhitus pinos	Redspotted hawkfish
	Dactylopterus volitans	Flying gurnard
	Chaetodipterus faber	Atlantic spadefish
	Gobiosoma oceanops	Neon goby
	Priolepis hipoliti	Rusty goby
	Gramma loreto	Royal gramma
	Clepticus parrae	Creole wrasse
	Halichoeres cyanocephalus	Yellowcheek wrasse
	Halichoeres garnoti	Yellowhead wrasse
	Halichoeres maculipinna	Clown wrasse
	Hemipteronotus novacula	Pearly razorfish
	Hemipteronotus splendens	Green razorfish
	Thalassoma bifasciatum	Bluehead wrasse
	Echidna catenata	Chain moray
	Gymnothorax funebris	Green moray
	Gymnothorax miliaris	Goldentail moray
	Ogcocepahalus spp.	Batfish
	Myrichthys ocellatus	Goldspotted eel
	Opistognathus aurifrons	Yellowhead jawfish
	Opistognathus whitehursti	Dusky jawfish
	Centropyge argi	Cherubfish
	Holacanthus tricolor	Rock beauty
	Abudefduf saxatilis	Sergeant major
	Chromis cyanea	Blue chromis
	Chromis insolata	Sunshinefish
	Microspathodon chrysurus	Yellowtail damselfish
	Pomacentrus fuscus	Dusky damselfish
	Pomacentrus leucostictus	Beaugregory
	Pomacentrus partitus	Bicolor damselfish
	Pomacentrus planifrons	Threespot damselfish
	Priacanthus cruentatus	Glasseye snapper
	Equetus acuminatus	High-hat
	Equetus lanceolatus	Jackknife-fish
	Equetus punctatus	Spotted drum
	Scorpaenidae	Scorpionfishes
	Hypoplectrus unicolor	Butter hamlet
	Liopropoma rubre	Swissguard basslet
	Rypticus saponaceus	Greater soapfish

Family	Scientific Name	Common Name
	Serranus annularis	Orangeback bass
	Serranus baldwini	Lantern bass
	Serranus tabacarius	Tobaccofish
	Serranus tigrinus	Harlequin bass
	Serranus tortugarum	Chalk bass
	Symphurus arawak	Caribbean tonguefish
	Hippocampus spp.	Seahorses
	Syngnathus spp.	Pipefishes
	Synodus intermedius	Sand diver
	Canthigaster rostrata	Sharpnose puffer
	Diodon hystrix	Porcupinefish
Aquarium Trade Species – Coral FMP	*Aphimedon compressa*	Erect rope sponge
	Chondrilla nucula	Chicken liver sponge
	Cynachirella alloclada	-
	Geodia neptuni	Potato sponge
	Haliclona spp.	Finger sponge
	Myriastra spp.	-
	Niphates digitalis	Pink vase sponge
	N. erecta	Lavender rope sponge
	Spinosella policifera	-
	S. vaginalis	Branching vase sponge
	Tethya crypta	-
	Aiptasia tagetes	Pale anemone
	Bartholomea annulata	Corkscrew anemone
	Condylactis gigantea	Giant pink-tipped anemone
	Hereractis lucida	Knobby anemone
	Lebrunia spp.	Staghorn anemone
	Stichodactyla helianthus	Sun anemone
	Zoanthus spp.	Sea mat
	Discosoma spp. (formerly Rhodactis)	False coral
	Ricordia florida	Florida false coral
	Sabellastarte spp.	Tube worms
	S. magnifica	Magnificent duster
	Spirobranchus giganteus	Christmas tree worm
	Tridachia crispata	Lettuce sea slug
	Oliva reticularis	Netted olive
	Cyphoma gibbosum	Flamingo tongue
	Lima spp.	Fileclams
	L. scabra	Rough fileclam
	Spondylus americanus	Atlantic thorny oyster

Family	Scientific Name	Common Name
	Octopus spp. (except the Common octopus, O.vulgaris)	-
	Alpheaus armatus	Snapping shrimp
	Paguristes spp.	Hermit crabs
	P. cadenati	Red reef hermit
	Percnon gibbesi	Nimble spray crab
	Lysmata spp.	Peppermint shrimp
	Thor amboinensis	Anemone shrimp
	Mithrax spp.	Clinging crabs
	M. cinctimanus	Banded clinging
	M. sculptus	Green clinging
	Stenorhynchus seticornis	Yellowline arrow
	Periclimenes spp.	Cleaner shrimp
	Gonodactylus spp.	-
	Lysiosquilla spp.	-
	Stenopus hispidus	Banded shrimp
	S. scutellatus	Golden shrimp
	Analcidometra armata	Swimming crinoid
	Davidaster spp.	Crinoids
	Nemaster spp.	Crinoids
	Astropecten spp.	Sand stars
	Linckia guildingii	Common comet star
	Ophidiaster guildingii	Comet star
	Oreaster reticulatus	Cushion sea star
	Astrophyton muricatum	Giant basket star
	Ophiocoma spp.	Brittlestars
	Ophioderma spp.	Brittlestars
	O. rubicundum	Ruby brittlestar
	Subphylum Urochordata	Tunicates

[1] Black durgon was listed incorrectly as a filefish in the species table in Appendix A to Part 622 (Caribbean Reef Fish). Here, it is properly identified as a triggerfish.

Table 2.2.3. Species included in the St. Thomas/St. John FMP based on Preferred Alternative 2, *Criterion C.* Species marked with an asterisk are new to federal management.

Family	Scientific Name	Common Name
Serranidae -- Groupers	*Cephalopholis fulva*	Coney
	Hyporthodus mystacinus	Misty grouper
	Mycteroperca interstitialis	Yellowmouth grouper*
Scaridae -- Parrotfishes	*Scarus vetula*	Queen parrotfish
	Scarus taeniopterus	Princess parrotfish

Family	Scientific Name	Common Name
	Sparisoma chrysopterum	Redtail parrotfish
	Sparisoma viride	Stoplight parrotfish
	Sparisoma aurofrenatum	Redband parrotfish
	Scarus iseri	Striped parrotfish
	Sparisoma rubripinne	Redfin parrotfish
Haemulidae -- Grunts	*Haemulon plumierii*	White grunt
	Haemulon album	Margate
	Haemulon sciurus	Bluestriped grunt
Sparidae -- Porgies	*Calamus bajonado*	Jolthead porgy
	Archosargus rhomboidalis	Sea bream
	Calamus penna	Sheepshead porgy
	Calamus calamus	Saucereye porgy[1]
Acanthuridae -- Surgeonfishes	*Acanthurus coeruleus*	Blue tang
	Acanthurus bahianus	Ocean surgeonfish
	Acanthurus chirurgus	Doctorfish
Labridae -- Wrasses	*Lachnolaimus maximus*	Hogfish
Pomacanthidae -- Angelfishes	*Holacanthus ciliaris*	Queen angelfish
	Pomacanthus arcuatus	Gray angelfish
	Pomacanthus paru	French angelfish

[1] The Scups & Porgies stock complex under the Reef Fish FMP included jolthead, sea bream, sheepshead, and pluma porgies. Landings for the porgies were previously reported by the stock complex, and most landings were recorded as pluma porgy. Following the changes to USVI data reporting forms, where the porgies were reported by species, landings were recorded as saucereye. Though pluma porgy and saucereye porgy are different species, it was assumed that fishers were landing the same species. Therefore, saucereye porgy was not considered a species new to management. Pluma porgy will not be managed, but rather was assumed to be the saucereye porgy.

Table 2.2.4. Species included in the St. Thomas/St. John FMP based on Preferred Alternative 2, *Criterion D*. Species marked with an asterisk would be new to federal management.

Family	**Scientific Name**	**Common Name**
Lutjanidae -- Snappers	*Etelis oculatus*	Queen snapper
Carangidae -- Jacks	*Caranx crysos*	Blue runner
Balistidae -- Triggerfishes	*Balistes vetula*	Queen triggerfish
Coryphaenidae -- Dolphinfish	*Coryphaena hippurus*	Dolphin*
Scombridae -- Mackerels and Tunas	*Acanthocybium solandri*	Wahoo*

Table 2.2.5. Species proposed to be included in the St. Thomas/St. John FMP based on Preferred Alternative 2, *Criterion E*.

Class	Scientific Name	Common Name
Holothuroidea	All (See Appendix E)	Sea cucumbers
Echinoidea*	All (See Appendix E)	Sea urchins

*Orders Arbacioida, Camarodonta, Cassiduloida, Cidaroida, Diadematoida, Echinolampadoida, Echinoneoida, Echinothurioida, Pedinoida, Salenioida, and Spatangoida

2.2.2 Discussion of Action 2 Alternatives

Under **Alternative 1** (No Action), the species included in the St. Thomas/St. John FMP as established under Action 1 (i.e., the species previously managed under the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs) would not be modified. Under **Alternative 1,** the St. Thomas/St. John FMP would include 81 species of reef fish, 58 species of aquarium trade fish, spiny lobster, queen conch, 94 species or genera of corals, and 63 species or genera of aquarium trade invertebrates. **Alternative 1** would not allow that list of species to be tailored to the St. Thomas/St. John EEZ, as many species included in the Council's U.S. Caribbean-wide FMPs are not neccesarily present, or are not an economically important component of the fishery, in the St. Thomas/St. John EEZ waters. **Alternative 1** would also not allow for new species to be included for management in the St. Thomas/St. John FMP, which may result in the exclusion of a species that requires conservation and management.

Preferred Alternative 2 uses an integrated attributes analysis to select species for management in the St. Thomas/St. John FMP. The five selection criteria (Criteria A-E [discussed below]) were based on attributes that reflected present management status, biological attributes such as ecological importance or vulnerability, and the importance and value of the fishery to the region.

The Council's Scientific and Statistical Committee (SSC) and St. Thomas/St. John District Advisory Panel (DAP) provided input and recommendations on the criteria used to select species in need of conservation and management. Species considered for management included those within the St. Thomas/St. John FMP (as retained from the four U.S. Caribbean-wide FMPs) as well as non-managed species for which the Southeast Fisheries Science Center (SEFSC) had landings (See Appendix D). These experts developed the initial list of species to be included in the St. Thomas/St. John FMP by applying selection criteria A-D in a stepwise manner. The final list of proposed species was considered by the Council at their 153rd meeting in August 2015. A fifth criterion, *Criterion E*, was added at the Council's 162nd regular meeting in April 2018, as a means to deal with stocks for which average landings during the reference period were so low as to be considered *de minimis*[11]. However, at the 163rd Council meeting in August 2018, the

[11] Definition - too trivial or minor to merit consideration. The *de mininis* landings would not apply to previously identified conservation and management concerns that resulted in the application of specific management

Council decided to reject *Criterion E* (see Appendix F for the rationale) and replace it with a new *Criterion E* that would reflect earlier work that the Council had completed to include species that require conservation and management but were not captured by *Criteria A-D,* such as sea cucumbers and sea urchins (See Appendix E for a partial list of these species).

The stepwise approach proposed in **Preferred Alternative 2** begins with application of *Criterion A*, which ensures the inclusion of stocks in the St. Thomas/St. John FMP that currently have specific management measures in place, including those classified as overfished in U.S. Caribbean waters, stocks for which historically identified harvest is now prohibited due to ecological importance as habitat or habitat engineers, and those stocks for which seasonal closures or size limits apply. Inclusion of *Criterion A* is necessary to ensure that management of those identified stocks continues to aid their recovery and/or conservation. Under *Criterion A* of **Preferred Alternative 2**, 18 finfish, queen conch, spiny lobster, and previously managed corals would be included in the Thomas/St. John FMP (Table 2.2.1). Following a recommendation from the St. Thomas/St. John DAP, the Council agreed that all corals[12] occurring in St. Thomas/St. John EEZ waters were in need of conservation and management and therefore should be included in the FMP under this criterion (See Appendix E for a partial list of corals).

Under *Criterion B* of **Preferred Alternative 2**, species that occur infrequently in federal waters would be excluded from the St. Thomas/St. John FMP, unless they were included under *Criterion A*. For these excluded species, the Council determined that the FMP would not be able to improve or maintain the condition of the stock and so they were not in need of conservation and management. Suitable harvest location data (e.g., catch from federal versus territorial waters) were not available from commercial catch reports. However, depth distribution data were available and were used in the expert determination as to whether the species predominantly occurred in St. Thomas/St. John territorial waters (generally $\leq$ 30 m) and were therefore not appropriate for federal management, or commonly occurred in federal waters (generally > 30 m) and therefore eligible for further consideration under *Criteria C* and *D*. Under *Criterion B*, 36 individual species of finfish, all aquarium trade finfish species, and 56 aquarium trade invertebrate species originally included in the St. Thomas/St. John FMP through Action 1 would be excluded from management (Table 2.2.2). Additionaly, a total of seven species that were included in the list of considered species, but that were not previously managed in federal waters, were excluded under *Criterion B*.

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regulations (captured in Criterion A). The *de minimis* classification is appropriate when low landings of a stock reflect fishery socioeconomics rather than the biological condition of the stock.

[12] At their 153rd Regular meeting, the Council moved to include all soft, hard, mesophotic, and deep water corals under the new island-based FMPs. Corals included in the St. Thomas/St. John FMP include the phylum Cnidaria (formerly Coelenterata) 1) Class Hydrozoa, Sub-Class Hydroidolina, Order Anthoathecata, Family Milleporidae and Family Stylasteridae; 2) Class Anthozoa, Subclass Octocorallia (soft corals, gorgonians, sea pansies, sea pens), Order Alcyonacea (soft corals), Order Pennatulacea (sea pens), Subclass Hexacorallia, Order Scleractinia (stony corals), and Order Anthipatharia (black corals).

From the remaining list of species (i.e., those not included under *Criterion A* or excluded under *Criterion B*), *Criterion C* of **Preferred Alternative 2**, would include a species in the St. Thomas/St. John FMP if it was biologically vulnerable, constrained to a specific habitat that renders it particularly vulnerable, or has an essential ecological value. Under *Criterion C*, 24 finfish would be included in the St. Thomas/St. John FMP including one new species (yellowmouth grouper) (Table 2.2.3).

From the remaining list of species (i.e., those not included under *Criterion A,* excluded under *Criterion B,* or included under *Criterion C*), *Criterion D* of **Preferred Alternative 2** would include in the St. Thomas/St. John FMP species that possesses economic importance to the nation or regional economy or if it represents an important component of bycatch. Five finfish species were selected for inclusion under this criterion including two new pelagic species (dolphin and wahoo) (Table 2.2.4). After careful consideration, thse pelagic species were included for federal management under this criterion. The Council recognized the economic importance of these stocks within the region and decided to include them for management under the St. Thomas/St. John FMP, even though, given their migratory nature, they are exposed to harvest pressure across a wide area of the Atlantic Ocean.

As mentioned above, a new description for *Criterion E* was added to **Preferred Alternative 2** to allow the Council discretion to add those species they felt were in need of conservation or management. All sea cucumbers and sea urchins that occur in the St. Thomas/St. John EEZ would fall under this category (Table 2.2.5). These groups were added to the St. Thomas/St. John FMP by Council motion at their 153rd regular meeting in August 2015, because as slow-moving benthic invertebrates, they are commercially exploited for consumption through export to Asian markets and are highly vulnerable to overharvest.

One species included in the St. Thomas/St. John FMP as established in Action 1 was not included in the final list of species to be managed, but was not excluded via *Criterion B*. During their 153rd regular meeting in August 2015, the Council determined that longspine squirrelfish did not require conservation and management because it was not targeted, was not highly susceptible to fishing pressure, and was not at risk of overfishing. Thus, under **Preferred Alternative 2** longspine squirrelfish was not included in the St. Thomas/St. John FMP.

In summary, **Preferred Alternative 2** would result in the following list of species to be included in the St. Thomas/St. John FMP: queen conch, spiny lobster, all species of sea cucumbers, sea urchins, and coral occurring in St. Thomas/St. John EEZ waters, and 47 species of finfish (Table 2.2.6).

Table 2.2.6. Species included in the St. Thomas/St. John FMP based on Criteria A-E of Preferred Alternative 2. The Council proposed these stocks for management at their 153rd Regular Meeting (August 2015). Species marked with an asterisk would be new to federal management.

Family or Class	Scientific Name	Common Name	Criterion
Strombidae -- True conchs	*Lobatus gigas*	Queen conch	A
Palinuridae -- Spiny lobster	*Panulirus argus*	Caribbean spiny lobster	A
Lutjanidae -- Snappers	*Apsilus dentatus*	Black snapper	A
	Lutjanus buccanella	Blackfin snapper	A
	Lutjanus vivanus	Silk snapper	A
	Rhomboplites aurorubens	Vermilion snapper	A
	Lutjanus synagris	Lane snapper	A
	Lutjanus analis	Mutton snapper	A
	Ocyurus chrysurus	Yellowtail snapper	A
	Etelis oculatus	Queen snapper	D
Serranidae -- Groupers	*Epinephelus striatus*	Nassau Grouper	A
	Epinephelus itajara	Goliath grouper	A
	Epinephelus guttatus	Red hind grouper	A
	Mycteroperca bonaci	Black grouper	A
	Epinephelus morio	Red grouper	A
	Mycteroperca tigris	Tiger grouper	A
	Mycteroperca venenosa	Yellowfin grouper	A
	Hyporthodus flavolimbatus	Yellowedge grouper	A
	Cephalopholis fulva	Coney	C
	Hyporthodus mystacinus	Misty grouper	C
	Mycteroperca interstitialis	Yellowmouth grouper*	C
Scaridae -- Parrotfishes	*Scarus coeruleus*	Blue parrotfish	A
	Scarus coelestinus	Midnight parrotfish	A
	Scarus guacamaia	Rainbow parrotfish	A
	Scarus vetula	Queen parrotfish	C
	Scarus taeniopterus	Princess parrotfish	C
	Sparisoma chrysopterum	Redtail parrotfish	C
	Sparisoma viride	Stoplight parrotfish	C
	Sparisoma aurofrenatum	Redband parrotfish	C
	Scarus iseri	Striped parrotfish	C
	Sparisoma rubripinne	Redfin parrotfish	C
Haemulidae -- Grunts	*Haemulon plumierii*	White grunt	C
	Haemulon album	Margate	C
	Haemulon sciurus	Bluestriped grunt	C
Sparidae -- Porgies	*Calamus bajonado*	Jolthead porgy	C
	Archosargus rhomboidalis	Sea bream	C
	Calamus penna	Sheepshead porgy	C
	Calamus calamus	Saucereye porgy	C
Carangidae -- Jacks	*Caranx crysos*	Blue runner	D
Acanthuridae -- Surgeonfishes	*Acanthurus coeruleus*	Blue tang	C
	Acanthurus bahianus	Ocean surgeonfish	C
	Acanthurus chirurgus	Doctorfish	C

Family or Class	Scientific Name	Common Name	Criterion
Labridae -- Wrasses	*Lachnolaimus maximus*	Hogfish	C
Pomacanthidae -- Angelfishes	*Holacanthus ciliaris*	Queen angelfish	C
	Pomacanthus arcuatus	Gray angelfish	C
	Pomacanthus paru	French angelfish	C
Balistidae -- Triggerfishes	*Balistes vetula*	Queen triggerfish	D
Coryphaenidae -- Dolphinfish	*Coryphaena hippurus*	Dolphin*	D
Scombridae – Mackerels and Tunas	*Acanthocybium solandri*	Wahoo*	D
Class Holothuroidea – Sea Cucumbers	All (See Appendix E)	Sea cucumbers	E
Class Echinoidea[1] – Sea Urchins	All (See Appendix E)	Sea urchins	E
Corals (soft, hard, mesophotic, deep-water)	All (See Appendix E)	Corals	A

[1] Orders Arbacioida, Camarodonta, Cassiduloida, Cidaroida, Diadematoida, Echinolampadoida, Echinoneoida, Echinothurioida, Pedinoida, Salenioida, and Spatangoida.

Comparison of Action 2 Alternatives and Summary of Effects

Alternative 1 (No Action) would continue management of those stocks that are included under the U.S. Caribbean-wide FMPs, without alteration. When compared to **Alternative 1**, **Preferred Alternative 2** would identify species in need of conservation and management using an expert-based analysis of available data and information applied within an ordered set of evaluation criteria. The outcome of this ordered selection process would result in a change in the number of stocks subject to federal management in St. Thomas/St. John EEZ waters relative to **Alternative 1**. Although three reef fish stocks would be newly included in the federal management regime, 37 reef fish stocks would be simultaneously removed from management, resulting in an overall decrease in the number and composition of managed fish (from 81 to 47). Both alternatives would include spiny lobster and queen conch. Under **Preferred Alternative 2**, all species of corals, sea cucumbers, and sea urchins that occur in St. Thomas/St. John EEZ waters would be added to the federal management regime (see Appendix E). In contrast, under **Alternative 1**, only the species or genera of corals, sea urchins, and sea cucumbers that were included in the Coral FMP would be managed in St. Thomas/St. John EEZ waters.

Alternative 1 would not have direct physical, biological/ecological, socio-economic, or administrative effects relative to the present situation. **Alternative 1** would be expected to have indirect biological/ecological, and socio-economic effects because it would not extend management to other species in need of conservation and management based on the criteria established in the guidance on the Magnuson-Stevens Act. The Council would not set management reference points or other conservation measures for those species, or otherwise ensure those species are managed in a manner that prevents overfishing while achieving, on a continuing basis, the OY from the fishery as required by National Standard (NS) 1 of the

Magnuson-Stevens Act. Additionally, not including species that are economically important could have both short- and long-term socio-economic effects on fishermen pursuing the locally occurring stocks of those species, if unregulated harvest results in depletion of the stock. Conversely, including stocks predominantly harvested from St. Thomas/St. John territorial waters in a management plan applicable only to federal waters is administratively ineffective because of the lack of federal authority and resultant enforcement capacity in those local waters, particularly with respect to application of accountability measures (AM) in response to harvest exceeding the allowable catch limit.

When compared to **Alternative 1**, the indirect benefits of **Preferred Alternative 2** on the physical, biological and ecological environments would depend on the management measures the Council puts in place for those stocks added to the FMP as in need of conservation and management. These stocks, and the physical and biological/ecological environment, could benefit from measures the Council establishes to prevent overfishing or from measures that result in new fishing area management, changes in the number of fish harvested, or fishing effort not previously analyzed. Likewise, for stocks removed from management, the indirect physical and/or biological/ecological effects on the environment depend on the extent to which fishing behavior would change once the stock is removed from federal management. For example, if fishing for a stock that would be removed from federal management under **Preferred Alternative 2** continues as is regardless of federal management, because the stock is largely harvested from territorial waters, effects would be minimal.

Like **Alternative 1**, **Preferred Alternative 2** would continue to manage species that are susceptible to excess fishing pressure and/or vulnerable to environmental conditions (e.g., species classified as overfished [Nassau, goliath grouper], species with harvest prohibitions due to ecological importance [midnight, rainbow, blue parrotfish], species with seasonal closures or size limits [spiny lobster and select snappers and groupers]). Unlike **Alternative 1, Preferred Alternative 2** has the flexibility to include species that were not included in the previous FMPs, but are currently considered to be biologically vulnerable or ecologically important (e.g., certain species of sea cucumbers, sea urchins). **Preferred Alternative 2** would also benefit the biological/ecological environment indirectly by establishing catch limits (not directly in this action, but later in Action 4) for highly targeted stocks that are currently without management measures, like dolphin and wahoo, thus providing a more comprehensive management of the St. Thomas/St. John coral reef ecosystem. **Preferred Alternative 2** would include for federal management all species of corals that occur within the St. Thomas/St. John management area (See Appendix E), thereby providing protection not just for ESA-listed coral species but for the host of corals that provide the most essential of habitats supporting coral reef fisheries. Including all sea urchins occurring in the St. Thomas/St. John EEZ for management provides an essential ecological service via grazing activities, which provides settlement substrate for coral propagules. Similarly, managing all sea cucumbers in federal waters provides an essential ecological service because they regenerate nutrients sequestered in the sediments surrounding coral reefs, making those nutrients available to primary producers (including coral symbionts).

When compared to **Alternative 1**, **Preferred Alternative 2** could in the future create a short-term socio-economic burden to fishermen that fish for those stocks newly added to management. This would occur if management measures applied to those newly added species, including for example ACLs, trip limits, or size limits, resulted in a reduction in the allowable harvest or an increase in the effort required to obtain that harvest. However, in the long-term, positive effects would be expected as the management measures work to prevent overfishing while achieving, on a continuing basis, the OY from the fishery as prescribed in NS1 of the Magnuson-Stevens Act.

When compared to **Alternative 1**, **Preferred Alternative 2** would be more beneficial administratively because it would direct resources to the management and protection of species that occur in federally managed waters and that are therefore responsive to federal management measures.

In summary, when compared to **Alternative 1**, **Preferred Alternative 2** would be more beneficial to the human environment because it would (1) direct resources to the management and protection of species that are in the highest need of conservation and management; (2) allow inclusion of species that have not been previously subject to conservation and management; and (3) remove species and associated management measures in place for species that are not targeted in federal waters. That reorganization of species to be managed would increase the likelihood of sustainable harvest, as a means both to enhance food security for the island of St. Thomas/St. John and to rebuild and sustain the natural ecological balance of the coral reef ecosystem within the context of sustainable harvest.

2.3 Action 3: Compose Stock Complexes and Identify Indicator Stocks as Appropriate

Through Action 3, the Council would determine, for species selected for management in Action 2 (Preferred Alternative 2), whether those species are managed as individual stocks or within a stock complex, and if the latter then whether the species is assigned as an indicator stock, is governed by an indicator stock, or is managed as a group within the complex. As with Action 2, this action follows from selecting Preferred Alternative 2 in Action 1 and proceeding with establishing a St. Thomas/St. John FMP composed of measures pertinent to St. Thomas/St. John.

Stocks may be grouped into stock complexes for various reasons, for example, where stocks in a multi-species fishery cannot be targeted independent of one another; where there are insufficient data to measure a stock's status relative to established SDC; or when it is not feasible for fishermen to distinguish individual stocks among their catch. The vulnerability of individual stocks should be considered when determining if a particular stock complex should be established or reorganized, or if a particular stock should be included in a complex.

2.3.1 Proposed Alternatives for Action 3

Alternative 1. No Action. In the St. Thomas/St. John FMP, retain the stock complex arrangements previously established in the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs for stocks that would continue to be managed under the St. Thomas/St. John FMP. For stocks not previously included in the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs, but which would be managed under the St. Thomas/St. John FMP via Action 2, no stock complexes would be established and no indicator stocks assigned.

Alternative 2. Do not organize the species in the St. Thomas/St. John FMP into stock complexes. Species selected for management in Action 2 would be managed as individual stocks.

Preferred Alternative 3. Manage species included for management in the St. Thomas/St. John FMP as individual stocks or as stock complexes, based on scientific analysis, including one or more of the following: cluster analysis based on landings patterns; outcomes from the Southeast Data, Assessment, and Review (SEDAR) Caribbean Data Evaluation Workshop (2009) (only for species previously managed that would remain in the FMP); biological/life history similarities and vulnerability (for all species); and, expert opinion from the scientific and fishing communities (for all species).

Alternative 4. Where there are stock complexes, determine whether to assign one or more indicator stocks as follows:

Preferred Sub-alternative 4a. Indicator stocks would be used. One or more indicator stocks would be assigned within a stock complex based on the following criteria: percent of the catch, targeted, habitat co-occurrence, life history/vulnerability, catch co-occurrence, data, and market. For stock complexes for which harvest is allowed and for which one or more indicator stocks is assigned, stocks in the stock complex would be subject to AMs as a group based on the ACL established for the indicator stock(s).

Preferred Sub-alternative 4b. No indicator stock(s) would be assigned. For stock complexes for which harvest is allowed, stocks in the complex would be subject to AMs as a group based on the aggregate ACL derived from information on all of the stocks in the complex.

2.3.2 Discussion of Action 3 Alternatives

Stocks selected for management in Action 2 would be grouped according to the same stock/stock complex organization brought in under Action 1 from the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs, as applicable. Action 2 removed certain species from management and added others, so the stock complex composition under **Alternative 1** would differ from the stock complex composition under the Reef Fish FMP, as shown below (Table 2.3.1). Species added to management would not be grouped into stock complexes, but would be managed individually. Both spiny lobster and queen conch were previously managed as individual stocks, and individual stock management would continue under the St. Thomas/St. John FMP. Select coral, sea urchin, and sea cucumber species were managed under the Coral FMP (see Appendix D), but Action 2 modified that list to include all species within each of those groups (see Appendix E) occurring within the St. Thomas/St. John EEZ. As a result, **Alternative 1** would contain three stock complexes, one for each of the corals, sea urchins, and sea cucumbers that were previously managed, as well as an unknown number of coral, sea urchin, and sea cucumber species that would be managed as individual stocks.

Table 2.3.1. Comparison of stock/stock complex organization under the Reef Fish FMP and Action 3, Alternative 1 (No Action).

Scientific name	Common name	Reef Fish FMP	Alternative 1 (No Action)
Apsilus dentatus	Black snapper	Snapper Unit 1	Snapper 1
Lutjanus buccanella	Blackfin snapper	Snapper Unit 1	Snapper 1
Lutjanus vivanus	Silk snapper	Snapper Unit 1	Snapper 1
Rhomboplites aurorubens	Vermilion snapper	Snapper Unit 1	Snapper 1
Pristipomoides aquilonaris	Wenchman	Snapper Unit 1	removed
Pristipomoides macrophthalmus	Cardinal snapper	Snapper Unit 2	removed
Etelis oculatus	Queen snapper	Snapper Unit 2	Snapper 2
Lutjanus synagris	Lane snapper	Snapper Unit 3	Snapper 3
Lutjanus analis	Mutton snapper	Snapper Unit 3	Snapper 3
Lutjanus griseus	Gray snapper	Snapper Unit 3	removed
Lutjanus jocu	Dog snapper	Snapper Unit 3	removed
Lutjanus apodus	Schoolmaster	Snapper Unit 3	removed
Lutjanus mahogani	Mahogany snapper	Snapper Unit 3	removed
Ocyurus chrysurus	Yellowtail snapper	Snapper Unit 4	Snapper 4
Epinephelus striatus	Nassau Grouper	Grouper Unit 1	Grouper 1
Epinephelus itajara	Goliath grouper	Grouper Unit 2	Grouper 2
Cephalopholis fulva	Coney	Grouper Unit 3	Grouper 3
Cephalopholis cruentata	Graysby	Grouper Unit 3	removed
Epinephelus guttatus	Red hind	Grouper Unit 3	Grouper 3
Epinephelus adscensionis	Rock hind	Grouper Unit 3	removed
Mycteroperca bonaci	Black grouper	Grouper Unit 4	Grouper 4

Scientific name	Common name	Reef Fish FMP	Alternative 1 (No Action)
Epinephelus morio	Red grouper	Grouper Unit 4	Grouper 4
Mycteroperca tigris	Tiger grouper	Grouper Unit 4	Grouper 4
Mycteroperca venenosa	Yellowfin grouper	Grouper Unit 4	Grouper 4
Hyporthodus mystacinus	Misty grouper	Grouper Unit 5	Grouper 5
Hyporthodus flavolimbatus	Yellowedge grouper	Grouper Unit 5	Grouper 5
Mycteroperca interstitialis	Yellowmouth grouper	not managed	Individual
Scarus coeruleus	Blue parrotfish	Parrotfish	Parrotfish
Scarus coelestinus	Midnight parrotfish	Parrotfish	Parrotfish
Scarus guacamaia	Rainbow parrotfish	Parrotfish	Parrotfish
Scarus taeniopterus	Princess parrotfish	Parrotfish	Parrotfish
Scarus vetula	Queen parrotfish	Parrotfish	Parrotfish
Sparisoma rubripinne	Redfin parrotfish	Parrotfish	Parrotfish
Sparisoma chrysopterum	Redtail parrotfish	Parrotfish	Parrotfish
Sparisoma viride	Stoplight parrotfish	Parrotfish	Parrotfish
Sparisoma aurofrenatum	Redband parrotfish	Parrotfish	Parrotfish
Scarus croicensis	Striped parrotfish	Parrotfish	Parrotfish
Holacanthus ciliaris	Queen angelfish	Angelfish	Angelfish
Pomacanthus arcuatus	Gray angelfish	Angelfish	Angelfish
Pomacanthus paru	French angelfish	Angelfish	Angelfish
Acanthurus coeruleus	Blue tang	Surgeonfish	Surgeonfish
Acanthurus bahianus	Ocean surgeonfish	Surgeonfish	Surgeonfish
Acanthurus chirurgus	Doctorfish	Surgeonfish	Surgeonfish
Haemulon plumieri	White grunt	Grunts	Grunts
Haemulon sciurus	Bluestriped grunt	Grunts	Grunts
Haemulon album	Margate	Grunts	Grunts
Haemulon aurolineatum	Tomtate	Grunts	removed
Haemulon flavolineatum	French grunt	Grunts	removed
Anisotremus virginicus	Porkfish	Grunts	removed
Canthidermis sufflamen	Ocean triggerfish	Triggerfish	removed
Balistes vetula	Queen triggerfish	Triggerfish	Triggerfish
Xanthichthys rigens	Sargassum triggerfish	Triggerfish	removed
Melichthys niger	Black durgon	Triggerfish*	removed
Lachnolaimus maximus	Hogfish	Wrasses	Wrasses
Halichoeres radiatus	Puddingwife	Wrasses	removed
Bodianus rufus	Spanish hogfish	Wrasses	removed
Caranx crysos	Blue runner	Jacks	Jacks
Caranx latus	Horse-eye jack	Jacks	removed
Caranx lugubris	Black jack	Jacks	removed
Seriola rivoliana	Almaco jack	Jacks	removed
Caranx ruber	Bar jack	Jacks	removed
Seriola dumerili	Greater amberjack	Jacks	removed
Caranx bartholomaei	Yellow jack	Jacks	removed

Scientific name	Common name	Reef Fish FMP	Alternative 1 (No Action)
Calamus bajonado	Jolthead porgy	Porgies	Porgies
Archosargus rhomboidalis	Sea bream	Porgies	Porgies
Calamus penna	Sheepshead porgy	Porgies	Porgies
Calamus pennatula	Pluma	Porgies**	removed
Calamus calamus	Saucereye porgy	not managed**	Porgies
Myripristis jacobus	Blackbar soldierfish	Squirrelfish	removed
Priacanthus arenatus	Bigeye	Squirrelfish	removed
Holocentrus rufus	Longspine squirrelfish	Squirrelfish	removed
Holocentrus adscensionis	Squirrelfish	Squirrelfish	removed
Acanthostracion polygonius	Honeycomb cowfish	Boxfish	removed
Acanthostracion quadricornis	Scrawled cowfish	Boxfish	removed
Lactophrys trigonus	Trunkfish	Boxfish	removed
Lactophrys bicaudalis	Spotted trunkfish	Boxfish	removed
Lactophrys triqueter	Smooth trunkfish	Boxfish	removed
Aluterus scriptus	Scrawled filefish	Filefish	removed
Cantherhines macrocerus	Whitespotted filefish	Filefish	removed
Pseudupeneus maculatus	Spotted goatfish	Goatfish	removed
Mulloidichthys martinicus	Yellow goatfish	Goatfish	removed
Caulolatilus cyanops	Blackline tilefish	Tilefish	removed
Malacanthus plumieri	Sand tilefish	Tilefish	removed
Coryphaena hippurus	Dolphin	not managed	Dolphin
Acanthocybium solandri	Wahoo	not managed	Wahoo

** previously listed as filefish*

** The Scups & Porgies stock complex under the Reef Fish FMP included jolthead, sea bream, sheepshead, and pluma porgies. Landings for the porgies were previously reported by the stock complex, and most landings were recorded as pluma porgy. Following the changes to USVI data reporting forms, where the porgies were reported by species, landings were recorded as saucereye. Though pluma porgy and saucereye porgy are different species, it was assumed that fishers were landing the same species. Therefore, saucereye porgy was not considered a species new to management. Pluma porgy will not be managed, but rather was assumed to be the saucereye porgy. Under Action 2, the Council determined to manage the species as saucereye porgy, not pluma.

The organization of the stock complexes under the U.S. Caribbean-wide FMPs was based on biological, geographic, ecological, and/or economic characteristics. For some previously managed stocks, the stock/stock complex organization under **Alternative 1** may not be based on the best currently available information, even if it was the best scientific information available at the time the stock complexes were established.

Additionally, stocks new to management under Action 2, Preferred Alternative 2 would be managed as individual stocks rather than grouped in a complex. Those new stocks may have similar biological characteristics to stocks previously managed in a stock complex, which under guidelines on implementing NS1 would suggest that it may be appropriate to manage them within that stock complex. However, under **Alternative 1**, they would not be included in a stock complex, but would be managed as individual stocks.

Alternative 1 would not be a preferred alternative if the Council implements Preferred Alternative 2 in Action 2, as species that were not previously managed in the St. Thomas/St. John EEZ, would not be assigned into stock complexes. Based on Preferred Alternative 2 in Action 2, three finfish species would be new to management under the St. Thomas/St. John FMP (yellowmouth grouper, dolphin, wahoo), along with multiple sea urchins, sea cucumbers, and corals, including deep-water corals and mesophotic corals. Prior to taking action to revise the species list in Action 2, the St. Thomas/St. John FMP would have only included some species of sea urchins, sea cucumbers, and corals, as under the Coral FMP. Those species that would be newly added to the St. Thomas/St. John FMP may share biological, geographic, ecological, and/or economic similarities with those species that would remain under federal management and/or share similarities with some of the other newly added species and therefore, it could be beneficial to group those species into stock complexes. However, **Alternative 1** would not group these species into stock complexes.

Alternative 2 proposes that all stocks included in the St. Thomas/St. John FMP be managed individually. None would be organized into stock complexes. Under **Alternative 2** some stocks may be appropriately managed as individual stocks, such as the queen conch and spiny lobster, because of their unique and individual characteristics. Additionally, many of the stocks that would be included for management in the St. Thomas/St. John FMP have issues with species identification (reported as a group or easily and often mis-identified) or unreliable landings through time (due to the rarity of the species or lack of targeted fishing effort). For those stocks, there may not be enough information available to establish management reference points and management measure proxies required under the Magnuson-Stevens Act or included in the NS guidelines for fishery management. The revised NS1 guidelines state that stocks may be grouped into complexes for various reasons, including “where there is insufficient data to measure a stock's status relative to SDC [status determination criteria],” 50 CFR 600.310(d)(2)(i). Under **Alternative 2**, those reference points would have to be established for each individual stock, even if there is insufficient information to set SDC at the individual stock level or to monitor stock performance with respect to those SDC. Additionally, setting an individual ACL for stocks with highly variable landings may result in frequent ACL overages because of the highly variable landings characteristic of those stocks, resulting in unnecessary application of AMs. In general, AMs create socio-economic burdens on the fishing communities and additional workload burdens on fishery managers and enforcement officers, so they must be applied in the most effective and conscientious manner.

Preferred Alternative 3 would manage stocks individually or as stock complexes, as appropriate, based on scientific analysis, including one or more of the following: cluster analysis based on landings patterns; outcomes from the SEDAR Caribbean Data Evaluation Workshop (2009) (only for species previously managed that would remain in the FMP); biological/life history similarities and vulnerability (for all species); and, expert opinion from the scientific and fishing communities (for all species). This management is consistent with the revised NS1 guidelines, which explain that, where practical, stocks grouped into a complex should be sufficiently similar in geographic distribution, life history characteristics, and vulnerabilities to fishing pressure such that the impact of management actions on the stocks included in a complex is similar (50 CFR 600.310(d)(2)(i)). In addition, the guidelines indicate that the vulnerability of individual stocks should be considered when determining if a particular stock complex should be established or reorganized, or if a particular stock should be included in a complex (50 CFR 600.310(d)(2)(i)).

In contrast to **Alternative 2**, **Preferred Alternative 3** provides managers with the flexibility to choose to manage stocks individually or as a complex, depending on the information available and the goals of the management plan. As discussed under **Alternative 2**, grouping stocks into complexes allows management reference points to be specified for the complex as a whole, which can be particularly helpful in data-limited situations when it is not possible to evaluate an individual stock's status relative to SDC or to otherwise specify management reference points at the individual stock level (50 CFR 600.310(d)(2)(i)). Grouping non-targeted or data-poor stocks into complexes helps buffer uncertainty in individual landings histories, mitigates issues with species identification, and may reduce the likelihood of unnecessary implementation of AMs. In contrast, species such as spiny lobster and queen conch share few if any attributes with any other species proposed for management in the St. Thomas/St. John FMP. These species are best managed as individual stocks, thereby ensuring to the greatest degree possible that management measures reflect their unique characteristics and are not unduly influenced by species that may share (for example) geographic or cultural affinities but fundamentally differ in their biological and/or fishery characteristics. In these cases, the Council has the option under **Preferred Alternative 3** to establish single stock management for those species that are harvested using methods that specifically target that species, have a unique life history, are physically separated from other stocks, are classified as overfished or undergoing overfishing, are in rebuilding plans, or are targeted by fishermen independent of other species.

The Council's SSC and the St. Thomas/St. John DAP met on several occasions to discuss grouping species into complexes as prescribed under **Preferred Alternative 3** and provided recommendations to the Council regarding if and how stocks should be grouped into a complex. Criteria discussed when considering whether to group a set of stocks into a complex included the composition of the existing stock complexes, life history information (i.e., habitat and depth, including federal versus territorial waters), fishery information (i.e., gear and if the stock is targeted or bycatch), if members of the stock might be ciguatoxic, and if (and when) the stock was specifically included on landings forms. A combined SSC/DAP meeting occurred from

March 15-17, 2016, at which the SSC and DAP members discussed groupings using the methods discussed above. Members of the St. Thomas/St. John DAP and SSC evaluated all of the species proposed for management in the St. Thomas/St. John FMP (resulting from the application of Preferred Alternative 2 in Action 2) to determine if they should be managed as a single stock or as part of a stock complex. The resultant stocks (for individual species) and stock complexes (for groups of species) were presented to the Council at their March 17, 2016, meeting. Further review of the stock complexes occurred at the SSC's February 2017 meeting and at the DAP's March 2017 meeting. The recommendations were then finalized at the April 2017 SSC meeting and accepted by the Council at their April 2017 regular meeting.

Preferred Alternative 3 would result in 12 individual stocks and 14 stock complexes (Table 2.3.2). A discussion of how the stocks were composed under **Preferred Alternative 3** and how that organization compares to results from **Alternative 1** and **Alternative 2** can be found below (Table 2.3.3).

Table 2.3.2. Stocks and stock complexes resulting from Preferred Alternative 3 of Action 3 in the St. Thomas/St. John FMP.

Family or Class	Stock/Stock Complexes	Scientific Name	Common Name
Strombidae -- True conchs	Queen Conch	*Lobatus gigas*	Queen conch
Palinuridae -- Spiny lobster	Spiny Lobster	*Panulirus argus*	Caribbean spiny lobster
Lutjanidae -- Snappers	Snapper 1	*Apsilus dentatus*	Black snapper
		Lutjanus buccanella	Blackfin snapper
		Lutjanus vivanus	Silk snapper
		Rhomboplites aurorubens	Vermilion snapper
	Snapper 2	*Etelis oculatus*	Queen snapper
	Snapper 3	*Lutjanus synagris*	Lane snapper
		Lutjanus analis	Mutton snapper
	Snapper 4	*Ocyurus chrysurus*	Yellowtail snapper
Serranidae -- Groupers	Grouper 1	*Epinephelus striatus*	Nassau Grouper
	Grouper 2	*Epinephelus itajara*	Goliath grouper
	Grouper 3	*Cephalopholis fulva*	Coney
		Epinephelus guttatus	Red hind grouper
	Grouper 4	*Mycteroperca bonaci*	Black grouper
		Epinephelus morio	Red grouper
		Mycteroperca tigris	Tiger grouper
		Mycteroperca venenosa	Yellowfin grouper
	Grouper 5	*Mycteroperca interstitialis*	Yellowmouth grouper
		Hyporthodus flavolimbatus	Yellowedge grouper
		Hyporthodus mystacinus	Misty grouper
Scaridae -- Parrotfish	Parrotfish 1	*Scarus coeruleus*	Blue parrotfish
		Scarus coelestinus	Midnight parrotfish
		Scarus guacamaia	Rainbow parrotfish
	Parrotfish 2	*Scarus vetula*	Queen parrotfish

Family or Class	Stock/Stock Complexes	Scientific Name	Common Name
		Scarus taeniopterus	Princess parrotfish
		Sparisoma chrysopterum	Redtail parrotfish
		Sparisoma viride	Stoplight parrotfish
		Sparisoma aurofrenatum	Redband parrotfish
		Scarus iseri	Striped parrotfish
		Sparisoma rubripinne	Redfin parrotfish
Haemulidae -- Grunts	Grunts 1	*Haemulon plumierii*	White grunt
		Haemulon sciurus	Bluestriped grunt
	Grunts 2	*Haemulon album*	Margate
Sparidae -- Porgies	Porgies	*Calamus bajonado*	Jolthead porgy
		Calamus calamus	Saucereye porgy
		Calamus penna	Sheepshead porgy
		Archosargus rhomboidalis	Sea bream
Carangidae -- Jacks	Jacks	*Caranx crysos*	Blue runner
Acanthuridae -- Surgeonfish	Surgeonfish	*Acanthurus coeruleus*	Blue tang
		Acanthurus bahianus	Ocean surgeonfish
		Acanthurus chirurgus	Doctorfish
Labridae -- Wrasses	Wrasses	*Lachnolaimus maximus*	Hogfish
Pomacanthidae -- Angelfish	Angelfish	*Holacanthus ciliaris*	Queen angelfish
		Pomacanthus arcuatus	Gray angelfish
		Pomacanthus paru	French angelfish
Balistidae -- Triggerfish	Triggerfish	*Balistes vetula*	Queen triggerfish
Coryphaenidae -- Dolphinfish	Dolphin	*Coryphaena hippurus*	Dolphin
Scombridae -- Mackerels and Tunas	Wahoo	*Acanthocybium solandri*	Wahoo
Class Holothuroidea -- Sea Cucumbers	Sea Cucumbers	All (See Appendix E)	Sea cucumbers
Class Echinoidea* -- Sea Urchins	Sea Urchins	All (See Appendix E)	Sea urchins
Corals	Corals	All (See Appendix E)	Corals

* Orders Arbacioida, Camarodonta, Cassiduloida, Cidaroida, Diadematoida, Echinolampadoida, Echinoneoida, Echinothurioida, Pedinoida, Salenioida, and Spatangoida.

Table 2.3.3. Comparison of stock and stock complex organization for each species included in the St. Thomas/St. John FMP under each Alternative in Action 3. Species new to federal management (see Action 2) are in bold.

Scientific name	Common name	Alternative 1 (No Action)	Alternative 2	Preferred Alternative 3
Lobatus gigas	Queen conch	Queen conch	Queen conch	Queen conch
Panulirus argus	Spiny lobster	Spiny lobster	Spiny lobster	Spiny lobster
Apsilus dentatus	Black snapper	Snapper 1	Black snapper	Snapper 1
Lutjanus buccanella	Blackfin snapper	Snapper 1	Blackfin snapper	Snapper 1
Lutjanus vivanus	Silk snapper	Snapper 1	Silk snapper	Snapper 1

Scientific name	Common name	Alternative 1 (No Action)	Alternative 2	Preferred Alternative 3
Rhomboplites aurorubens	Vermilion snapper	Snapper 1	Vermilion snapper	Snapper 1
Etelis oculatus	Queen snapper	Snapper 2	Queen snapper	Snapper 2
Lutjanus synagris	Lane snapper	Snapper 3	Lane snapper	Snapper 3
Lutjanus analis	Mutton snapper	Snapper 3	Mutton snapper	Snapper 3
Ocyurus chrysurus	Yellowtail snapper	Snapper 4	Yellowtail snapper	Snapper 4
Epinephelus striatus	Nassau Grouper	Grouper 1	Nassau Grouper	Grouper 1
Epinephelus itajara	Goliath grouper	Grouper 2	Goliath grouper	Grouper 2
Cephalopholis fulva	Coney	Grouper 3	Coney	Grouper 3
Epinephelus guttatus	Red hind	Grouper 3	Red hind	Grouper 3
Mycteroperca bonaci	Black grouper	Grouper 4	Black grouper	Grouper 4
Epinephelus morio	Red grouper	Grouper 4	Red grouper	Grouper 4
Mycteroperca tigris	Tiger grouper	Grouper 4	Tiger grouper	Grouper 4
Mycteroperca venenosa	Yellowfin grouper	Grouper 4	Yellowfin grouper	Grouper 4
Hyporthodus mystacinus	Misty grouper	Grouper 5	Misty grouper	Grouper 5
Hyporthodus flavolimbatus	Yellowedge grouper	Grouper 5	Yellowedge grouper	Grouper 5
Mycteroperca interstitialis	**Yellowmouth grouper**	Yellowmouth grouper	Yellowmouth grouper	Grouper 5
Scarus coeruleus	Blue parrotfish	Parrotfish	Blue parrotfish	Parrotfish 1
Scarus coelestinus	Midnight parrotfish	Parrotfish	Midnight parrotfish	Parrotfish 1
Scarus guacamaia	Rainbow parrotfish	Parrotfish	Rainbow parrotfish	Parrotfish 1
Scarus taeniopterus	Princess parrotfish	Parrotfish	Princess parrotfish	Parrotfish 2
Scarus vetula	Queen parrotfish	Parrotfish	Queen parrotfish	Parrotfish 2
Sparisoma rubripinne	Redfin parrotfish	Parrotfish	Redfin parrotfish	Parrotfish 2
Sparisoma chrysopterum	Redtail parrotfish	Parrotfish	Redtail parrotfish	Parrotfish 2
Sparisoma viride	Stoplight parrotfish	Parrotfish	Stoplight parrotfish	Parrotfish 2
Sparisoma aurofrenatum	Redband parrotfish	Parrotfish	Redband parrotfish	Parrotfish 2
Scarus croicensis	Striped parrotfish	Parrotfish	Striped parrotfish	Parrotfish 2
Holacanthus ciliaris	Queen angelfish	Angelfish	Queen angelfish	Angelfish
Pomacanthus arcuatus	Gray angelfish	Angelfish	Gray angelfish	Angelfish
Pomacanthus paru	French angelfish	Angelfish	French angelfish	Angelfish
Acanthurus coeruleus	Blue tang	Surgeonfish	Blue tang	Surgeonfish
Acanthurus bahianus	Ocean surgeonfish	Surgeonfish	Ocean surgeonfish	Surgeonfish
Acanthurus chirurgus	Doctorfish	Surgeonfish	Doctorfish	Surgeonfish
Haemulon plumieri	White grunt	Grunts	White grunt	Grunts 1
Haemulon sciurus	Bluestriped grunt	Grunts	Bluestriped grunt	Grunts 1
Haemulon album	Margate	Grunts	Margate	Grunts 2
Balistes vetula	Queen triggerfish	Triggerfish	Queen triggerfish	Queen triggerfish
Lachnolaimus maximus	Hogfish	Wrasses	Hogfish	Hogfish

Scientific name	Common name	Alternative 1 (No Action)	Alternative 2	Preferred Alternative 3
Caranx crysos	Blue runner	Jacks	Blue runner	Blue runner
Calamus bajonado	Jolthead porgy	Porgies	Jolthead porgy	Porgies
Archosargus rhomboidalis	Sea bream	Porgies	Sea bream	Porgies
Calamus penna	Sheepshead porgy	Porgies	Sheepshead porgy	Porgies
Calamus calamus	Saucereye porgy	Porgies*	Saucereye porgy	Porgies
Coryphaena hippurus	**Dolphin**	Dolphin	Dolphin	Dolphin
Acanthocybium solandri	**Wahoo**	Wahoo	Wahoo	Wahoo
Corals		One stock complex and multiple individual stocks	Multiple invidual stocks	Corals stock complex
Sea urchins		One stock complex and multiple individual stocks	Multiple invidual stocks	Sea urchins stock complex
Sea cucumbers		One stock complex and multiple individual stocks	Multiple invidual stocks	Sea cucumbers stock complex

* The Scups & Porgies stock complex under the Reef Fish FMP included jolthead, sea bream, sheepshead, and pluma porgies. Landings for the porgies were previously reported by the stock complex, and most landings were recorded as pluma porgy. Following the changes to USVI data reporting forms, where the porgies were reported by species, landings were recorded as saucereye. Though pluma porgy and saucereye porgy are different species, it was assumed that fishers were landing the same species. Therefore, saucereye porgy was not considered a species new to management, and pluma porgy was not listed as excluded from management under Criterion B.

Definitions

Productivity – the capacity of the stock to produce maximum sustainable yield and to recover if the population is depleted.

Susceptibility – the potential for the stock to be impacted by the fishery, which includes direct captures, as well as indirect impacts to the fishery (e.g., loss of habitat quality).

Vulnerability – the combination of a stock's productivity, which depends upon its life history characteristics, and its susceptibility to the fishery.

The stock complexes selected in **Preferred Alternative 3** were supported by the outcomes from a semi-quantitative productivity/susceptibility analysis (PSA) conducted by the SSC in cooperation with the SEFSC. The PSA process used scores from a variety of biological and fishery attributes (see Appendix G) to categorize the relative biological productivity and fishery susceptibility of each stock included in the management plan. Although the SSC developed the PSA approach for deriving reference points, it is useful for validating outcomes from the stock complex assignment process. The productivity score was of value in assessing the similarities in integrated biological characteristics (see Appendix G) of those stocks included in a common complex. Similarly, the susceptibility score provided insights into the relative exposure of the individual stocks comprising a complex to direct (e.g., gear) and indirect (e.g., management strategy) components of the fishery (see Appendix G). Evaluating the complexes in view of the productivity and susceptibility scores ensures that, to the greatest possible extent, the resultant stock complex arrangements meet Magnuson-Stevens Act guidance regarding the formulation and performance of stock complexes. Specifically, application of those scores served to ensure that, where practical, stocks grouped into a complex should be sufficiently similar in geographic distribution, life history characteristics, and vulnerabilities to fishing pressure such that the impact of management actions on the stocks included in a complex is similar (50 CFR 600.310(d)(2)(i)). In addition, the guidelines indicate that the vulnerability of individual stocks should be considered when determining if a particular stock complex should be established or reorganized, or if a particular stock should be included in a complex (50 CFR 600.310(d)(2)(i)). In the following paragraphs, the rationale applied by the St. Thomas/St. John DAP and the SSC in recommending each stock complex is described and compared relative to the applicable productivity and susceptibility scores (Table 2.3.4).

Table 2.3.4. Results of the PSA for stocks included in the St. Thomas/St. John FMP. Stocks in bold represent the indicator stock selected for the complex based on Action 3, Preferred Sub-alternative 4a .

Scientific Name	Common Name	Stock / Complex	Productivity	Susceptibility
Panulirus argus	Caribbean spiny lobster	Spiny Lobster	High	Low
Apsilus dentatus	Black snapper	Snapper 1	Moderate/High	Low
Lutjanus buccanella	**Blackfin snapper**	**Snapper 1**	**Moderate/High**	**Low**
Lutjanus vivanus	Silk snapper	Snapper 1	Moderate/High	Low
Rhomboplites aurorubens	Vermilion snapper	Snapper 1	Moderate/High	Low
Etelis oculatus	Queen snapper	Snapper 2	High	Low
Lutjanus synagris	Lane snapper	Snapper 3	Moderate	Low
Lutjanus analis	**Mutton snapper**	**Snapper 3**	**Low/Moderate**	**Low**
Ocyurus chrysurus	Yellowtail snapper	Snapper 4	Moderate/High	Low/Moderate
Epinephelus striatus	Nassau Grouper	Grouper 1	Low	High
Epinephelus itajara	Goliath grouper	Grouper 2	Low	High
Cephalopholis fulva	Coney	Grouper 3	High	Low
Epinephelus guttatus	**Red hind**	**Grouper 3**	**Moderate/High**	**Low**
Mycteroperca bonaci	Black grouper	Grouper 4	Low	Moderate
Epinephelus morio	Red grouper	Grouper 4	Low	Moderate
Mycteroperca tigris	Tiger grouper	Grouper 4	Low	Moderate
Mycteroperca venenosa	Yellowfin grouper	Grouper 4	Low	Moderate
Hyporthodus mystacinus	Misty grouper	Grouper 5	Low	Low

Scientific Name	Common Name	Stock / Complex	Productivity	Susceptibility
Hyporthodus flavolimbatus	Yellowedge grouper	Grouper 5	Low	Low
Mycteroperca interstitialis	Yellowmouth	Grouper 5	Low	Low
Haemulon plumieri	**White grunt**	**Grunts 1**	**High**	**Low/Moderate**
Haemulon sciurus	Bluestriped grunt	Grunts 1	High	Low/Moderate
Haemulon album	Margate	Grunts 2	High	Low/Moderate
Calamus bajonado	Jolthead porgy	Porgies	Moderate/High	Low/Moderate
Archosargus rhomboidalis	Sea bream	Porgies	Moderate/High	Low/Moderate
Calamus penna	Sheepshead porgy	Porgies	Moderate/High	Low/Moderate
Calamus calamus	**Saucereye porgy**	**Porgies**	**Moderate/High**	**Low/Moderate**
Caranx crysos	Blue runner	Blue runner	High	Low/Moderate
Scarus guacamaia	Rainbow parrotfish	Parrotfish 1	Moderate	High
Scarus coeruleus	Blue parrotfish	Parrotfish 1	Moderate	High
Scarus coelestinus	Midnight parrotfish	Parrotfish 1	Moderate	High
Scarus taeniopterus	Princess parrotfish	Parrotfish 2	High	Low
Scarus vetula	Queen parrotfish	Parrotfish 2	High	Low
Sparisoma rubripinne	Redfin parrotfish	Parrotfish 2	High	Low
Sparisoma chrysopterum	**Redtail parrotfish**	**Parrotfish 2**	**High**	**Low**
Sparisoma viride	**Stoplight parrotfish**	**Parrotfish 2**	**High**	**Low**
Sparisoma aurofrenatum	Redband parrotfish	Parrotfish 2	High	Low
Scarus croicensis	Striped parrotfish	Parrotfish 2	High	Low
Acanthurus coeruleus	Blue tang	Surgeonfish	High	Low/Moderate
Acanthurus bahianus	Ocean surgeonfish	Surgeonfish	High	Low/Moderate
Acanthurus chirurgus	**Doctorfish**	**Surgeonfish**	**High**	**Moderate**
Balistes vetula	Queen triggerfish	Triggerfish	Moderate	Low/Moderate
Lachnolaimus maximus	Hogfish	Wrasses	Moderate	Low/Moderate
Holacanthus ciliaris	Queen angelfish	Angelfish	High	Low/Moderate
Pomacanthus arcuatus	**Gray angelfish**	**Angelfish**	**Moderate**	**Low/Moderate**
Pomacanthus paru	French angelfish	Angelfish	Moderate/High	Low/Moderate
Coryphaena hippurus	Dolphin	Dolphin	High	Low
Acanthocybium solandri	Wahoo	Wahoo	Moderate/High	Low
Lobatus gigas	Queen conch	Queen Conch	Low/Moderate	Low/Moderate
Sea cucumbers		Sea cucumbers	Low	High
Sea urchins		Sea urchins	Moderate	High
Corals		Corals	-	High

Snapper Stocks/Stock Complexes

Under **Preferred Alternative 3**, the snappers included for management in the St. Thomas/St. John FMP would be managed as two individual stocks and two stock complexes, as follows:

Snapper 1

The Snapper 1 stock complex under **Preferred Alternative 3** (and under **Alternative 1**) would be composed of black, blackfin, silk, and vermilion snappers. Although the Snapper Unit 1 complex previously managed under the Reef Fish FMP included wenchman, this species was excluded from management in Action 2, Preferred Alternative 2 under Criterion B (species occurs infrequently in federal waters). **Alternative 1** and **Preferred Alternative 3** differ from **Alternative 2**, which would manage each snapper stock individually. The Snapper 1 complex includes snappers that inhabit relatively shallow to mid-depth water and that are commonly caught together. Statements made by the fishing community at Council meetings indicated that the fishery for species included in Snapper 1 is very valuable with a substantial market demand. Natural mortality for the members of this complex may exceed fishing mortality and larger individuals are not usually targeted (160th Council meeting minutes 2017). Outcomes from the PSA supported the composition of the Snapper 1 stock complex, as all stocks expressed a moderate/high productivity and low susceptibility to the fishery (Table 2.3.4).

Snapper 2

Under **Alternative 1**, **Alternative 2**, and **Preferred Alternative 3**, queen snapper would be managed as a single stock. Queen snapper was previously managed under the Reef Fish FMP with cardinal snapper, as they are both deep-water species. However, cardinal snapper was excluded from management in Action 2, Preferred Alternative 2 under Criterion B.

Snapper 3

The Snapper 3 stock complex under **Alternative 1** and **Preferred Alternative 3** would be composed of lane and mutton snappers. Although the Snapper Unit 3 complex previously managed under the Reef Fish FMP included other shallow water snappers (gray, dog, schoolmaster, and mahogany), these species were excluded for management in Action 2, Preferred Alternative 2 under Criterion B. **Alternative 1** and **Preferred Alternative 3** differ from **Alternative 2**, which would manage each snapper stock individually. Outcomes from the PSA expressed low/moderate (mutton) to moderate (lane) productivity and a low susceptibility to the fishery, consistent with grouping them in a single stock complex. The three-month seasonal closure for lane and mutton in both St. Thomas/St. John territorial waters and federal waters was factored into the low susceptibility score.

Snapper 4

Under **Alternative 1**, **Alternative 2**, and **Preferred Alternative 3**, yellowtail snapper would be managed as a single stock. Yellowtail are targeted independently when compared to the other managed snappers.

Grouper Stocks/Stock Complexes

Under **Preferred Alternative 3**, groupers included for management in the St. Thomas/St. John FMP would be managed as two individual stocks and three stock complexes, as follows:

<u>Grouper 1 and Grouper 2</u>
Grouper 1 would consist of Nassau grouper and Grouper 2 would consist of goliath grouper. Nassau grouper and goliath grouper are each currently under rebuilding plans and managed with harvest prohibitions throughout the U.S. Caribbean EEZ; and these management measures would not change under the St. Thomas/St. John FMP. Both stocks scored low with respect to productivity and high with respect to fishery susceptibility in the PSA. Management of these species as two individual stocks would be the same under **Alternative 1**, **Alternative 2**, and **Preferred Alternative**.

<u>Grouper 3</u>
Under **Alternative 1** and **Preferred Alternative 3** the Grouper 3 complex would be composed of coney and red hind. Although the Grouper Unit 3 complex previously managed under the Reef Fish FMP included graysby and rock hind, these species were excluded from management in Action 2, Preferred Alternative 2 under Criterion B. Outcomes from the PSA for these species expressed moderate/high (red hind) to high (coney) productivity and low susceptibility to the fishery, consistent with grouping them in a single complex. There is high demand for these species in the market. **Alternative 2** differs from **Preferred Alternative 3** and **Alternative 1**, as the two stocks would be managed individually.

<u>Grouper 4</u>
Under **Alternative 1** and **Preferred Alternative 3**, the Grouper 4 stock complex would be composed of black, red, tiger, and yellowfin groupers. Outcomes from the PSA for these species expressed low productivity and moderate susceptibility to the fishery, consistent with grouping them in a single complex. **Alternative 1** and **Preferred Alternative 3** differ from **Alternative 2**, under which the four stocks would be managed individually.

<u>Grouper 5</u>
Under **Preferred Alternative 3**, the Grouper 5 complex would be composed of the deep-water misty, yellowedge, and yellowmouth groupers. This is similar to **Alternative 1,** where the complex consists of misty and yellowedge grouper, except that **Preferred Alternative 3** adds yellowmouth grouper to the stock complex. Yellowmouth grouper would be new to management as an outcome of Action 2, Preferred Alternative 2, and thus is not assigned to a stock complex in **Alternative 1.** The DAP initially recommended that misty grouper be separated from the yellowmouth and yellowedge and managed as a separate stock because it is generally found at deeper depths than the other two species. However, the SSC recommended that these three stocks be managed together in a complex since the amount of landings reported for all three was low. With low landings, the SSC explained that it would be difficult to set

accurate reference points and monitor stock status. In view of the limited information, the SSC recommended continuing to manage misty and yellowedge grouper together and to add in yellowmouth grouper, another deep-water species, to the complex. Managing the stocks together represents a conservative approach that uses limited available information. In addition, including these three species in a common complex is consistent with the PSA outcomes, which indicated all three species have low productivity and low susceptibility to the fishery. At the April 2017 Council meeting, the DAP chair agreed with the SSC's recommendation to manage the three species together in Grouper 5, and the Council accepted this recommendation. This management differs from **Alternative 2,** under which all species would be managed as individual stocks.

Parrotfish Stock Complexes

Under **Preferred Alternative 3**, parrotfish included for management in the St. Thomas/St. John FMP would be managed as two stock complexes, as follows.

Parrotfish 1

Under **Preferred Alternative 3**, the three large-bodied species of parrotfish, midnight, blue, and rainbow parrotfish, would be managed in the Parrotfish 1 stock complex. Both the SSC and the St. Thomas/St. John DAP agreed that these three stocks should be managed together. Each of these stocks was at one time relatively abundant but are now rarely seen. A prohibition on harvest from U.S. Caribbean EEZ waters was instituted in 2012 as an outcome of the 2010 Caribbean ACL Amendment (CFMC 2011a). That prohibition would remain in place under the St. Thomas/St. John FMP. The PSA classified all three as moderately productive and highly susceptible to the fishery, further warranting their grouping into a single complex.

Parrotfish 2

The smaller parrotfish species (i.e., queen, princess, redtail, stoplight, redband, striped, and redfin parrotfish) would be managed together as a stock complex under **Preferred Alternative 3**. Although these species can be classified into two separate size classes (redband and striped parrotfish are smaller species), the rationale for managing all together in a complex was that they all occur in the same habitat and are commonly fished using the same gear under the same circumstances. The SSC recommended managing these stocks together in within a single stock complex and the DAP concurred. The Council accepted this recommendation. The PSA resulted in all seven of these parrotfish classified with high productivity and moderate (princess) to moderate/high susceptibility to the fishery.

The organization of parrotfish into two different stock complexes (Parrotfish 1 and Parrotfish 2) in **Preferred Alternative 3** differs from management under **Alternative 1**, which would continue to manage all parrotfish together as a single stock complex. It also differs from **Alternative 2** where all species would be managed as individual stocks.

Surgeonfish Stock Complex

Under **Preferred Alternative 3**, blue tang, ocean surgeonfish, and doctorfish would be managed together as one stock complex. In the U.S. Caribbean region, these species commonly occur in small to moderately sized schools, typically in association with coral reef habitat. Surgeonfish are not targeted by commercial or recreational fishermen, instead most commonly being caught as bycatch in traps, nets and hand lines. However, all three stocks serve an important ecological function as grazers in the coral reef ecosystem, which served as the basis for their proposed inclusion in the St. Thomas/St. John FMP. Both the SSC and the DAP recommended continuing to group the three surgeonfish stocks in a single complex. That approach is consistent with PSA outcomes indicating all three stocks express high productivity and low/moderate (blue tang and ocean surgeonfish) to moderate (doctorfish) susceptibility to the fishery. This organization is identical to that proposed in **Alternative 1**, but different to **Alternative 2**, where all species would be managed as individual stocks.

Triggerfish Stock

Under **Alternative 1, Alternative 2,** and **Preferred Alternative 3,** queen triggerfish would be managed as an individual stock. Queen triggerfish was managed under the Council's Reef Fish FMP in a stock complex with ocean and sargassum triggerfish and black durgon[13], but these species were excluded from management in Action 2, Preferred Alternative 2 under Criterion B.

Wrasses Stock

Under **Alternative 1, Alternative 2,** and **Preferred Alternative 3,** hogfish would be managed as an individual stock. Although hogfish was previously managed under the Council's Reef Fish FMP in a complex with Spanish hogfish and puddingwife, those two wrasses were excluded from management in Action 2, Preferred Alternative 2 under Criterion B.

Angelfish Stock Complex

Under **Alternative 1** and **Preferred Alternative 3**, gray, queen, and French angelfish would be managed together as a stock complex. All three angelfish species were identified as being in need of conservation and management in Action 2 based on Criterion C, specifically their ecological importance to the coral reef ecosystem. Angelfish graze sponges, thereby clearing space for recruitment of coral propagules in a manner similar to that recognized for parrotfish and surgeonfish. Although productivity scores differ per species, from moderate (gray angelfish) to moderate/high (French angelfish) to high (queen angelfish), all three exhibit a low/moderate susceptibility to the fishery. Managing these species together differs from the management approach proposed in **Alternative 2**, under which stocks would be managed individually.

[13] Black durgon was incorrectly listed as a filefish under the Reef Fish FMP.

Grunts Stock/Stock Complex

Under **Preferred Alternative 3**, grunts included for management in the St. Thomas/St. John FMP would be managed as one stock complex and one individual stock as follows:

Grunts 1
Under **Preferred Alternative 3**, the Grunts 1 stock complex would be comprised of white and bluestriped grunt as they are caught together in the trap fishery. This management differs from **Alternative 1**, as the grunts complex under that alternative would include margate in addition to white and bluestriped grunt. The grunt complex organization previously managed under the Council's Reef Fish FMP included six species (white grunt, margate, tomtate, bluestriped grunt, French grunt, and porkfish). However, tomtate, French grunt, and porkfish were excluded from management in Action 2, Preferred Alternative 2 under Criterion B. Under **Alternative 2** white and bluestriped grunts would be managed as separate stocks. Outcomes from the PSA for these species expressed high productivity and low/moderate susceptibility to the fishery, consistent with grouping them in a single complex.

Grunts 2
Under **Preferred Alternative 3**, margate would be managed as an individual stock. While this species generally occurs less frequently than white and bluestriped grunts, recent observations of the fishery show an increase in landings, possibly indicating a developing fishery, which would support managing this species as a separate stock. This management would be the same as management under **Alternative 2** (individual stock management), but would differ from management under **Alternative 1**, as margate would be managed in a stock complex with white and bluestriped grunt (as described above).

Jack Stock

Blue runner would be managed as a single stock under **Alternative 1, Alternative 2,** and **Preferred Alternative 3**. Although the Jacks complex previously manged under the Council's Reef Fish FMP included horse-eye jack, black jack, almaco jack, bar jack, greater amberjack, and yellow jack, those jack species were removed from management in Action 2, Preferred Alternative 2 under Criterion B.

Porgies Stock Complex

Under **Preferred Alternative 3,** the porgies stock complex would include jolthead, sea bream, sheepshead, and saucereye. This management differs from **Alternative 1**, as the previous porgies complex managed under the Council's Reef Fish FMP included pluma porgy instead of saucereye porgy, though the updated reference (from pluma to saucereye) does not indicate the species in the managed fishery are changing. Landings for the Scups & Porgies stock complex were previously reported by the stock complex, and most landings were recorded as pluma porgy. Following the changes to USVI data reporting forms, where the porgies were reported by species, landings were recorded as saucereye. Though pluma porgy and saucereye porgy are different species, it was assumed that fishers were landing the same species. Therefore, saucereye porgy was not considered a species new to management, and pluma porgy was not listed as excluded from management under Criterion B. **Preferred Alternative 3** differs from **Alternative 2**, which would manage the four species as individual stocks. Outcomes from the PSA for all four species expressed moderate/high productivity and low/moderate susceptibility to the fishery.

Dolphin Stock

Under **Alternative 1, Alternative 2,** and **Preferred Alternative 3**, dolphin would be managed as an individual stock. Dolphin would be new to management as an outcome of Action 2, Preferred Alternative 2, Criterion D (economically important species).

Wahoo Stock

Under **Alternative 1, Alternative 2** and **Preferred Alternative 3**, wahoo would be managed as an individual stock. Wahoo would be new to management as an outcome of Action 2, Preferred Alternative 2, Criterion D (economically important species).

Sea Cucumbers Stock Complex

At their August 19-20, 2015, meeting, the Council moved to include sea cucumbers in the St. Thomas/St. John FMP, with the intent of including all species of sea cucumbers occurring in the St. Thomas/St. John EEZ in this stock complex to avoid overexploitation of these ecologically important species (See Appendix E). Under **Preferred Alternative 3**, all sea cucumbers (Class Holothuridae) would be managed in the Sea cucumbers stock complex. A class-level PSA indicated that sea cucumber stocks are of low productivity and high susceptibility to the fishery, a combination requiring careful and conservative management particularly within a framework of limited information on their species-specific distribution and abundance patterns. Management of sea cucumbers under **Preferred Alternative 3** would be similar to **Alternative 1** as many sea cucumber species were previously managed as a stock complex as part of the aquarium trade unit within the Coral FMP. **Preferred Alternative 3**, however, manages all sea cucumbers. It is not known how many individual species of sea cucumbers occur in and are available for harvest from the St. Thomas/St. John EEZ; their harvest is recorded under the generic name “sea cucumber.” Thus, it would not be possible to establish individual stock management, as proposed under **Alternative 2**.

Sea Urchins Stock Complex

At their August 19-20, 2015, meeting, the Council moved to include sea urchins in the St. Thomas/St. John FMP, with the intent of including all species of sea urchins occurring in the St. Thomas/St. John EEZ in this stock complex to avoid overexploitation of these ecologically important species (See Appendix E). Under **Preferred Alternative 3**, all sea urchins (see Appendix E) would be managed in the sea urchins stock complex. A class-level PSA indicated that sea urchin stocks are of moderate productivity and high susceptibility to the fishery. A precautionary approach to management is therefore advised, requiring conservative management particularly within a framework of limited information on their species-specific distribution and abundance patterns. **Preferred Alternative 3** would result in management of additional sea urchins in the stock complex than under **Alternative 1** because only select urchin species were previously included in the aquarium trade unit within the Coral FMP. **Preferred Alternative 3** is not comparable to **Alternative 2** because it is not known how many individual species of sea urchin occur in and are available for harvest from the St. Thomas/St. John EEZ. Thus, it would not be possible to establish individual stock management, as proposed under **Alternative 2**. Stocks new to management would be managed individually under **Alternative 1**, but individual management is not possible for the same reasons described for **Alternative 2**.

Corals Stock Complex

At their August 19-20, 2015, meeting, the Council moved that all corals present in the EEZ of St. Thomas/St. John (soft, hard, mesophotic, and deepwater corals) be included for management in the St. Thomas/St. John FMP (See Appendix E). The Council decided to continue managing the corals for which harvest had been prohibited under the Coral FMP under Action 2, Criterion A and, at this meeting, expanded the scope of corals to be managed under the St. Thomas/St. John FMP. This comprehensive approach to managing coral species ensures that cryptic species (those that are difficult to tell apart) as well as any as yet unidentified or undescribed species that may be vulnerable to exploitation are included in management. Coral constitutes the foundation of most (if not all) St. Thomas/St. John EEZ fisheries, along with the wealth of other ecological, economic, and cultural contributions they provide the region. The PSA assigned a high fishery susceptibility to the coral group, but no productivity score was assigned due to the diverse and in many cases unknown biology of the many species constituting the Corals stock complex. **Preferred Alternative 3** differs from **Alternative 1**. **Alternative 1** retains the stock complex composition from the Coral FMP, which includes only a select number of coral species, and would manage newly added coral species as individual stocks. **Preferred Alternative 3** includes all coral species in the St. Thomas/St. John EEZ in a single stock complex. Thus, the corals stock complex under **Preferred Alternative 3** would be more comprehensive than the corals stock complex under **Alternative 1**. **Preferred Alternative 3** also differs from **Alternative 2**, which would manage each coral species an individual stock.

Indicator Stocks

Under **Alternative 4**, the Council can choose whether or not to select an indicator stock for the stock complexes proposed in **Preferred Alternative 3**. The NS1 guidelines define an indicator stock as a stock with measurable SDC[14] that can be used to help manage and evaluate more poorly known stocks that are in a stock complex (50 CFR 600.310(d)(2)(ii)(A)). The NS1 guidelines state that, "where practicable, stock complexes should include one or more indicator stocks (each of which has SDC and ACLs). Otherwise, stock complexes may be comprised of: Several stocks without an indicator stock (with SDC and an ACL for the complex as a whole), or one or more indicator stocks (each of which has SDC and management objectives) with an ACL for the complex as a whole" 50 CFR 600.310(d)(2)(ii)(B)). The guidelines provide that "[i]f an indicator stock is used to evaluate the status of a complex, it should be representative of the typical vulnerability of stocks within the complex" (50 CFR 600.310(d)(2)(ii)(C)). Furthermore, "[i]f the stocks within a stock complex have a wide range of vulnerability, they should be reorganized into different stock complexes that have similar vulnerabilities; otherwise the indicator stock should be chosen to represent the more vulnerable stocks within the complex" 50 CFR 600.310(d)(2)(ii)(C). However, in instances where an indicator stock is less vulnerable than other members of the complex, the guidelines provide that management measures should be more conservative so that the more vulnerable members of the complex are not at risk from the fishery (50 CFR 600.310(d)(2)(ii)(C)).

More than one indicator stock can be selected to provide more information about the status of the complex (50 CFR 600.310(d)(2)(ii)(D)). When one or more indicators are used, Councils should periodically re-evaluate available quantitative or qualitative information (e.g., catch trends, changes in vulnerability, fish health indices, etc.) to determine if the stocks within the complex are being sustainably managed (50 CFR 600.310(d)(2)(ii)(B)).

By following these guidelines, NMFS believes that using one or more indicator stocks in a stock complex would not increase the risk of overfishing other stocks within the complex. In addition, when developing the guidelines, NMFS explained that in cases where the status of the stocks within a complex is generally unknown, the use of an indicator would likely reduce the probability that stocks within the complex experience overfishing. Thus, NMFS explained that use of stock complexes and indicator stocks in accordance with the NS guidelines can serve a useful role in managing data poor stocks and/or stocks that cannot be targeted independently of one another. Finally, the guidelines recommend the use of indicator stocks to reduce the likelihood of overfishing in cases of high scientific uncertainty among stocks within a complex, and also recommend that Councils use more conservative management measures in cases where

[14]Status determination criteria refer to the measurable and objective factors MFMT, OFL, and MSST, or their proxies, that are used to determine if overfishing has occurred or if the stock or stock complex is overfished (50 CFR 600.310(e)(2)(i)(A)).

it is not possible to use the most vulnerable stock within a complex as an indicator (81 FR 71858 Oct. 18, 2016).

Alternative 4, Preferred Sub-alternative 4a allows for the selection of one or more indicator stocks in those cases where stocks are being managed within a stock complex. **Alternative 4, Preferred Sub-alternative 4a** was selected as the preferred alternative for the Snapper 1, Snapper 3, Grouper 3, Parrotfish 2, Grunts 1, Porgies, Surgeonfish, and Angelfish stock complexes, as established under **Preferred Alternative 3**. The SSC identified seven criteria (defined below) to guide the selection of an indicator stock for each of these stock complexes. All or a subset of these seven criteria were used by the SSC in their process of recommending one or more indicators for each of the stock complexes to which **Alternative 4, Preferred Sub-alternative 4a** was applied. Under **Alternative 4, Preferred Sub-alternative 4a**, the ABC and ACL for the stock complex would be derived from the indicator stock. Stocks in the stock complex would be subject to AMs as a group, based on the average landings of the indicator stock or stocks during the most recent three years of available landings data (see Chapter 5).

a) Percent Catch: Indicator stock represents a predominant component of the complex's catch.

b) Targeted: Indicator stock is specifically pursued by the fishery.

c) Life History/Vulnerability: Life history characteristics or the vulnerability of the indicator stock is representative of the complex or is more vulnerable than that of other members of the complex (where the vulnerabilities of the complex differed).

d) Habitat Co-occurrence: Indicator stock occurs in the same habitat as the others in the complex.

e) Catch Co-occurrence: Indictor stock co-occurs in the catch with other members of the complex.

f) Data Availability: Amount of information on the indicator stock is sufficient for providing catch advice and establishing SDC.

g) Market Value: Indicator stock is considered to have equal or greater market value relative to other species.

The SSC recommended one or more indicator stocks for each of these complexes based on the best available scientific information, input from the St. Thomas/St. John DAP, and the expert opinion of the SSC members. Below is a summary of the indicator stock(s) chosen for each of the stock complexes for which the Council selected **Alternative 4**, **Preferred Sub-alternative 4a** as the preferred alternative.

For the Snapper 1 stock complex, blackfin snapper was selected as the indicator stock based on the SSC's recommendation because it constitutes a high percentage of the Snapper 1 catch, it is the targeted stock in the complex, and it is a valuable species in St. Thomas/St. John EEZ waters. Additionally, it co-occurs in the habitat and in the catch with other stocks in the complex (black, silk, and vermilion). Furthermore, because it is targeted, listed on the commercial reporting form, and frequently reported in the landings, it is a likely candidate for a successful stock assessment. The PSA outcome revealed blackfin snapper to be equally productive (moderate/high) and equally susceptible to the fishery (low) as the other stocks in the complex and therefore it possesses a representative vulnerability for the complex.

For the Snapper 3 stock complex, mutton snapper was selected as the indicator stock based on the SSC's recommendation because it constitutes a high percentage of the Snapper 3 catch, it is the targeted stock in the complex, and is a valuable species in St. Thomas/St. John EEZ waters. Lane snapper is not targeted and rarely landed, and then only on the north coast, because it has a high probability of being ciguatoxic, thus it was not a good candidate for an indicator stock for the stock complex. The PSA outcome revealed mutton snapper to be similarly productive (low/moderate versus moderate for lane snapper) and equally susceptible to the fishery (low) as lane snapper, therefore possessing a representative or slightly greater vulnerability than lane snapper.

For the Grouper 3 stock complex, red hind was selected as the indicator stock based on the SSC's recommendation because it constitutes a high percentage of the Grouper 3 catch, it is the targeted stock in the complex, and it co-occurs in the habitat and in the catch with the other stock in the complex (coney). Furthermore, because it is targeted, listed on the commercial reporting form, and frequently reported in the landings, it is a likely candidate for a successful stock assessment. The PSA outcome revealed red hind to be less productive (moderate/high productivity versus high productivity for coney) and equally susceptible to the fishery (low) as coney, therefore possessing a representative or slightly greater vulnerability than coney.

For the Parrotfish 2 stock complex, redtail and stoplight parrotfish were selected as indicator stocks based on the SSC's recommendation because they constitute a large percentage of the Parrotfish 2 catch and they co-occur in the habitat and in the catch with the other stocks in the complex (princess, queen, redfin, redband, and striped parrotfish). They are listed on the commercial reporting form and frequently reported in the landings, it are likely candidates for successful stock assessments. The PSA outcome revealed redtail and stoplight equally productive (high) and equally susceptible to the fishery (low) as the other stocks in the complex, therefore possessing a representative vulnerability for the complex.

For the Grunts 1 stock complex, white grunt was selected as the indicator stock based on the SSC's recommendation because it constitutes a high percentage of the Grunts 1 catch and it co-occurs in the habitat and in the catch with the other stock in the complex (bluestriped grunt). Furthermore, because it is listed on the commercial reporting form and frequently reported in the landings, it is a likely candidate for a successful stock assessment. The PSA outcome revealed white grunt to be equally productive (high) and equally susceptible to the fishery (low/moderate) as bluestriped, therefore possessing a representative vulnerability for the complex.

For the Porgies stock complex, saucereye was selected as the indicator stock based on the SSC's recommendation because it constitutes a high percentage of the catch, is the targeted stock in the complex, and is a valuable species in St. Thomas/St. John EEZ waters. The PSA outcome revealed saucereye to be equally productive (moderate/high) and equally susceptible to the fishery (low/moderate) as the other stocks in the complex (sea bream, sheepshead porgy, and jolthead porgy), therefore possessing a representative vulnerability for the complex.

For the Surgeonfish stock complex, doctorfish was selected as the indicator stock based on the SSC's recommendation because it constitutes a high percentage of the surgeonfish catch, it co-occurs in the habitat and in the catch with the other stocks in the complex (blue tang and ocean surgeonfish), and it is a valuable species in St. Thomas/St. John EEZ waters. The PSA outcome revealed doctorfish to be equally productive (high) and more susceptible to the fishery (moderate versus low/moderate for both blue tang and ocean surgeonfish) as the other stocks in the complex, therefore possessing a representative vulnerability to a slightly greater vulnerability than the other stocks in the complex. The DAP noted that ocean surgeonfish and the doctorfish look alike and are very hard to distinguish from one another, and most are reported as doctorfish. Thus, managing the complex based on doctorfish landings should be protective of other species in the complex, including the ocean surgeonfish.

For the Angelfish stock complex, gray angelfish was selected as the indicator stock based on the SSC's recommendation because it constitutes a high percentage of the angelfish catch and it co-occurs in the habitat and in the catch with the other stock in the complex (French and queen angelfish). The PSA outcome revealed gray angelfish to be of average productivity (moderate versus moderate/high for French angelfish and high for queen angelfish) and equally susceptible to the fishery (low/moderate) as the other stocks in the complex, therefore possessing a representative or slightly greater vulnerability than the other stocks in the complex.

Alternative 4, Preferred Sub-alternative 4b was selected as the preferred alternative for those stock complexes for which none of the seven criteria was useful to make a determination, landings information for any of the stocks in the complex did not allow for a clear definition of an indicator stock, or the composition of the complex was balanced and therefore required no indicator to be assigned. This includes the Grouper 4, Grouper 5, and Parrotfish 1 stock complexes. For the Grouper 4 and Grouper 5 stock complexes, no indicator stock was selected because some of these groupers are more incidental catch than targeted catch, and thus there was no specifically targeted grouper that should serve as the indicator for the complex. For the Parrotfish 1 stock complex, no indicator stock was selected because these stocks are managed together with a harvest prohibition for each of the species. For these stock complexes, stock-specific data would be needed to evaluate which stocks within each complex would be an appropriate indicator. **Preferred Sub-alternative 4b** would also be applied to those stock complexes for which harvest is set as zero in Action 4 and thus determined to be vulnerable to overfishing, including the Parrotfish 1, Sea cucumbers, Sea urchins, and Corals stock complexes.

Comparison of Action 3 Alternatives and Summary of Effects

Alternative 1 would continue management of stocks and stock complexes as previously managed under the U.S. Caribbean-wide FMPs. However, species that would no longer be managed as a result of Action 2 would be removed from the previously managed complexes, and species that are new to management as a result of Action 2 would be managed as individual stocks.

Alternative 1 is not expected to have direct physical, biological/ecological, economic, or social effects because how the stocks are grouped, as opposed to how they are managed, is not expected to change fishing behavior. Direct effects to the administrative environment would be expected as additional resources would be expended to reflect the change to the managed stock complexes. However, **Alternative 1** could have indirect biological effects as it would not update those stocks/stock complexes in the St. Thomas/St. John FMP in order to reflect the most current or best information available. Similarly, **Alternative 1** would not include the option to establish stock complexes for stocks new to management. These limitations could directly increase the administrative burden associated with managing stocks and stock complexes, especially if the current management measures result in frequent administrative actions, such as the application of AMs. Without reliable and consistent data, particularly for those newly added species that would not be assigned to a complex as appropriate, the reference points that are established and AMs that could follow may create closures that disrupt current fishing patterns, or they may not result in closures when appropriate, with effects to the physical, biological/ecological, socio-economic, and administrative environments.

Under **Alternative 2**, each stock would be managed individually regardless of the amount of data available for that stock, or whether there are similarities among two or more stocks in life history or fishing practices that would allow those stocks to be more effectively managed as a complex. When compared to **Alternative 1** and **Preferred Alternative 3**, **Alternative 2** would likely have the greatest direct effects on the administrative environment. Indirect effects of fishing activities on the physical environment (i.e., the habitat, particularly that constituting the coral reef) would depend on whether and how individual management affects fishing effort. Where precautionary management of individual stocks results in additional closures, fishing effort may be reduced, which could reduce the potential for physical effects to the environment.

Effects could be expected from **Alternative 2** via bycatch-related overharvest of a stock experiencing regulatory closure as the fishermen pursue those coincident stocks not governed by the regulatory closure. Economically, managing at the level of individual stock is likely to result in more regulatory discards and lost financial benefit than that which would occur under **Alternative 1** or **Preferred Alternative 3**. Hence, benefits associated with **Alternative 2** are less than those of **Alternative 1** or **Preferred Alternative 3**. Similarly with regard to social effects, any outcomes that result in more frequent application of management measures, particularly those that reduce access to a stock and particularly if that access is limited in an overly precautionary manner, would have indirect effects on the fishing communities reliant on those stocks. Administratively, tracking the performance of many individual stocks rather than fewer stock complexes requires considerably more administrative effort, likely would require more individual management actions, and would require a greater level of enforcement. Additionally, the resultant stock-specific management measures could potentially be insufficient and inefficient, resulting in more frequent and potentially overly precautionary future actions.

In contrast to **Alternative 2**, **Preferred Alternative 3** provides managers with the flexibility to choose to manage stocks individually or as a complex, depending on the information available and the goals of the management plan. **Preferred Alternative 3** would be expected to have beneficial effects resulting from allowing the species to be managed either as individual stocks or as stock complexes using the best scientific information available. There may be some short-term administrative effects associated with creating new management measures for the new stocks/stock complexes. However, the long-term administrative effects of **Preferred Alternative 3** would be expected to be more beneficial than **Alternative 1** or **Alternative 2** because the flexibility of this alternative allows for the stocks/stock complexes to be best tailored to the St. Thomas/St. John fisheries. **Preferred Alternative 3** ensures the process includes consideration of all managed stocks, in direct opposition to **Alternative 2**, that allows no grouping, and **Alternative 1**, which limits the number of stocks available for grouping. That tailoring should result in the establishment of more appropriate management measures, which would in turn result in fewer unnecessary ACLs exceeded or AMs applied. There is likely a better chance of setting ACLs that would provide adequate protection of the stock with **Preferred Alternative 3** than with **Alternative 2**, which, through time, would provide greater indirect economic benefits. **Preferred Alternative 3** therefore provides the benefits to the physical, biological/ecological, economic, and social environment largely denied by **Alternative 2** and limited by **Alternative 1**.

Alternative 4 would build upon the benefits of **Preferred Alternative 3**, as the stocks and stock complexes would remain the same as selected under **Preferred Alternative 3**, but an indicator stock could be selected (**Preferred Sub-alternative 4a**) or not selected (**Preferred Sub-alternative 4b**) depending on the information available for the stocks in the stock complex.

All effects would be expected to be identical between **Preferred Alternative 3** and **Preferred Sub-alternative 4b**, because not choosing an indicator for all stock complexes results in the same list as **Preferred Alternative 3**. In contrast, **Preferred Sub-alternative 4a** may result in a greater benefit to the physical, biological/ecological, economic, social, and administrative environments. Essentially, selecting an indicator stock that is targeted by the fishery, best represents the vulnerability of the other stocks in the complex, or otherwise meets the criteria established above, would provide more conservative management for all the stocks in the complex, because management measures, including ACLs and AMs, would be tailored to the indicator. Conversely, if an appropriate indicator stock is available for the complex but is not assigned, the ACL would instead be based on the landings of all stocks in the complex, potentially allowing harvest to exceed a level that is not sustainable for some of the stocks within the complex, especially those that may be most vulnerable to fishing pressure. However, not all stock complexes have the necessary data or information available to establish an indicator stock, or in other ways are inappropriate or not in need of indicator assignment. In instances where all the stocks in the stock complex are infrequently landed, or are landed at low levels, selecting an indicator stock could result in an ACL that was so low that it was easily exceeded, thereby triggering AMs and prohibiting harvest of the other stocks in the stock complex, which may be able to withstand a higher rate of harvest. Using an established set of criteria, the Council's SSC determined, for each stock complex, whether or not an indicator stock would provide additional benefits as discussed above, specifically to the biological/ecological and administrative (i.e., management) environments. Those benefits then extend to the physical environment by ensuring that species caught together are managed together and fishing activity would respond accordingly to minimize fishing impacts to the environment. Benefits also extend to the economic environment by increasing the likelihood that implementation of management measures is appropriate and necessary, to the social environment by reducing the likelihood of overly precautionary management interventions, and to the administrative environment by reducing the number of stocks for which landings must be monitored against the ACL and by reducing the frequency of management interventions particularly with respect to ACL overages.

2.4 Action 4: Establish Status Determination Criteria and Management Reference Points

The Magnuson-Stevens Act requires each federal FMP to assess and specify the present and probable future condition of, and the MSY and OY from, the fishery, and include a summary of the information utilized in making such specification" (16 U.S.C. 1853(a)(3)). The MSY is the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions and fishery technological characteristics (e.g., gear selectivity), and the distribution of catch among fleets (50 CFR 600.310(e)(1)(i)(A)). To guide effective management, the Magnuson-Stevens Act also requires FMPs to specify objective and measurable criteria for determining stock status (i.e., SDC), specifically whether the stock is overfished or undergoing overfishing (16 U.S.C. 1853(a)(10)).

NMFS guidelines regarding this statutory requirement describe those SDC to include: 1) the maximum fishing mortality threshold (MFMT) and associated overfishing limit (OFL) or their proxies, indicative of an annual harvest level that jeopardizes the capacity of the stock or stock complex to produce MSY on a continuing basis (i.e., overfishing), and; 2) the minimum stock size threshold (MSST), or its proxy, indicative of a level of biomass below which the capacity of the stock or stock complex to produce MSY on a continuing basis has been jeopardized (i.e., overfished) (50 CFR 600.310(e)(2)(i)(B)-(F)).

SDC and Management Reference Points

Maximum Sustainable Yield (MSY) – The largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological, environmental conditions and fishing technology characteristics (e.g., gear characteristics) and the distribution of catch among fleets.

Maximum Fishing Mortality Threshold (MFMT) – The level of fishing mortality (F), on an annual basis, above which overfishing is occurring. The MFMT or reasonable proxy may be expressed either as a single number (a fishing mortality rate or F value), or as a function of spawning biomass or other measure of reproductive potential.

Overfishing Limit (OFL) – the annual amount of catch that corresponds to the estimate of MFMT applied to a stock or stock complex's abundance and is expressed in terms of numbers or weight of fish.

Minimum Stock Size Threshold (MSST) – The biomass level below which the capacity of the stock to produce MSY on a continuing basis has been jeopardized. A stock or stock complex is considered overfished when its biomass has declined below MSST.

When data are not available to specify SDC based on MSY or MSY proxies, NMFS guidelines at 50 CFR 600.310(e)(2)(ii) also provide that alternative types of SDC that promote sustainability of the stock or stock complex can be used. If alternative types of SDC are used, the Council should explain how the approach would promote sustainability of the stock or stock complex on a long-term basis. Chapter 5 provides information about the resulting SDC and management reference points for stocks in the St. Thomas/St. John FMP.

Action 4 describes different approaches for establishing SDC (e.g., OFL, MFMT, MSST) and management reference points (e.g., MSY, ABC, ACL) for the stocks/stock complexes and indicator stocks that were selected in Action 3. Three alternatives are included. The three proposed alternatives provide different approaches to setting SDCs and management reference points. Both **Preferred Alternative 2** and **Alternative 3** include a stepwise process with multiple sub-alternatives.

2.4.1 Proposed Alternatives for Action 4

Alternative 1. No Action. In the St. Thomas/St. John FMP, as created in Action 1, retain the management reference point values and SDC (MSY, OFL, ABC, OY, ACL) specified in the 2010 and 2011 Caribbean ACL Amendments, as applicable. Retain the definitions for the MSST specified in the Sustainable Fisheries Act (SFA) Amendment (CFMC 2005), as applicable.

Preferred Alternative 2. Apply the three-step process described below to define MSY (or its proxy), SDC, ABC, ACL, and OY for each stock or stock complex in the St. Thomas/St. John FMP.

Preferred Alternative 2 - Step 1. Adopt and apply the ABC Control Rule (ABC CR) described in Table 2.4.1.

Table 2.4.1. Caribbean Fishery Management Council Acceptable Biological Catch Control Rule from Action 4, Preferred Alternative 2.

Tier 1: Data Rich	
Condition for Use	Full stage-structured stock assessment available with reliable time series on (1) catch, (2) stage composition, and (3) index of abundance. The assessment provides estimates of minimum stock size threshold (MSST), maximum fishing mortality threshold (MFMT), and the probability density function (PDF) of the overfishing limit (OFL).
MSY	MSY = long-term yield at F_{MSY} (or, MSY proxy = long-term yield at F_{MSY} proxy); assumes spawner-recruit relationship known.
SDC	MFMT = F_{MSY} or proxy MSST = 0.75*long-term Spawning Stock Biomass at MFMT (SSB_{MFMT}) OFL = Catch at MFMT
ABC	ABC = OFL as reduced (buffered) by scientific uncertainty[1] and reflecting the acceptable probability of overfishing[2]. The buffer is applied to the PDF of OFL (σ), where the PDF is determined from the assessment (where $\sigma > \sigma_{min}$)[3]. $ABC = d * OFL$ where $d = \begin{cases} \text{Scalar} & \text{if } B \geq B_{MSY} \\ \text{Scalar} * (B - B_{critical}) / (B_{MSY} - B_{critical}) & \text{if } B < B_{MSY} \end{cases}$ Scalar = 1 if acceptable probability of overfishing is specified (<0.5), < 1 if not specified (=0.5). $B_{critical}$ is defined as the minimum level of depletion at which fishing would be allowed.

Tier 2: Data Moderate	
Condition for Use, MSY, SDC	Data-moderate approaches where two of the three time series (catch, stage composition, and index of abundance) are deemed informative by the assessment process, and the assessment can provide MSST, MFMT, and PDF of OFL.
ABC	Same as Tier 1, but variation of the PDF of OFL (σ) must be greater than 1.5 σ_{min} (in principle there should be more uncertainty with data-moderate approaches than data-rich approaches).
Tier 3: Data Limited: Accepted Assessment Available	
Condition for Use	Relatively data-limited or out-of-date assessments
MSY	MSY proxy = long-term yield at proxy for F_{MSY}
SDC	MFMT = F_{MSY} proxy MSST = 0.75* SSB_{MFMT} or proxy OFL = Catch at MFMT
ABC	ABC determined from OFL as reduced (buffered) by scientific uncertainty[4] and reflecting the acceptable probability of overfishing[2] a. Where the buffer is applied to the PDF of OFL when the PDF is determined from the assessment (with $\sigma \geq 2\sigma_{min}$) **OR** b. Where ABC = buffer * OFL, where buffer must be $\leq$ 0.9
Tier 4: Data Limited: No Accepted Assessment Available	
MSY	MSY proxy = long-term yield at proxy for F_{MSY}.
SDC	MFMT = F_{MSY} proxy MSST = 0.75* SSB_{MFMT} Sustainable Yield Level(SYL)[5] = a level of landings that can be sustained over the long-term. OFL proxy = SYL
Tier 4a **Conditions for Use**	No accepted[6] assessment, but the stock has relatively low vulnerability to fishing pressure. A stock's vulnerability to fishing pressure is a combination of its productivity and its susceptibility to the fishery. Productivity refers to the capacity of the stock to produce MSY and to recover if the population is depleted. Susceptibility is the potential for the stock to be impacted by the fishery. If SSC consensus[7] cannot be reached on the use of Tier 4a, Tier 4b should be used.
SYL	SYL = Scalar * ***75th percentile*** of reference period landings, where the reference period of landings is chosen by the Council, as recommended by the SSC in consultation with the SEFSC. Scalar $\leq$3 depending on perceived degree of exploitation, life history and ecological function.
ABC	ABC = buffer * SYL, where buffer must be $\leq$ 0.9 (e.g., 0.9, 0.8**,** 0.75, 0.70…) based on the SSC's determination of scientific uncertainty[8].
Tier 4b **Conditions for Use**	No accepted[6] assessment, but the stock has relatively high vulnerability to fishing pressure (see definition in Tier 4a Condition for Use), or SSC consensus[7] cannot be reached on the use of Tier 4a.
SYL	SYL = Scalar * ***mean*** of the reference period landings, where the reference period of landings is chosen by the Council, as recommended by the SSC in consultation with the SEFSC. Scalar < 2 depending on perceived degree of exploitation, life history, and ecological function.
ABC	ABC[9] = buffer * SYL, where buffer must be $\leq$ 0.9 (e.g., 0.9, 0.8, 0.75, 0.70…) based on the SSC's determination of scientific uncertainty[8].
Footnotes	[1]Scientific uncertainty would take into account, but not be limited to, the species life history and ecological function. [2]Acceptable probability of overfishing determined by Council. [3]σ_{min} could be equal to coefficient of variation; σ_{min} is in a log scale.

	[4]Scientific uncertainty would take into account, but not be limited to, the species life history and ecological function, the perceived level of depletion, and vulnerability of the stock to collapse. [5]MSY $\geq$ SYL. See Appendix G for a detailed explanation of SYL. [6]Accepted means that the assessment was approved by the SSC as being appropriate for management purposes. [7]The SSC defines consensus as having 2/3 of the participating members in favor of a Tier 4a assignment, otherwise the assignment would be Tier 4b of the ABC CR. [8]Scientific uncertainty would take into account, but not be limited to, deficiencies in landings data, availability of ancillary data, species life history, and ecological function, perceived level of depletion, and vulnerability of the stock to collapse. [9]The ABC for a Tier 4b stock should not exceed mean landings during the reference period.

Preferred Alternative 2 - Step 2. Establish the proxy that would be used when F_{MSY} cannot be determined:

Sub-alternative 2a. The proxy for $F_{MSY} = F_{MAX}$

Sub-alternative 2b. The proxy for $F_{MSY} = F_{40\%SPR}$

Preferred Sub-alternative 2c. The proxy for $F_{MSY} = F_{30\%SPR}$

Preferred Alternative 2 - Step 3. OY and ACL: Determine the OY and the ACL based on the formula in one of the sub-alternatives below and the ABC established in **Preferred Alternative 2**, **Step 1** above.

Sub-alternative 2d. OY = ACL = ABC

Sub-alternative 2e. (Preferred for all stocks except angelfish, parrotfish, surgeonfish). OY = ACL = ABC x 0.95

Sub-alternative 2f. OY = ACL = ABC x 0.90

Sub-alternative 2g. (Preferred for angelfish, parrotfish, surgeonfish). OY = ACL = ABC x 0.85

Sub-alternative 2h. OY = ACL = ABC x 0.75

Sub-alternative 2i. OY = ACL = 0

Alternative 3. Apply the four-step process used in the 2010 Caribbean ACL Amendment and/or the 2011 Caribbean ACL Amendment, as applicable, to set management reference points and/or SDC for a stock or stock complex in the St. Thomas/St. John FMP as described in the sub-alternatives below. Choose a sub-alternative from each step, in order (1-4), for each stock or stock complex.

***Alternative 3 – Step 1*. Time Series:** select a time series of landings data to establish management reference points for a stock, as applicable. A different sub-alternative can be chosen for each stock or stock complex.

Sub-alternative 3a. Use the longest year sequence of reliable[15] landings data available to set management reference points, as applicable.

Sub-alternative 3b. Use the longest time series of pre-Caribbean SFA Amendment (CFMC 2005) landings data that is considered to be consistently reliable[16] to set management reference points.

Sub-alternative 3c. Use 2012-2016 as the most recent five years of available landings data to set management reference points.

Sub-alternative 3d. Use another year sequence, as recommended by the Council's SSC, to set management reference points.

***Alternative 3 – Step 2*. MSY proxy:** establish the MSY proxy for the stock or stock complex as described by any of the sub-alternatives below. A different sub-alternative can be chosen for each stock or stock complex. The OFL would be set equal to the MSY proxy resulting from this alternative (MSY proxy = OFL).

Sub-alternative 3e. Median annual landings from year sequence selected in Alternative 3, Step 1.

Sub-alternative 3f. Mean annual landings from the year sequence selected in Alternative 3, Step 1.

***Alternative 3 – Step 3*. Acceptable Biological Catch:** establish the ABC for the stock or stock complex as described by any of the sub-alternatives below and the OFL established in Alternative 3, Step 2. A different sub-alternative may be chosen for each stock or stock complex.

Sub-alternative 3g. Do not specify an ABC Control Rule. Adopt the ABC recommended by the Council's SSC. The SSC would develop the ABC on an ad hoc basis for each stock or stock complex.

Sub-alternative 3h. Adopt an ABC Control Rule where ABC= OFL.

Sub-alternative 3i. Adopt an ABC Control Rule where ABC= OFL x 0.90.

Sub-alternative 3j. Adopt an ABC Control Rule where ABC= OFL x 0.85.

Sub-alternative 3k. Adopt an ABC Control Rule where ABC= OFL x 0.75.

***Alternative 3 – Step 4*. Annual Catch Limit and Optimum Yield:** Determine the ACL for the stock or stock complex based on the formula in one of the sub-alternatives below and the ABC

[15] Defined in both the 2010 and 2011 Caribbean ACL Amendments: more recent time-series landings data that are more reliable than baseline but that are affected by recent regulatory changes.
[16] Defined in both the 2010 and 2011 Caribbean ACL Amendments: reflects landings prior to implementation of the Caribbean SFA Amendment in 2006, thereby approximating sustainable yield.

established in Alternative 3, Step 3. The OY would be set equal to the ACL resulting from this alternative (OY = ACL). A different sub-alternative may be chosen for each stock or stock complex.

Sub-alternative 3l. OY = ACL = ABC.

Sub-alternative 3m. OY = ACL = ABC x 0.95.

Sub-alternative 3n. OY = ACL = ABC x 0.90.

Sub-alternative 3o. OY = ACL = ABC x 0.85.

Sub-alternative 3p. OY = ACL = ABC x 0.75.

Sub-alternative 3q. OY = ACL = 0.

2.4.2 Discussion of Action 4 Alternatives

Alternative 1 is the no action alternative. Established values of the SDC and management reference points, including the MSY proxy, OFL, ABC, and ACL, would be retained from the 2010 Caribbean ACL Amendment (CFMC 2011a) and the 2011 Caribbean ACL Amendment (CFMC 2011b) for those stocks or stock complexes that would be managed under the St. Thomas/St. John FMP as a result of Actions 2 and 3, as applicable (see discussion below). **Alternative 1** (No Action) would also retain the definition for MSST that was specified in the Caribbean SFA Amendment (CFMC 2005) for those stocks or stock complexes that would be managed under the St. Thomas/St. John FMP under Actions 2 and 3. These reference points were brought into the St. Thomas/St. John FMP in Action 1.

Alternative 1 would only be applicable if the managed stocks stayed the same following Action 2 and, for some stocks, if the complex organization stayed the same following Action 3. Under the 2010 and 2011 Caribbean ACL Amendments to the U.S. Caribbean-wide FMPs, the Council established SDC, management reference points, and ACLs for all stock aggregations (e.g., for parrotfishes, snappers, and groupers, etc.). If a species was removed from management, or a new species was added, then the SDC, reference points, and ACLs previously established and retained under **Alternative 1** would not be applicable. Additionally, under **Alternative 1**, SDC and management reference points would not be set for species new to management, in violation of the Magnuson-Stevens Act. Only the Angelfish and Surgeonfish stock complexes have the same organization under St. Thomas/St. John FMP as under the Reef Fish FMP (see Appendix D), making the majority of the SDC established for stock complexes under the Reef Fish FMP inapplicable. The Porgies stock complex also likely remained the same. Although the stock complex now lists saucereye and not pluma porgy, the Council determined that the fishers had been catching and reporting catch of saucereye porgy. Thus, the change was administrative.

Preferred Alternative 2 reflects a refined approach to developing reference points in the data-limited context. The Southeast Fisheries Science Center (SEFSC) guidance to the Council is that, because the Council does not have successful outputs from a quantitative assessment model, the Council should rely on proxies for MSY and MFMT based on qualitative estimates of fishing mortality rates and biomass expected when achieving MSY, and proxies for MSY and OFL based on a newly-developed metric called the sustainable yield level (SYL). Application of **Alternative 1** establishes a numeric MSY proxy for previously managed species aggregations and equates OFL to that MSY proxy without first establishing an SYL. Such outcomes do not reflect current thinking on the ways to set reference points in the data limited context in the St. Thomas/St. John EEZ. Additionally, under **Alternative 1**, MSY proxies and OFLs would not be set for species new to management, which is not consistent with the Magnuson-Stevens Act.

Preferred Alternative 2 reflects the work of the Council's ABC CR Working Group, which in coordination with the Council's SSC, developed the ABC CR described in Step 1. The ABC CR in Step 1 of **Preferred Alternative 2** contains four tiers to be used by the SSC in specifying ABC recommendations and other management reference points for stocks managed by the Council in the St. Thomas/St. John FMP (Table 2.4.1). The choice of which of the four tiers to apply, and the degree to which MSY (or its proxy) and SDC can be quantitatively established, depend on the type and validity of assessment data available. Beginning with Tier 4 and moving up the tier levels, successful application of each tier requires an increasing amount of information. However, even the data rich and data moderate Tiers 1 and 2 may rely on MSY proxies in those cases when spawner-recruit relationships cannot be well-estimated. Data limitations (discussed in Appendix H) require the use of MSY proxies in Tiers 3 and 4. In Tier 4, the most data-limited of the options, an MSY proxy, MFMT, and MSST are defined with respect to assumptions about fishing mortality rate and biomass, but cannot be quantified due to data limitations. In addition, Tier 4 introduces the SYL. The SYL (discussed in Appendix G) is a level of landings that can be sustained over the long-term. It is intended to be used when the information or resources needed to produce a quantitative stock assessment are not available to determine the MSY or corresponding reference point such as the OFL. As such, the SYL may be determined on the basis of historic landings patterns, Productivity Susceptibility Analyses, or other available information including expert opinion. Because OFL and MSY cannot be quantified in Tier 4 under the methods available in the higher tiers, the SYL would be used as a proxy for OFL, and MSY would be greater than or equal to the SYL.

The SYL is based on an equilibrium (long-term) concept. In both Tier 4a and Tier 4b, it is set based on long-term landings (i.e., the 75th percentile of landings during the reference period in Tier 4a, and the mean of the landings during the reference period in Tier 4b). MSY is an equilibrium concept, but OFL is a non-equilibrium (short-term) quantity defined as the annual amount of catch that corresponds to the estimate of the MFMT applied to a stock's abundance. The value of OFL thus increases or decreases in accordance with the abundance of the stock, and

MSY is the long-term average of such catches. OFLs are set accounting for this variation and are intended to represent the annual metric that corresponds to MSY. The SYL, though based on long-term landings, accounts for the potential variability in annual landings. To calculate SYL, the control rule allows a scalar to be applied to the landings during the reference period, which accounts for variability around the long-term landings. Thus, SYL is similar to an OFL. In addition, in the absence of better information, it can be considered to be a minimum estimate of MSY. In fact, the SYL was developed to ensure a stock is maintained at a sustainable level until the stock's status relative to formal stock assessment-based MSY-related reference points can be determined. Thus, SYL would be used as an indicator of the sustainability of the fishery. While landings in excess of SYL would not establish that overfishing is occurring, they would indicate that harvest could be above a sustainable level. Therefore, when landings exceed the SYL, those landings would need to be investigated to determine whether overfishing is occurring and whether, as a result of continued SYL exceedance, the stock or stock complex would become overfished. Because an SYL exceedance would trigger the stock status review, SYL would also be considered an OFL proxy.

Tier 4 of the ABC CR would enable the Council to comply with the Magnuson-Stevens Act requirement "to assess and specify…the maximum sustainable yield and optimum yields from the fishery" (16 U.S.C. 1853(a)(3)), and to specify SDC, when data are not available to apply either Tiers 1, 2, or 3.

The process and rationale for applying Tier 4 of the ABC CR are described in Appendix G.

Preferred Alternative 2 would define a *three-step process* to establish SDC and allowable harvest levels (i.e., ACLs) for managed stocks and stock complexes caught in the St. Thomas/St. John EEZ. In *Step 1*, the Council's ABC CR, composed of four tiers designed to respond to different levels of data availability (Table 2.4.1), results in quantitative reference point estimates culminating in an ABC for each managed stock/stock complex. *Step 2* establishes a proxy to use when F_{MSY} cannot be determined under the tiers to specify MSY and MFMT. *Step 3* then applies a reduction factor, which reflects the Council's estimate of management uncertainty and is specific to each stock or stock complex, to the resultant ABC to establish the ACL for that stock or stock complex.

Preferred Alternative 2, Step 1:

Step 1 would require application of the Council's four-tier ABC CR. As mentioned above, for stocks/stock complexes with valid assessments, CR Tiers 1, 2, or 3 would be applied, depending on the extent of data used in the assessment and the fishing mortality level (F) at MSY or its spawning potential ratio (SPR)-based proxy chosen by the Council. In contrast, Tier 4 would be applied when inadequate data are available with which to assess stock status via Tiers 1-3. Within Tier 4, a SYL would first be defined based on the product of the 75th percentile (Tier 4a) or mean (Tier 4b) of the landings during a reference period and an adjustment scalar (See Appendix G). That SYL is then reduced to the ABC using a buffer that reflects the SSC's determination of scientific uncertainty associated with the data used to calculate SYL.

Tiers 1-3 of the ABC CR each require inputs from a quantitative assessment of stock status. Tier 1 is applicable in a data-rich environment that supports a full stage-structured stock assessment dependent on the availability of reliable time series of catch, stage composition, and index of abundance. Inputs to the ABC CR, from the stage-structured assessment, include MSST, MFMT, and the PDF of the OFL. Both OFL and ABC are derived by applying assessment outcomes within the ABC CR process, tempered by consideration of scientific uncertainty and a Council-defined risk of overfishing. Tier 1 outcomes are characterized by a minimal level of parameter uncertainty relative to the following tiers. Tier 2 is applicable in a data-moderate environment where two of the three time series described above are deemed informative. The approach and outcomes are the same as for the Tier 1 approach, but a higher level of parameter uncertainty is associated with those outcomes. Tier 3 is applicable in a data-limited environment that remains supportive of a quantitative assessment, but may also be applicable in the case of an out-of-date assessment. The data-limited assessment is expected to provide MFMT but it is likely MSST would be unknown. The OFL remains a quantitative output, but the ABC is more strongly constrained by application of conservative estimates of scientific uncertainty and risk of overfishing as determined by the Council. Tier 3 of the ABC CR results in a higher level of parameter uncertainty relative to Tiers 1 and 2. Note that for each of Tiers 1-3, MSY also may be quantified from the assessment, assuming the spawner-recruit relationship is well estimated, but is not a necessary requirement of the ABC CR process to produce OFL and ABC estimates.

Tier 4 is applicable in situations where an accepted quantitative assessment is not available, which is the present case for all stocks proposed for management in the St. Thomas/St. John FMP. Defining reference points within this tier instead relies on landings data, ancillary information on the species in question such as life history traits and characteristics of the fishery, and expert opinion. Two sub-tiers are defined within Tier 4. Tier 4a is applicable when the Council's SSC determines the stock has a relatively low or moderate vulnerability to fishing pressure. A stock's vulnerability to fishing pressure reflects a combination of its biological productivity and its susceptibility to the fishery (Patrick et al. 2009); 50 CFR 600.310(b)(4). Tier 4b is applied when the Council's SSC determines the stock has relatively high vulnerability to fishing pressure or when SSC consensus (= 2/3 or more members concur) cannot be reached on the use of Tier 4a. Additional information about the process to apply Tier 4 can be found in Appendix G.

Preferred Alternative 2, Step 2:

In the ABC CR specified in Step 1 of **Preferred Alternative 2**, MSY is equal to the yield at F_{MSY}. However, each tier of the ABC CR indicates that a F_{MSY} proxy can be used in situations where F_{MSY} cannot be estimated. The Magnuson-Stevens Act allows for the use of proxies in situations where MSY-related parameters cannot be estimated from available data, or when estimated values are determined to be unreliable. **Preferred Alternative 2**, Step 2 specifies a proxy to use when F_{MSY} cannot be determined.

Step 2 provides three sub-alternatives for setting an F_{MSY} proxy based on various fishing mortality rates. The F_{MSY} proxies identified in **Sub-alternative**s **2a-c**, which are commonly used in fisheries management, can be easily calculated because relatively few data are required. The F_{MSY} proxy specified in **Sub-alternative 2a** (F_{MAX}) is derived from yield-per-recruit (YPR) analyses. F_{MAX} is the fully-recruited fishing mortality rate, which produces the maximum YPR; whereas, F_{MSY} is the fishing mortality that maximizes the sustainable yield. F_{MAX} is one of the earliest measures used as a proxy for F_{MSY}. F_{MAX} is always greater than or equal to F_{MSY}; however, because it does not account for the fact that recruitment must decline at low spawning stock sizes, it is often believed to be an overestimate of F_{MSY} (Gabriel and Mace 1999).

The F_{MSY} proxies identified in **Sub-alternative 2b** and **Preferred Sub-alternative 2c** are calculated from spawning-stock-biomass-per-recruit analyses. Under conditions of no fishing mortality, 100% of a stock's spawning potential is obtained. A fishing mortality rate denoted by $F_{40\%SPR}$ (**Sub-alternative 2b**) or $F_{30\%SPR}$ (**Preferred Sub-alternative 2c**) would allow stock to attain 40% or 30%, respectively, of the maximum spawning potential, which would have been obtained under conditions of no fishing mortality. Thus, as fishing mortality rates increase, spawning stock biomass per recruit decrease as more spawning opportunities are lost over the lifetime of the cohort.

$F_{30\%SPR}$ is the most commonly used F_{MSY} proxy for data poor snapper-grouper stocks managed by the South Atlantic Fishery Management Council (South Atlantic Council; SAFMC 1998). In addition, the $F_{30\%SPR}$ was selected by the South Atlantic Council as the F_{MSY} proxy for South Atlantic red snapper (SAFMC 2010). Gabriel and Mace (1999) recommend that fishing mortality rates in the range $F_{30\%SPR}$ to $F_{40\%SPR}$ be used as general default proxies for F_{MSY} where $F_{30\%SPR}$ used for stocks believed to have relatively high resilience to overfishing and $F_{40\%SPR}$ for stocks believed to have low to moderate resilience to overfishing.

Preferred Alternative 2, Step 3:

Fisheries in the EEZ around St. Thomas/St. John would be managed by the Council and NMFS based on ACLs and AMs. The ACL can equal the SSC's ABC recommendation, but in the U.S. Caribbean region the ACL (previously specified in the U.S. Caribbean-wide plans) has generally been reduced from the ABC to account for management uncertainty. Management uncertainty refers to uncertainty in the ability of managers to constrain catch so the ACL is not exceeded, and the uncertainty in quantifying the true catch amounts (i.e., estimation errors). The sources of management uncertainty could include: late catch reporting; misreporting; underreporting of catches; lack of sufficient in-season management, including in-season closure authority; or other factors.

In Step 3 of **Preferred alternative 2**, the Council is considering six alternative reduction buffers to account for management uncertainty in the transition from ABC to ACL, ranging from no buffer reduction (**Sub-alternative 2d**), through reduction multipliers of 0.95 (**Preferred Sub-alternative 2e**), 0.90 (**Sub-alternative 2f**), 0.85 (**Preferred Sub-alternative 2g**), 0.75 (**Sub-alternative 2h**), and a 0.00 multiplier resulting in an ACL = 0 (**Sub-alternative 2i**). The Council may choose a different sub-alternative for each stock or stock complex (see Appendix G), reflecting their understanding of the effectiveness and response time of management measures. Similar to the 2010 and 2011 Caribbean ACL Amendments, OY would be set equal to the ACL.

Sub-alternative 2d would establish an ACL equal to the ABC. This sub-alternative assumes no management uncertainty.

Preferred Sub-alternative 2e, the Council's <u>preferred sub-alternative</u> for all managed stocks/stock complexes except angelfish, parrotfish and surgeonfish, would specify an ACL equal to the ABC x 0.95. This sub-alternative assumes a thorough, but not complete, understanding of the factors influencing management decisions and the ability to apply those decisions in a timely and effective manner.

Sub-alternative 2f would establish an ACL equal to the ABC x 0.90. This level of reduction to account for management uncertainty was previously used by the Council when establishing an ACL for those stocks identified as not undergoing overfishing in the 2011 Caribbean ACL Amendment.

Preferred Sub-alternative 2g, the Council's <u>preferred sub-alternative</u> for angelfish, parrotfish and surgeonfish, would establish an ACL equal to the ABC x 0.85. This level of reduction to account for management uncertainty was previously used by the Council when establishing an ACL for those stocks identified as undergoing overfishing in the 2010 Caribbean ACL Amendment.

Sub-alternative 2h would establish an ACL equal to the ABC x 0.75. This level of reduction to account for management uncertainty was previously used by the Council when establishing an ACL for those stocks identified as being of ecological importance to the coral reef ecosystem in both the 2010 and 2011 Caribbean ACL Amendments.

Sub-alternative 2i would establish an ACL equal to the ABC x 0. This level of reduction to account for management uncertainty would be applied when the ability to manage the stock is minimal, or for those stocks for which any level of management is inadequate to ensure the continued stability and resilience of the coral reef ecosystem upon which the federally managed stocks considered in the St. Thomas/St. John FMP depend.

Alternative 3 uses the stepwise process for establishing references points in the 2010 and 2011 Caribbean ACL Amendments, but allows for the selection of sub-alternative combinations that may result in SDC and reference point outcomes that differ from those presently in place for federally managed stocks/stock complexes. This contrasts with **Alternative 1**, which results in the direct transfer of SDC and/or reference points established in the 2010 and 2011 Caribbean ACL Amendments, as applicable. As mentioned above, **Alternative 1** would not establish reference points for stocks new to management, but **Alternative 3** would allow for the development of those reference points.

Step 1 of **Alternative 3** would identify a year sequence of landings to be used as the baseline for establishing SDC and reference points. The chosen year sequence should represent a period of stable and sustainable landings, as defined and discussed in the 2010 and 2011 Caribbean ACL Amendments. A different year sequence could be chosen for each stock or stock complex. Step 1 of **Alternative 3** includes four sub-alternatives, and each is described in turn below.

Sub-alternative 3a would use the longest year sequence of reliable landings data available to set management reference points, as applicable. As described in the 2011 Caribbean ACL Amendment, the Council determined that landings for St. Thomas/St. John's commercial fishing sector prior to 2000 could not be used because they were assigned based on the gear used rather than on the species caught. For all stocks, the end year for the longest period of reliable catch data is 2016, the most recent year for which a complete compilation of landings data is available.

Sub-alternative 3b would use the longest time series of pre-Caribbean SFA Amendment landings data that is considered to be consistently reliable to set management reference points. The Caribbean SFA Amendment, implemented in 2005 (CFMC 2005), instituted a variety of new management measures for federal waters in the U.S. Caribbean region. The specific details regarding those management measures are incorporated here by reference, the salient point for the purpose of **Sub-alternative 3b** is that the year 2005 represents a shift in federal fishery management in the region. This proposed sub-alternative calls for only using commercial landings data reported during 2000-2005 for determining reference points. It is important to note, however, that throughout the history of fishing activity in St. Thomas/St. John waters, many factors have influenced fisher behavior and fishing success, including various changes to the regulatory regime along with other influences such as hurricanes and shifting markets. Thus, while implementation of the Caribbean SFA Amendment was a noteworthy event, other events are equally or perhaps even more influential to fishermen and the fish populations upon which they depend. Within that context, the value of choosing 2005 as a demarcation is not clear.

Sub-alternative 3c would use the most recent five years (2012-2016) of available landings data to set SDC and management reference points for a stock. This sub-alternative has value because it reflects the most recent fishing activity in St. Thomas/St. John. However, the most recent period of St. Thomas/St. John fishing activity may not represent a period of stable landings and almost certainly does not represent a period suitable for representing the MSY proxy. At least two reasons explain this under-representation of the MSY proxy. First, St. Thomas/St. John shared in the global economic downturn that began around 2008, reducing market opportunities for the fishermen that resulted in reduced fishing activity. Second, and more specifically with regard to this sub-alternative, both the 2010 and 2011 Caribbean ACL Amendments were implemented beginning in January 2012, and these revisions to the St. Thomas/St. John federal fishery management regime placed upper limits on the allowable catch of each federally managed stock. By definition, those caps reduced harvest below the MSY proxy. That outcome is legitimate and appropriate, but not necessarily for determining an MSY proxy. If such an approach is taken, the long-term outcome would be a constantly declining allowable catch level, as each new iteration of reference points would result in the new MSY proxy being brought down to the existing allowable catch level, and the new allowable catch level, and the new catch level being equal to or below that revised MSY proxy. Because uncertainty is inherent in fisheries management, the latter would be the most common outcome.

Sub-alternative 3d would use another (presently undefined) year sequence, based on a recommendation of the Council's SSC, to set management reference points for a stock. The implications of this sub-alternative cannot be fully analyzed until the SSC identifies the year sequence to be used. It is likely, however, that the chosen year sequence would fall between 2000 and 2016. The SSC has already determined that landings data acquired prior to 2000 are not applicable, so it's unlikely the SSC would choose any years prior to 2000 for use in reference point determinations. At the other end of the landings data spectrum, even if St. Thomas/St. John landings data more recent than 2016 became available, those landings data would be unrepresentative and substantially lower than a typical year due to the impacts of hurricanes Irma and Maria on the island in 2017, its inhabitants, and the markets that support fishing activity.

<u>Step 2</u> of **Alternative 3** would establish an MSY proxy for a stock as described by any of the sub-alternatives described below. A different sub-alternative could be chosen for each stock or stock complex. Following the procedures described in the 2010 and 2011 Caribbean ACL Amendments, the OFL for the stock/stock complex would then be set equal to the MSY proxy resulting from the chosen sub-alternative.

Sub-alternative 3e would establish an MSY proxy based on median annual landings derived from the year sequence selected in **Alternative 3** Step 1. When establishing SDC for some stocks in the 2011 Caribbean ACL Amendment, the SSC used the median rather than the mean of annual landings to account for a lack of landings information for those stocks/stock complexes. This was generally the case when few years of data were available for the stock, with the result that the mean calculated from those landings would be very low and likely unrepresentative of the capacity of the stock to produce MSY. In contrast, use of the median in such situations generally (but not always) would result in an outcome more representative of the stock's capacity to support harvest.

Sub-a**lternative 3f** would establish an MSY proxy based on mean annual landings derived from the year sequence selected in **Alternative 3** Step 1. This is the most common approach historically used to establish an MSY proxy for federally managed fish stocks in the U.S. Caribbean region. When a generally complete and stable fishery is operating, this approach best captures the capacity of the stock to support harvest if the year sequence chosen in **Alternative 3** Step 1 represents a period of stable and sustainable landings.

<u>Step 3</u> of **Alternative 3** would establish the ABC as described by any of the sub-alternatives below and using the MSY proxy (=OFL) established in **Alternative 3** Step 2. A different sub-alternative may be chosen for each stock.

Sub-alternative 3g would not specify an ABC Control Rule to be used for establishing the ABC from the MSY proxy (=OFL). Instead, the Council would adopt the ABC recommended by the SSC. The SSC would develop the ABC on an ad hoc basis for each stock/stock complex. The SSC previously used this approach in the 2010 Caribbean ACL Amendment when recommending management reference points for queen conch and some species of parrotfish.

Sub-alternative 3h would adopt an ABC CR where ABC = MSY proxy (=OFL). This sub-alternative assumes a complete understanding of the many factors involved in obtaining and understanding the scientific data used to determine the MSY proxy (=OFL). The factors taken into account when establishing scientific uncertainty were described in Step 2 of **Preferred Alternative 2**. This sub-alternative was previously used by the SSC when recommending management reference points for most stocks/stock complexes (except queen conch and some species of parrotfish) in both the 2010 and 2011 Caribbean ACL Amendments.

Sub-alternatives 3i through **3k** would adopt an ABC CR where ABC = MSY proxy (=OFL) x various buffer reductions including 0.90 (**Sub-alternative 3i**), 0.85 (**Sub-alternative 3j**), and 0.75 (**Sub-alternative 3k**). These buffer reductions represent an increasing level of scientific uncertainty resulting from variations in and the vagaries of the data upon which the MSY proxy (=OFL) was established. The factors taken into account when establishing scientific uncertainty were described in Step 2 of **Preferred Alternative 2** in Appendix G.

<u>Step 4</u> of **Alternative 3** would establish the ACL based on the buffer reduction factor described in one of the sub-alternatives below and using the ABC established in **Alternative 3** Step 3. A different sub-alternative may be chosen for each stock. Reducing from the ABC to the ACL is designed to account for management uncertainty, as discussed in Step 2 of **Preferred Alternative 2**. **Sub-alternatives 3l-3q** are similar to **Sub-alternatives 2a-2f** in **Preferred Alternative 2**, and the discussion above applies in here as well. Following the procedures and logic included in the 2010 and 2011 Caribbean ACL Amendments, OY would be set equal to the ACL.

<u>**Comparison of Action 4 Alternatives and Summary of Effects**</u>

Alternative 1 (No Action) would result in the continuation of SDC and management reference points established in the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b) and the Caribbean SFA Amendment (CFMC 2005), as applicable. Implementation of **Alternative 1** would be expected to have negative short-and long-term effects on the human environment, including the physical, biological/ecological, social, and economic environments. **Alternative 1** simply carries over the existing reference points and SDC. **Alternative 1** does not respond to availability of additional data or additional expert opinion on setting SDC and management reference points, and does not adapt to a changing suite of managed stocks. In particular, stocks newly added to the St. Thomas/St. John FMP would not be accounted for in **Alternative 1**. This is not in compliance with the Magnuson-Stevens Act.

Preferred Alternative 2 would replace the ABC CRs established in each of the 2010 and 2011 Caribbean ACL Amendments and provide a complete revision of reference points relative to what would result from **Alternative 1**. With respect to **Alternative 3**, specific comparisons of quantitative outcomes cannot be made unless sub-alternatives are selected by the Council for each of the four steps included in the action. However, the process established by **Preferred Alternative 2** would fundamentally differ from the process defined in **Alternative 3** regardless of the specific differences resulting from choice of sub-alternatives, and would provide explicit advantages relative to either **Alternative 1** or **Alternative 3**. Compared with **Alternative 1**, **Preferred Alternative 2** provides access to more recent landings data, thereby ensuring to the greatest practicable extent that an appropriate period of stable and sustainable landings is identified. Although Step 1 of **Alternative 3** provides multiple sub-alternatives (**Sub-alternatives 3a-3d**) for choosing a year-sequence of landings, including optional outcomes that could be identical to the year-sequence outcome applied in **Preferred Alternative 2** (e.g., Tier 4), the latter alternative provides additional advantages and better meets the obligations of scientific rigor and quality. Most importantly, the tiered approached included in the **Preferred Alternative 2** ABC CR better positions the Council to take advantage of future improvements in data and analytical methodologies.

Preferred Alternative 2 would be expected to have positive short- and long-term effects on the physical, biological/ecological, social, and economic environments associated with the St. Thomas/St. John EEZ. Applying the best scientific information available through **Preferred Alternative 2** would ensure that federally managed stocks are harvested sustainably while protecting reproductive capacity and maintaining effective ecological contributions. Establishing appropriate harvest reference points, taking into account both the biological needs and the ecological contributions of the stock as would be prescribed by **Preferred Alternative 2**, provides positive short- and long-term benefits to the physical and biological/ecological environments both directly by managing fishing effort and associated gear impacts and indirectly by managing the ecological integrity of the coral reef ecosystem. Management measures implemented to achieve the harvest objectives set by the F_{MSY} proxy would directly impact the biological environment in the form of controlling fishing effort. By being more conservative, **Sub-alternative 2b** of Step 2 would provide greater assurance overfishing would not occur and thus the biological benefits of **Sub-alternative 2b** would be greater than **Sub-alternative 2a** and **Preferred Sub-alternative 2c**.

Those positive short- and long-term biological/ecological effects, and the associated positive short- and long-term effects to the physical environment, translate to positive short- and long-term effects on the social and economic environments by stabilizing harvest and thereby increasing the predictability of harvest opportunities. **Sub-alternative 2b** would be expected to result in greater constraints on harvest than **Sub-alternative 2a** and **Preferred Sub-alternative 2c** resulting in the greatest short-term negative socio-economic impacts.

With the series of sub-alternatives included in **Preferred Alternative 2** Step 3, progressing from **Sub-alternative 2d** to **Sub-alternative 2i**, each sub-alternative identified a more restrictive OY and ACL, being **Sub-alternative 2i** the most restrictive (no catch). As the sub-alternatives progress to a larger buffer and lower ACL and OY, the biological effects would become increasingly positive in the short-term as catch limits would be increasingly lower (reduced fishing mortality). The long-term biological/ecological effects would also be likely positive if the OY and ACLs provide protection for the stocks and ensure the sustainability of stocks and stock complexes. In this case, the benefits to the physical and biological/ecological environments would be enhanced with a larger buffer between ABC and ACL, whereas, the benefits to the social and economic environments would be lessened in the short-term with a larger buffer. In the long-term, a larger buffer, in providing protection for the stock, may allow the greatest continued use of the resources. In all cases, the OY would be set equal to the ACL. Regarding administrative effects, in general, **Preferred Alternative 2** would be expected to result in minor negative short-term effects as effort is expended to modernize landings tracking protocols to account for establishment of new reference points and inclusion of new species.

Alternative 3 would follow the SDC and reference point setting methodologies developed in the 2010 and 2011 Caribbean ACL Amendments. The substantial differences between **Alternative 1** and **Alternative 3** include that the former is number-based, carrying over established measures as applicable, whereas the latter is process-based and therefore provides for a wider range of outcomes. Additionally, the latter allows the process to be applied across the full suite of stocks and stock complexes (as appropriate) that would be chosen by the Council in Actions 2 and 3 whereas the former is constrained to only those stocks/stock complexes already under management in the St. Thomas/St. John EEZ.

The effects to the physical, biological/ecological, social, and economic environments resulting from **Alternative 3,** Step 1 (**Sub-alternatives 3a-3d**), Step 2 (**Sub-alternatives 3e-3f**), and Step 3 (**Sub-alternatives 3g-3k**) would be expected to be more beneficial than those that would result from implementation of **Alternative 1**, but less beneficial than those that would result from implementation of **Preferred Alternative 2**. The extent of the positive effects would be limited through time as this control rule does not provide a mechanism to consider and apply the best scientific information available (e.g., data and methods for calculating MSY) and to update management as those data expand and improve. Instead, the Council would have to amend the FMP to specify an alternative control rule. Short-term administrative effects of **Alternative 3** (all sub-alternatives considered) would be negative but minor, due to the additional administrative effort to update regulations and public awareness documents. The range of reduction buffers to determine the ACL included in **Sub-alternatives 3l-3q** of **Alternative 3**, Step 4, is identical to the range of buffers included in **Preferred Alternative 2**, Step 3 (**Sub-alternatives 2d-2i**). The effects would be expected to be the same as for **Preferred Alternative 2** discussed above.

2.5 Action 5: Establish Accountability Measures for Stocks and Stock Complexes

Through Action 5, the Council would re-establish AMs for previously managed stocks and stock complexes and establish AMs for stocks new to management in the St. Thomas/St. John FMP. This action follows from selecting Preferred Alternative 2 in Action 1 and proceeding with establishing a St. Thomas/St. John FMP, composed of measures contained in the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs that are pertinent to St. Thomas/St. John, as modified in Actions 2-4. For a stock or stock complex, an AM would be triggered based on annual landings from the commercial fishing sector. Commercial landings data are obtained from commercial catch reports collected by the USVI Department of Planning and Natural Resources (DPNR).

2.5.1 Proposed Alternatives for Action 5

Alternative 1. No Action. Do not revise the determinant for triggering an AM or the specific AM that would be applied to a stock or stock complex in the St. Thomas/St. John FMP. The AMs applicable to reef fish, spiny lobster, queen conch, and coral resources established in the Council's Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs and that would be brought into the St. Thomas/St. John FMP based on Action 1 Preferred Alternative 2 would continue to be applied to previously managed stocks/stock complexes in the St. Thomas/St. John EEZ, as those stocks/stock complexes are organized following Actions 2 and 3. This action would not establish AMs for stocks/stock complexes that are new to management.

Preferred Alternative 2. For a stock/stock complex in the St. Thomas/St. John FMP, trigger an AM if commercial landings, as determined in one of the sub-alternatives below, exceeds the established ACL for that stock/stock complex, unless NMFS' SEFSC determines the overage occurred because data collection/monitoring improved rather than because catch increased. If an AM is triggered, NMFS would reduce the length of the fishing season for the applicable stock/stock complex the year following the overage determination by the amount necessary to ensure (to the greatest practicable extent) landings do not again exceed the ACL in the year of application. Any fishing season reduction resulting from an AM application would be applied from September 30 backward, toward the beginning of the fishing year. If the length of the required fishing season reduction exceeds the time period of January 1 through September 30, any additional fishing season reduction would be applied from October 1 forward, toward the end of the fishing year.

> **Sub-alternative 2a**. A single year of commercial landings, beginning with the most recent available complete year of commercial landings.
>
> **Sub-alternative 2b.** A single year of commercial landings, beginning with the most recent available complete year of commercial landings, then a two-year average of commercial landings from that single year and the subsequent year, and thereafter a progressive running two-year average.
>
> **Sub-alternative 2c**. A single year of commercial landings, beginning with the most recent available complete year of commercial landings, then a two-year average of commercial landings from that single year and the subsequent year, then a three-year average of commercial landings from those two years and the subsequent year, and thereafter a progressive running three-year average.
>
> **Preferred Sub-alternative 2d.** A single year of commercial landings, using commercial landings from 2018; then a single year of commercial landings, using commercial

landings from 2019; then a two-year average of commercial landings from 2019 and the subsequent year (2019-2020); then a three-year average of commercial landings from those two years and the subsequent year (2019-2021); and thereafter a progressive running three-year average (2020-2022, 2021-2023, etc.). The Regional Administrator in consultation with the Council may deviate from the specific time sequences based on data availability.

Preferred Alternative 3. For the pelagic stocks (dolphin and wahoo) only, apply a two-step process to establish an annual catch target (ACT) for each stock that would be used as an AM (Step 1), and establish the determinant for triggering an AM (Step 2). Choose a sub-alternative from each step, for each stock.

Alternative 3 - <u>Step 1</u>. Establish an ACT for each pelagic stock, using any of Sub-alternatives 3a-3c listed below, and use the established ACT as the AM.

Preferred Sub-alternative 3a. The ACT would be 90% of the ACL.

Sub-alternative 3b. The ACT would be 80% of the ACL.

Sub-alternative 3c. The ACT would be 70% of the ACL.

Alternative 3 - <u>Step 2</u>. Trigger an AM if the commercial landings as determined in one of the sub-alternatives below, exceeds the ACT for that stock. If an AM is triggered, the Council in consultation with the SEFSC would assess whether corrective action is needed.

Sub-alternative 3d. A single year of commercial landings, beginning with the most recent available complete year of commercial landings.

Sub-alternative 3e. A single year of commercial landings, beginning with the most recent available complete year of commercial landings, then a two-year average of commercial landings from that single year and the subsequent year, and thereafter a progressive running two-year average.

Sub-alternative 3f. A single year of commercial landings, beginning with the most recent available year of commercial landings, then a two-year average of commercial landings from that single year and the subsequent year, then a three-year average of commercial landings from those two years and the subsequent year, and thereafter a progressive running three-year average.

Preferred Sub-alternative 3g. A single year of commercial landings, using landings from 2018; then a single year of commercial landings, using landings from 2019; then a two-year average of commercial landings from 2019 and the subsequent year (2019-2020); then a three-year average of commercial landings from those two years and the subsequent year (2019-2021); and thereafter a progressive running three-year average (2020-2022, 2021-2023, etc.). The Regional Administrator in consultation with the Council may deviate from the specific time sequences based on data availability.

Alternative 4. Establish an in-season AM. Harvest of a stock or stock complex would be prohibited for the remainder of the fishing season when the ACL for the stock/stock complex is reached or projected to be reached.

Preferred Alternative 5. For a stock with harvest prohibitions, the prohibition would serve as the AM.

2.5.2 Discussion of Action 5 Alternatives

Accountability measures are management controls to prevent ACLs from being exceeded, and to correct or mitigate overages of the ACL if they occur. The Magnuson-Stevens Act requires that AMs be established for all federally managed stocks. Accountability measures should address and minimize both the frequency and magnitude of overages and correct the problems that caused the overage in as short a time as possible. NMFS's guidelines identify two categories of AMs: in-season and post-season (50 CFR 600.310(g)(1)).

Action 5 would re-establish AMs for previously managed stocks and stock complexes and depending on the chosen alternative, establish AMs for stocks new to management in the St. Thomas/St. John FMP. As identified in Action 2, Preferred Alternative 2, three species of finfish would be new to federal management in the St. Thomas/St. John FMP, as would be a number of sea cucumbers, sea urchins, and corals that were not managed in the Coral FMP. In addition, the organization of stock complexes would change as a result of Action 3 and new ACLs would be set (or revised) as a result of Action 4. By revising AMs as proposed in Action 5, the Council would ensure ACL overages are accounted for with responsive management actions, thereby minimizing the risk of overfishing while ensuring to the greatest possible degree that OY is achieved on a continuing basis.

Alternative 1 (No Action) would not change the existing AMs for those stocks carried into the St. Thomas/St. John FMP from the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs. The current determinant for triggering AMs, as well as the presently established response to an ACL overage, would be applied to the stocks/stock complexes in the St. Thomas/St. John FMP. However, AMs would not be established for those stocks/stock complexes newly added to the St. Thomas/St. John FMP, nor would a trigger for applying an AM be defined.

Under **Alternative 1**, for the previously managed reef fish stocks and for spiny lobster, an AM would be triggered when the average of the most recent three years of landings[17] for a stock/stock complex exceeds the ACL established for that stock/stock complex. The AM would reduce the length of the fishing season in the year following the determination by the amount necessary to ensure that landings do not exceed the ACL applicable to that stock/stock complex.

Under **Alternative 1**, for the previously managed reef fish stocks and for spiny lobster, the trigger determination is conditional, in that if the NMFS determines the ACL exceedance resulted from enhanced data collection or monitoring rather than reflecting an actual increase in landings, an AM would not be triggered. This conditional clause responds to continuing efforts by the Council, territorial agencies, NMFS, and the fishermen to improve reporting of landings data. Such reporting enhancements likely would increase reported landings, thereby pushing the three-year average used for comparison upward despite no increase in the actual harvest. The conditional clause is designed to ensure fishermen would not be subject to an AM for enhancements to data collection and reporting patterns.

Under **Alternative 1**, for both previously managed reef fish stocks and for spiny lobster, any fishing season reduction resulting from an AM application would be applied from September 30 backward toward the January 1 beginning of the fishing year. If the length of the required fishing season reduction exceeds the January 1 through September 30 time period, any additional fishing season reduction would be applied from October 1 forward, toward the end of the fishing year.

In the St. Thomas/St. John EEZ, the harvest of queen conch and corals is prohibited under both the Queen Conch and Coral FMPs. Those harvest prohibitions would be carried over into the St. Thomas/St. John FMP. The harvest prohibition serves as the AM in both the Queen Conch and Coral FMPs, and would continue to do so under **Alternative 1** (and **Alternative 5** as discussed below).

Preferred Alternative 2 would use a stepwise temporal approach to calculate average landings for comparison against the ACL. This contrasts with **Alternative 1**, which would use the most recent three years of landings data as the determinant to trigger an AM. **Sub-alternative 2a** would use the most recent single year of landings for comparison against the ACL. For example, assuming that the first year of operation under the St. Thomas/St. John FMP is 2019, landings data from the 2018 fishing year (assuming this is the most recent year of available and complete landings) would be compared against the applicable ACL to determine if an AM would be

[17] With the exceptions of goliath grouper, Nassau grouper, midnight parrotfish, blue parrotfish, and rainbow parrotfish, ACLs are based on the combined landings from territorial and federal waters around St. Thomas/St. John. Harvest of these stocks is prohibited and the harvest prohibition operates as the AM.

applied to any stock/stock complex in 2019. That single year approach would be continued into the future; landings data from the 2019 fishing year would be compared against the ACL to determine if an AM would be applied to any stock/stock complex in 2020. This stepwise, single-year approach would be continued into the future.

Under **Sub-alternative 2b**, a single year of landings would be used during the first year of FMP operation, as in **Sub-alternative 2a**, but in the second year of operation an average of landings from the two most recent years of complete landings would be compared against the ACL. The two-year averaging approach would then be continued in a stepwise fashion (i.e., a running two-year average) into the future. For example, assuming the first year of operation under the St. Thomas/St. John FMP is 2019, landings data from the 2018 fishing year (assuming this is the most recent year of available and complete landings) would be compared against the ACL to determine if an AM would be applied to any stock/stock complex in 2019. An average of landings from 2018 and 2019 would be compared against the ACL to determine if an AM would be applied to any stock/stock complex in 2020. This stepwise, two-year running average approach would be continued into the future.

Sub-alternative 2c is similar to **Sub-alternative 2b**, but instead of using a two-year running average approach in the third year and into the future, a three-year average of landings would be compared against the ACL. The three-year running average approach would then be continued into the future. As in the previous examples, if 2019 were to be the first year of St. Thomas/St. John FMP operation, 2018 landings data would be used in the 2019 management year, 2018 and 2019 landings data would be used in the 2020 management year, 2018, 2019 and 2020 landings data would be used in the 2021 management year, and 2019, 2020, and 2021 landings data would be used in the 2022 management year. This stepwise, three-year running average approach would be continued into the future.

Preferred Sub-alternative 2d differs from **Sub-alternatives 2a-2c** in that **Preferred Sub-alternative 2d** calls for a modified stepwise approach to determine if an AM would be triggered. Under **Preferred Sub-alternative 2d**, landings data from 2018 alone would be compared against the ACL to determine if an AM would be triggered during the first year (2019)[18] of operation under the St. Thomas/St. John FMP. In the second year of FMP operation (2020), landings data from 2019 alone would be compared against the ACL to determine if an AM would be triggered. In the third year (2021) of FMP operation, an average of the landings from 2019 and 2020 would be compared against the ACL. In the fourth year (2022) of operation, an average of the landings from 2019, 2020, and 2021 would be compared against the ACL. This stepwise, three-year running average approach would be continued into the future (e.g., 2020+2021+2022 for the 2023 operating year).

[18]As described in Preferred Sub-alternative 2d, the RA has the discretion to deviate from the specified year sequence based on data availability.

Regarding the choice of years to be used when averaging landings for comparison against the ACL, using average landings provides benefits because of the variable nature of St. Thomas/St. John fisheries. While a few stocks provide predominate harvest from the St. Thomas/St. John EEZ, most harvested stocks contribute only a small proportion of the total landings. Additionally, the relative proportion of landings contributed by any single stock commonly varies from year to year, even in the case of those stocks providing large contributions. These fluctuations may result from biological (e.g., year-class variability) and economic (e.g., market demand) factors, either alone or in concert. Regardless, the fewer years of landings used, the more variable the resultant year-to-year comparison would be against the established ACL. An averaged time-series of landings would reduce the effects of the variability, and the longer the time-series the more the variation would be evened out. When using a single year of landings, the expected outcome would be more frequent exceedance of the ACL interspersed with years when the landings for any stock/stock complex fall well below the established ACL. Because some or all of the variability results from natural biological fluctuations, little biological/ecological advantage is obtained from using a single year of landings for comparison against the ACL, whereas potentially substantial negative socio-economic impacts would accrue resulting from more frequent AM applications. Overall, OY would be achieved less frequently when using a single year of landings for identifying an ACL overage. To a point, the longer the time-series, the more closely management would achieve OY. NMFS's NS1 guidelines allow for AMs based on multi-year average data for fisheries that have highly variable annual catches and suggest a three-year moving average could be appropriate to address variability (50 CFR 600.310(g)(5)). Three years is the longest time period considered in the **Preferred Alternative 2** (and **Preferred Alternative 3**) sub-alternatives.

Regarding the application of AMs in response to an ACL overage, **Preferred Alternative 2** is very similar in most respects to **Alternative 1**. As discussed above for **Alternative 1**, with **Preferred Alternative 2**, when an AM is triggered, application of that AM would result in a reduction in the length of the fishing season in the year following the determination, by the amount necessary to ensure to the greatest practicable extent that such an overage would not occur again in the year following the determination. As discussed above, this approach to management anticipates that fishing effort remains relatively constant between consecutive years (although not necessarily in the long-term). By adjusting the fishing year (i.e., reducing the length of the fishing season) to allow fishing at that level of anticipated effort for the number of days necessary to meet but not exceed the ACL, the Council would ensure the target stock or stock complex is harvested in a sustainable manner within the context of OY. The AM application process in **Preferred Alternative 2** could be applied to each of the managed stocks for which harvest is allowed in the St. Thomas/St. John EEZ (reef fish, spiny lobster, and, pelagic stocks[19]). Similar to **Alternative 1**, any fishing season reduction resulting from

[19] Pelagic stocks in the St. Thomas/St. John FMP resulting from Action 2 are dolphin and wahoo.

application of an AM would be applied from September 30 backward, toward the beginning of the fishing year. If the length of the required fishing season reduction exceeds the time period of January 1 through September 30, any additional fishing season reduction would be applied from October 1 forward, toward the end of the fishing year.

Preferred Alternative 3 applies specifically to pelagic stocks new to management in the St. Thomas/St. John EEZ. Based on Preferred Alternative 2 of Action 2 (species to manage in the FMP) and Preferred Alternatives 3 and 4 of Action 3 (stock organization and indicator selection), those newly added pelagic stocks would include dolphin and wahoo. Landings data for these stocks are available, but it is unknown to what extent those landings data fully represent sustainable harvest of these pelagic stocks. Because these pelagic stocks were not previously managed in EEZ waters surrounding St. Thomas/St. John, less emphasis was placed on data collection relative to those stocks previously under state or federal management. That approach to data collection may have failed to capture the temporally and spatially variable nature of these pelagic fisheries, both within the year due to migratory timing and fishing tournament events that target some or all of these stocks, and among years due to factors such as variation in inter-annual recruitment success and changing migratory pathways. As a result, while available landings provide guidance on a minimum level of sustainable harvest, those landings data may not provide adequate guidance concerning the capacity of the stock to support sustainable harvest. For both recreational and commercial fishermen, dolphinfish represent one of the most commonly targeted and economically important of harvested stocks. Reflecting these economic and cultural considerations, the Council requested a different approach to their management until a more complete understanding of these important fisheries is obtained. **Preferred Alternative 3** provides that approach. Instead of applying an AM in the event of an ACL overage, and reducing the length of the fishing season, as proposed in **Alternative 1** and **Preferred Alternative 2**, the Council would establish an ACT as a percentage of the ACL that would serve as the AM, based on one of the sub-alternatives in Step 1 of this alternative. An ACT is an amount of annual catch of a stock or stock complex that may appropriately serve as a management target for the fishery, and accounts for management uncertainty in controlling the catch at or below the ACL.

Three sub-alternatives are provided in Step 1 of **Preferred Alternative 3** for setting the ACT relative to the ACL. **Preferred Sub-alternative 3a** would set the ACT at 90% of the ACL, **Sub-alternative 3b** would set the ACT at 80% of the ACL, and **Sub-alternative 3c** would set the ACT at 70% of the ACL (Table 2.5.1). That range of alternative ACTs provides balance between management uncertainty and economic opportunity, with **Sub-alternative 3c** being more conservative in view of management uncertainty and **Preferred Sub-alternative 3a** being less conservative in view of economic opportunity.

Table 2.5.1. Annual catch targets for pelagic stocks under each of the sub-alternatives in Preferred Alternative 3, based on the Council's preferred alternatives in Action 4 for establishing annual catch limits (ACL).

Stock	ACL (lbs)	Sub-alt 3a (Preferred) ACT = ACL * 0.90 (lbs)	Sub-alt 3b ACT = ACL * 0.80 (lbs)	Sub-alt 3c ACT = ACL * 0.70 (lbs)
Dolphin	9,778	8,800	7,822	6,845
Wahoo	6,879	6,191	5,503	4,815

Under **Preferred Alternative 3**, if the ACT established in Step 1 is exceeded based on one of the four trigger sub-alternatives in Step 2, the AM would be applied and the Council in consultation with the SEFSC would review the available data and evaluate what factors led to the exceedance and whether corrective action (such as an ACL revision) would be needed. **Sub-alternatives 3d-3f** and **Preferred Sub-alternative 3g** of **Preferred Alternative 3** would use the same approach proposed **Sub-alternatives 2a-2c** and **Preferred Sub-alternative 2d** of **Preferred Alternative 2** to calculate average landings for comparison against the applicable ACT as the determinant to trigger an AM. This approach is discussed above for **Sub-alternatives 2a-2c** and **Preferred Sub-alternative 2d** of **Preferred Alternative 2,** and the reader is referred to that discussion as it would similarly apply to **Sub-alternatives 3d-3f** and **Preferred Sub-alternative 3g**.

Alternative 4 pertains to those stocks/stock complexes for which data are available to make an AM trigger determination within the fishing year. For stocks proposed for inclusion in the St. Thomas/St. John FMP, in-season data are presently unavailable. Territorial and federal efforts to improve the timing and extent of data acquisition for stocks harvested from the St. Thomas/St. John EEZ continue, however, and those improvements may result in the availability of in-season data with which to monitor and manage fishing activity. Until those improvements are realized, in-season management would not be possible.

Preferred Alternative 5 addresses those stocks for which harvest would be prohibited based on the preferred alternatives identified in Action 4 that result in an ACL of zero. This alternative would apply to queen conch, Nassau grouper, goliath grouper, blue parrotfish, midnight parrotfish, rainbow parrotfish, sea cucumbers, sea urchins, and all managed corals. Under **Preferred Alternative 5** the harvest prohibition would serve as the required AM.

<u>Comparison of Action 5 Alternatives and Summary of Effects</u>

When properly formulated and applied, AMs provide generally positive benefits to the human environment as they serve to manage fishing effort as a means to constrain harvest to a science-based level of sustainability. Both the short- and long-term effects are generally beneficial, as AMs provide protection from negative impacts to a stock resulting from overharvest. The biology of the individual stocks, the ecology of the coral reef ecosystem within which those stocks function, and the human community dependent on those stocks for their livelihood, all benefit from an effective management framework.

Alternative 1 (No Action) follows from choosing to transition to island-based management in Preferred Alternative 2 of Action 1, thereby creating a St. Thomas/St. John FMP that retains AMs established in the U.S. Caribbean-wide FMPs. However, **Alternative 1** would not be compliant with the requirements of the Magnuson-Stevens Act because it would not establish AMs for the stocks that are new to management. The U.S. Caribbean-wide FMPs do not contain AMs for stocks or stock complexes that are new to management, and thus the AMs that are carried over would not address those entities. This would likely negatively affect the socio-economic and biological/ecological environments by potentially failing to achieve OY on a continuing basis or to minimize the risk of stock depletion due to a failure to properly manage harvest.

Regarding the application of AMs in response to an ACL overage, for reef fish stocks for which harvest is allowed and for spiny lobster, **Preferred Alternative 2** is very similar in most respects to **Alternative 1** as discussed above. However, in contrast to **Alternative 1**, **Preferred Alternative 2** can be selected for all stocks to be managed under the St. Thomas/St. John FMP. Under **Preferred Alternative 2**, positive benefits to the biological/ecological environment would be realized when the AM is properly applied; in that instance, the length of the fishing season would be reduced to ensure that the landings do not exceed the ACL in the year following an ACL exceedance, thereby ensuring fishing effort is managed as necessary to prevent a subsequent exceedance of the ACL. These positive biological/ecological benefits translate directly into positive socio-economic benefits resulting from a reliable and sustained resource base.

Preferred Alternative 2 would use a stepwise temporal approach to calculate average landings for comparison against the ACL and the choice of years varies under each of **Sub-alternatives 2a-2c** and **Preferred Sub-alternative 2d**. A comparison of these sub-alternatives was included in the discussion of **Preferred Alternative 2** above. This approach to calculate landings for comparison against the ACL contrasts with **Alternative 1**, which would use the most recent three years of landings data as the determinant to trigger an AM. The choice of sub-alternative within **Preferred Alternative 2** could influence the frequency with which an AM-based fishing season reduction is implemented and the length of that fishing season reduction, but the specific effects associated with each sub-alternative depend on the stock in question and the variability in landings associated with that stock. Without that information, it is difficult to assess the relative effects of each sub-alternative.

Alternative 4 achieves these same goals but more responsively by applying effort control in a pro-active rather than reactive manner. **Alternative 4** therefore provides enhanced benefits relative to **Preferred Alternative 2**, and much greater benefits relative to **Alternative 1** because it provides a mechanism to prevent ACL overages within the fishing year rather than responding in a subsequent year to an already realized ACL overage.

Under **Preferred Alternative 3**, biological/ecological effects would likely be less beneficial relative to the other alternatives because the AM would not close harvest when triggered, risking potential depletion of the resource. Instead, it requires further action from the Council, as discussed above. In contrast, socio-economic effects resulting from application of **Preferred Alternative 3** would be more beneficial relative to the other alternatives, at least in the short-term, because harvest would not be constrained without additional action from the Council. However, the Council may revise their management approach in response to recommendations from the SEFSC, with a reasonable expectation that those management revisions would benefit stock productivity in the long-term with resultant benefits to the biological/ecological and socio-economic environments. From the three sub-alternatives proposed under **Preferred Alternative 3** for setting the ACT relative to the ACL, **Sub-alternative 3c** is the most conservative (smallest percentage of the ACL at 70%) and provides the greatest likelihood that the AM would be triggered followed by **Sub-alternative 3b** (80% of ACL) and lastly, **Preferred Sub-alternative 3a**, which is the least conservative (90% of ACL). The choice of years to compare against the applicable ACT and trigger an AM (if needed) proposed in **Sub-alternatives 3d-3f** and **Preferred Sub-alternative 3g** could influence the frequency with which an AM is triggered, but the specific effects associated with each of those sub-alternatives depend on the pelagic stock and the variability in landings associated with that stock. Without that information, it is difficult to assess the relative effects of each sub-alternative.

Preferred Alternative 5 equates the AM with a complete prohibition on harvest, as would result for several stocks from implementation of the Council's preferred alternatives for Action 4. Biological/ecological effects resulting from the application of **Preferred Alternative 5** would be positive and more substantial than those realized from any of the other Action 5 alternatives. But those benefits would only apply to stocks already assigned an ACL of zero based on the Council's preferred alternatives in Action 4. For the remainder of managed stocks, **Preferred Alternative 5** would not apply and no effects would therefore be realized. For those stocks to which **Preferred Alternative 5** would apply, potential benefits to the socio-economic environment could arise over the long-term, as the harvest prohibition is designed to allow for the recovery of overfished stocks or those with ecological importance.

In summary, **Alternative 4** of Action 5 (in-season AM) provides the greatest overall benefit to the environment because only this alternative aims to ensure that AM implementation prevents an ACL exceedance rather than simply responding to an ACL overage. Unfortunately, at the present time this is the least feasible alternative because in-season landings data are not available for St. Thomas/St. John's fisheries. **Preferred Alternative 5** also prevents rather than responds to an ACL overage, relying on a harvest prohibition. Given the absence of in-season landings data, which renders Alternative 4 infeasible, **Preferred Alternative 2** would provide the greatest overall benefit for those stocks for which harvest is allowed to ensure a balanced approach to biological/ecological and socio-economic outcomes. Lastly, **Preferred Alternative 3** provides the greatest overall benefit for those stocks for which that balance is not well understood, specifically pelagic stocks newly added to management in the St. Thomas/St. John FMP, because it would not result in unnecessary constraints to harvest for those prolific, wide-ranging stocks.

2.6 Action 6: Describe and Identify EFH for Species not Previously Managed in the St. Thomas/St. John EEZ

Through Action 6, the Council would describe and identify EFH for species that would be new to federal management in the St. Thomas/St. John FMP following Action 2.

All species previously managed under the U.S. Caribbean FMPs have EFH designations (CFMC 2005), and this action does not address species for which EFH was previously identified, with the exception of previously managed sea urchins, sea cucumbers, and corals (see discussion below). For the remainder of the previously managed species that were retained in the St. Thomas/St. John FMP under Action 2 (spiny lobster, queen conch, and 44 reef fish), EFH was described and identified as follows. For previously managed reef fish, EFH consists of all waters from mean high water to the outer boundary of the U.S. Caribbean EEZ (habitats used by eggs and larvae) and all substrates from mean high water to 100 fathoms depth (habitats used by other life stages). Identified substrates included wetlands, mangroves, seagrass, benthic algal plains, mixed submerged aquatic vegetation, drift algae, coral reefs, sand-shell, mud and soft bottom habitats, hard bottom habitat and rubble. For spiny lobster, all waters from mean high water to the outer boundary of the U.S. Caribbean EEZ (habitats used by phyllosome larvae) and seagrass, benthic algae, mangrove, coral, and live/hard bottom substrates from mean high water to 100 fathoms depth (habitats used by other life stages). For queen conch, all waters from mean high water to the outer boundary of the EEZ (habitats used by eggs and larvae) and seagrass, benthic algae, coral, live/hard bottom and sand/shell substrates from mean high water to 100 fathoms depth (habitats used by other life stages). Existing designations are being evaluated during the ongoing EFH Five-Year Review and the Council's ongoing data analysis efforts.

2.6.1 Proposed Alternatives for Action 6

Alternative 1. No Action. Do not describe and identify EFH for species not previously managed in federal waters of St. Thomas/St. John.

Preferred Alternative 2. Describe and identify EFH for the species not previously managed according to functional relationships between life history stages of federally-managed species and St. Thomas/St. John marine and estuarine habitats, based on best scientific information available from the literature, landings data, fishery-independent surveys, and expert opinion (See Appendix I).

Alternative 3. Use the highest level of detailed information below to describe and identify EFH for species not previously managed in federal waters of St. Thomas/St. John, including:

1) Designating EFH based on distribution data (distribution of habitat types, fish species and fishing effort) (*Level 1 data – surveys of presence/absence; simple habitat/species associations*);

2) Designating EFH based on habitat-related densities of the species (EFH would be defined as the area where the density or relative abundance of a species life stage is above a threshold level) *(Level 2 – Survey/fishery related catch per unit effort as proxy for density; or spatial modeling of probability of occurrence, or other forms of habitat suitability models)*;

3) Designating EFH based on data on growth, reproduction, or survival rates within habitats (*Level 3 – obtained from tagging data (growth), fecundity data by area*);

4) Designating EFH based on production rates by habitat (*Level 4*);

5) Habitat suitability models (*uses habitat suitability modeling prepared by National Ocean Service to infer information about species distribution, and possibly relative density [i.e. assuming that habitats with a higher suitability support greater abundances of a species life stage])*.

2.6.2 Discussion of Action 6 Alternatives

Under the Magnuson-Stevens Act, FMPs must "describe and identify essential fish habitat for the fishery based on the guidelines established by the Secretary under section 305(b)(1)(A), minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat" (16 USC 1853(a)(7)). The alternatives above identify different approaches that the Council could use to describe and identify EFH for species new to federal management. The Council previously evaluated the approaches within these alternatives when describing and identifying EFH for all species managed under the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs (CFMC 2004).

As identified in Action 2 (Preferred Alternative 2), species to be managed under the St. Thomas/St. John FMP includes queen conch, spiny lobster, 47 finfish species, and all species of sea cucumbers, sea urchins, and coral. From these, three species of finfish would be new to federal management: yellowmouth grouper, dolphin, and wahoo. The St. Thomas/St. John FMP would also include a number of new sea cucumbers, sea urchins, and corals that were not previously included under the Coral FMP. The sea urchin and sea cucumber species previously managed as Aquarium Trade species under the Coral FMP would be combined with the newly added species that occur in the St. Thomas/St. John EEZ and managed in the Sea urchins and Sea cucumbers stock complexes under the St. Thomas/St. John FMP. Similarly, the corals previously managed under the Coral FMP would be combined with newly added species that occur in the St. Thomas/St. John EEZ and managed under the Corals stock complex. To ensure effective managment of all species of sea urchins, sea cucumbers, and corals that occur in the St. Thomas/St. John EEZ, all species of sea urchins, sea cucumbers, and corals are being managed in stock complexes, each of which contains species new to management. It is not possible to describe and identify EFH individually for the managed species of corals, sea urchins, and sea cucumbers. Therefore, the resulting EFH descriptions in **Alternative 2** below for sea urchins, sea cucumbers, and corals apply to each of the managed species in the managed stock complexes, whether newly included under the FMP, or previously managed. The habitat and life history information for all new species is included in Appendix I.

Alternative 1 (No Action), would not comply with the requirements of the Magnuson-Stevens Act, as it would not identify EFH for the new species proposed for federal management in the St. Thomas/St. John FMP. The new finfish species for which EFH designations would not be provided include yellowmouth grouper (*Mycteroperca interstitialis*), dolphin (*Coryphaena hippurus*), and wahoo (*Acanthocybium solandri)*. Yellowmouth grouper co-occurs with the species managed under the Reef Fish FMP, but the EFH identified for the previously managed, co-occurring species would not be applied to the yellowmouth grouper. Dolphin and wahoo are identified as coastal migratory pelagic fish and although their habitat also overlaps that of the previously managed reef fish, the Council has not described or identified EFH for these species.

Additionally, **Alternative 1** would not identify EFH for any of the new species of sea cucumbers, sea urchins, or corals that were included for management in Action 2. Some of those new invertebrate species occur in substrates found at greater depths than those previously identified as EFH in the Coral FMP. Previously identified EFH for these species includes coral and hard bottom substrates from mean low water to 100 fathoms depth (CFMC 2005) and these newly managed invertebrate species have been found in substrates at depths greater than 100 fathoms. Thus, the Council may need to identify substrates at greater depths (e.g., substrates out to the outer boundary of the EEZ) as EFH for these invertebrate species that are new to management.

Preferred Alternative 2 would describe and identify EFH for species new to management according to functional relationships between life history stages and St. Thomas/St. John marine and estuarine habitats based on best scientific information available from the literature, landings data, fishery-independent surveys and expert opinion. This alternative follows the same approach as the preferred alternative in the Caribbean SFA Amendment (CFMC 2005).

The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." 16 USC 1802(10). The most significant impediments to describing and identifying EFH and mapping the extent of EFH in the U.S. Caribbean have been the lack of information on species distributions and the paucity of habitat mapping information deeper than about 82 ft (25 m), the limited information available from mesophotic reefs (98-164 ft [30-50 m]), and the limited data on pelagic species in the region. In instances where information is limited, **Preferred Alternative 2** uses information on ecological relationships to infer the distribution for the species. Little information exists on relationships between habitat, abundance, and distribution for many of the life stages of managed species in the U.S. Caribbean, and therefore EFH would be identified as all areas where the species are distributed. For practical purposes, and in accordance with the precautionary approach, describing and identifying EFH under this **Preferred Alternative 2** would be applied as broadly as possible. For each species, the habitats used by species and life stage are presented in Appendix I and summarized in Tables 2.6.1 and 2.6.2.

Table 2.6.1. Summary of species new to management under the St. Thomas/St. John FMP and information on their habitats per life stage. Complete information per species included in Appendix I.

Species Name	Common Name	Eggs	Larvae	Post larvae	Juveniles	Adults	Spawning Adults
Mycteroperca interstitialis	Yellowmouth grouper	Pelagic	Pelagic	Pelagic	Mangrove, reef	rocky, coral; MCD	Reef, rocky, coral; Grammanik Bank
Coryphaena hippurus	Dolphin	Pelagic	Pelagic, flotsam, Sargassum	Pelagic	Pelagic/ migratory/ no temperature barrier/ Sargassum/ flotsam	Pelagic /migratory/Sargassum/flotsam/ weed lines/ trap buoys	Pelagic/wide geographic range
Acanthocybium solandri	Wahoo	Pelagic	Pelagic/ oceanic	Pelagic	Pelagic	Pelagic	Pelagic
--	Sea Cucumbers	Pelagic/ internal	Pelagic/ brooding/ live young	-	Sand, seagrass, Pelagic	Sand, seagrass, Pelagic	Sand, seagrass, Pelagic
--	Sea Urchins	Pelagic /brooding	Pelagic/ brooding	-	Sand, seagrass	Sand, seagrass	Sand, seagrass, coral
--	Corals	Pelagic	Pelagic	Hard substrate	Coral, hard substrate	Sand, coral, hard substrate	Sand, coral, hard substrate

Table 2.6.2. Summary of functional relationship (feeding [F], growth [G], spawning [S], breeding [B]) by habitat type utilized by life history stages (egg [E], larvae [L], juvenile [J], adult [A]) for each new species proposed for federal management in the St. Thomas/St. John FMP. Complete information per species included in Appendix I. Values denoted with dash (-) indicate information that was not available..

Species Name	**Common Name**	**Mangrove**	**Seagrass**	**Coral Reef**	**Hard Bottom**	**Sand**	**Mud**	**Algal Plains**	**Pelagic/ Water column**	**Sargassum**
Mycteroperca interstitialis	Yellowmouth grouper	J F/G	-	J/A S	J/A F/G	-	-	-	E/L F/G	-
Coryphaena hippurus	Dolphin	-	-	J/A F/G	J/A F/G	-	-	-	E/L/J/A F/G/S	L/J/A F/G
Acanthocybium solandri	Wahoo	-	-	J/A F/G	J/A F/G	-	-	-	E/L/J/A F/G/S	L/J/A F/G
--	Sea Cucumbers	J/A F G S	J/A F G S	J/A F G S	J/A F G S	J/A F G S	-	J/A F G S	E/L F/G	-
--	Sea Urchins	J/A F/G/S	J/A F/G/S	J/A F/G/S	J/A F/G/S	J/A F/G/S	J/A F/G	J/A F/G/S	E/L F/G	-
--	Corals	-	-	J/A F/G/S	J/A F/G/S	-	-	-	E/L F/G	-

Under **Preferred Alternative 2**, based on the functional relationships between life history stages of the species new to management and St. Thomas/St. John marine and estuarine habitats (see Appendix I), EFH would be identified as follows (See Tables 2.6.1. and 2.6.2):

EFH for yellowmouth grouper (*Mycteroperca interstitialis*) (Grouper 5 stock complex) in the St. Thomas/St. John FMP consists of all waters from mean high water to the outer boundary of the U.S. Caribbean EEZ (habitats used by eggs and larvae) and mangroves, coral reefs, and rocky hard bottom substrates from mean high water to 100 fathoms (habitats used by juveniles [all] and adults [coral reefs and rocky hardbottom]).

EFH for dolphin (*Coryphaena hippurus*) in the St. Thomas/St. John FMP consists of all waters from mean high water to the outer boundary of the U.S. Caribbean EEZ (habitats used by eggs, larvae, juveniles, and adults) and coral reefs, hard bottom, and sargassum substrates from mean high water to the outer boundary of the U.S. Caribbean EEZ (habitats used by juveniles, adults, and larvae [for larvae, sargassum substrates only]).

EFH for wahoo (*Acanthocybium solandri*) in the St. Thomas/St. John FMP consists of all waters from mean high water to the outer boundary of the U.S. Caribbean EEZ (habitats used by eggs, larvae, juveniles, and adults) and sargassum, coral reef, and hard bottom substrates from mean high water to the outer boundary of the U.S. Caribbean EEZ (habitats used by juveniles, adults, and larvae [for larvae, sargassum substrates only]).

EFH for sea urchins (Sea urchins stock complex) in the St. Thomas/St. John consists of all waters from mean low water to the outer boundary of the U.S. Caribbean EEZ (habitats used by eggs and larvae) and mangrove, seagrass, coral reef, hard bottom, sand, mud, and algal plain substrates from mean low water to the outer boundary of the U.S. Caribbean EEZ (habitats used by juveniles and adults).

EFH for sea cucumbers (Sea cucumbers stock complex) in the St. Thomas/St. John FMP consists of all waters from mean low water to the outer boundary of the U.S. Caribbean EEZ (habitats used by eggs and larvae) and mangrove, seagrass, coral reef, hard bottom, sand, and algal plain substrates from mean low water to the outer boundary of the U.S. Caribbean EEZ (habitats used by juveniles and adults).

EFH for corals (Corals stock complex) in the St. Thomas/St. John FMP consists of all waters from mean low water to the outer boundary of the U.S. Caribbean EEZ (habitats used by eggs and larvae) and coral reef and hard bottom substrates from mean low water to the outer boundary of the U.S. Caribbean EEZ (habitats used by juveniles and adults).

NMFS EFH guidelines require maps depicting the geographic location or extent of habitats described as EFH. Maps for those EFH were included in the Final Environmental Impact Statement (FEIS) for the Generic EFH Amendment (Figures 2.38 – 2.42 in CFMC 2004). Since limited habitat distribution information beyond 82 ft (25 m) depth existed then, the potential habitat occurrence was considered to extend from the shallowest depth to the maximum depth on the shelf that a habitat could occur, which was determined to be 100 fathoms depth. Mapping out to that depth limit was considered likely to include the habitats used by federally managed species, and thus was a proxy for the fishable habitat where a species could be found. Information on where the species could be found was then used to determine whether those areas are qualified as essential fish habitat.

This estimate of fishable habitat, and the presumed maximum depth habitat could occur, is being re-evaluated as the fisheries have been expanding into deeper waters and as research and exploration continue in the deep-waters around the USVI and Puerto Rico. However, the majority of the exploration being conducted in the U.S. Caribbean is well beyond the 100-fathom depth, leaving an information gap between the 100-fathom limit and those deeper waters. Species and habitat information from within that depth gap would be needed to re-evaluate the definition of fishable habitat from the 100-fathom depth. Although data are not available to re-define fishable habitat at this time, research into deeper-waters could help identify the maximum depth where the species occurs that could be used to inform inferences about their habitat usage. For example, recent exploration of the deep-sea around the USVI and Puerto Rico have shown presence of sea cucumbers, sea urchins and corals to depths of over 9,843 ft (3,000 m) in areas not currently fished. This information was considered and used to identify EFH for those invertebrate under **Preferred Alternative 2**. However, because neither habitat- nor species-specific spatial distributions were updated during those explorations, the full extent of the species' habitat in waters deeper than 100 fathoms is not fully known. Using the precautionary approach, and identifying as EFH all waters and substrates in which the species has been found, **Preferred Alternative 2** identified substrates in deeper waters as EFH for sea cucumbers, sea urchins, and corals. Under **Preferred Alternative 2**, substrates from mean low water to the outer boundary of the EEZ, not just substrates from mean low water to 100 fathoms depth (the EFH for the previously managed species of sea cucumbers, sea urchins, and corals under the Coral FMP), was identified as EFH. Likewise, for dolphin and wahoo, two wide-ranging pelagic species, EFH identified under **Preferred Alternative 2** would include substrates from mean high water to the outer boundary of the U.S. Caribbean EEZ. The EFH maps included in the FEIS for the Generic EFH Amendment (Figures 2.38 – 2.42 in CFMC 2004) show the geographic boundaries of the EFH. For example, previously identified EFH for reef fish species (eggs and larvae) included all waters from mean high water to the outer boundary of the U.S. Caribbean EEZ, thus the maps showed the mean high water line and the outer boundary of the U.S. Caribbean EEZ. Previously identified EFH for the coral, sea urchin, and sea cucumbers (eggs and larvae) included all waters from mean low water to the outer boundary of the U.S. Caribbean

EEZ, and thus the maps additionally showed the mean low water line. Substrates were identified as EFH from mean high water to 100 fathoms (reef fish, other life stages) and from mean low water to 100 fathoms (corals, sea urchins, and sea cucumbers, other life stages), and thus the maps also showed the 100 fathom line. The mean high water line and the outer boundary of the U.S. Caribbean EEZ define the boundaries of EFH identified for dolphin, wahoo, and the mean low water line and the outer boundary of the U.S. Caribbean EEZ define the boundaries of EFH identified for sea urchins, sea cucumbers, and corals. Thus, the maps included in the FEIS for the Generic EFH Amendment still encompass and depict the geographic boundaries where EFH would be identified for species new to management under **Preferred Alternative 2**.

Alternative 3 would allow the Council to choose between approaches to describe EFH (see Section 2.6.1). These approaches, and how the sources of information within each, would be used to describe and identify EFH were discussed in the FEIS for the Generic EFH Amendment (CFMC 2004), and that discussion is incorporated here by reference. Under **Alternative 3** the Council would determine which approach uses the most complete information available that could be used to determine EFH for each species and life stage. However, at this time, the Council lacks the information to describe and identify EFH using any of the approaches described in **Alternative 3,** thus this alternative would not result in EFH for the species new to management.

The Council is engaged in endorsing projects to further data collection and analysis that could be used in one of the approaches under **Alternative 3**, which would result in more-refined EFH designations. The Council has received NOAA Coral Reef Conservation Program grants that have resulted in the baseline characterizations of mesophotic reefs (98-164 ft [30-50 m]) and the extended description of habitat with depth for species within the fish communities at these depths. The ongoing Five-Year EFH Review (currently under development) would include an evaluation of the data available to determine the potential to refine designations for species proposed and currently under management. The Council has also been engaged in the development of a geographic information system database of the reported commercial landings to determine the feasibility to use spatial data in the description and identification of EFH. All these efforts could provide the information required under one or more of the approaches under **Alternative 3** that would result in changes to EFH designations for species managed under the St. Thomas/St. John FMP.

<u>Comparison of Action 6 Alternatives</u>

Describing and identifying EFH would not have direct effects to the physical, biological/ecological, economic, or social environments. Indirect effects to those environments could occur if the EFH designation leads to future regulatory actions or future EFH consultations. The extent of these effects depends on whether the EFH identified for the species new to management was the same as, or different from, the previously identified EFH. Minor direct effects to the administrative environment would result from identifying EFH for the species newly added to management. In addition, indirect effects to the administrative environment could occur due to consultation requirements, again to the extent that new EFH areas are designated. Indirect effects on the social environment could result if there are differences in desired methodologies for designating EFH.

Alternative 1 is less beneficial when compared to **Preferred Alternative 2** and **Alternative 3** in that it would not address the legal mandate to describe and identify EFH for the species new to management. **Preferred Alternative 2** incorporates available information (i.e., functional life history and habitat relationships) to identify EFH for all species new to management. The EFH identified for species new to management under **Preferred Alternative 2** includes the EFH described under the U.S. Caribbean-wide FMPs, plus additional substrate areas, namely substrates found at depths greater than 100 fathoms. Newly identified EFH includes substrates from mean high water (dolphin, wahoo [juvenile and adult life stages]) or mean low water (corals, sea urchins, sea cucumbers [juvenile and adult life stages]) to the outer boundary of the U.S. Caribbean EEZ. Although **Alternative 3** includes approaches that would provide the most refined description of EFH for all species under management, these data are not currently available, thus **Alternative 3** would not result in EFH identified for the species new to management. In the future, the approaches under **Alternative 3** would likely have positive benefits as a more refined description of EFH could allow the Council to take more protective actions or could allow for more robust EFH consultations and potentially more tailored mitigation.

2.7 Action 7: Establish Framework Procedures for the St. Thomas/St. John FMP

Through Action 7, the Council would determine the framework procedure to be included under the new St. Thomas/St. John FMP. This action follows from selecting Alternative 2 in Action 1 and proceeding with establishing a St. Thomas/St. John FMP comprised of measures pertinent to St. Thomas/St. John. The purpose of the framework is to allow the Council to more expeditiously adjust reference points and management measures in response to changing fishery conditions. Amendments done through frameworks (Framework Amendments) typically take less time to develop than a traditional plan amendment, while continuing to ensure a thorough evaluation of the effects of alternative approaches to achieving management goals.

Alternative 1 (No Action) would result in retaining, in the St. Thomas/St. John FMP, the framework procedures included in the Reef Fish FMP, Spiny Lobster FMP, Queen Conch FMP, and Coral FMP. **Preferred Alternative 2** proposes a framework procedure that includes both closed and open framework procedures and, within the open framework, the additional option of using an abbreviated framework. **Alternative 3** and **Alternative 4** both include open and closed framework procedures.

2.7.1 Proposed Alternatives for Action 7

Alternative 1. No Action. In the St. Thomas/St. John FMP, retain the framework procedures presently included under the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs (Table 2.7.1).

Preferred Alternative 2. Adopt the Framework Procedure listed in Table 2.7.2.

Alternative 3. Adopt the broader Framework Procedure listed in Table 2.7.3.

Alternative 4. Adopt the narrower Framework Procedure listed in Table 2.7.4.

Table 2.7.1. Framework procedures included under Action 7, Alternative 1.

Framework Procedures Available Under Alternative 1
Framework Measures in the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs: a. Quota Requirements b. Seasonal Closures c. Area Closures d. Fishing Year e. Trip/Bag Limit f. Size Limits g. Gear Restrictions or Prohibitions h. Fishery Management Unit (FMU) i. Total Allowable Catch (TAC) j. Annual Catch Limits (ACL) k. Accountability Measures (AM) l. Annual Catch Targets (ACT) m. Maximum Sustainable Yield (MSY) n. Optimum Yield (OY) o. Minimum Stock Size Threshold (MSST) p. Maximum Fishing Mortality Threshold (MFMT) q. Overfishing Limit (OFL) r. Acceptable Biological Catch (ABC) control rules s. Actions to Minimize the Interaction of Fishing Gear with Endangered Species or Marine Mammals
Establish an assessment group and adjustments: The following discussion outlines the procedure by which the Council may make management changes through regulatory amendment. As previously discussed, the purpose of frameworks and regulatory amendments is to provide the most responsive and efficient modifications to management measures. If an additional review process was included, there could be substantial delays, thus resulting in a longer lag time between identification of a problem and implementation of a response.

Framework Procedures Available Under Alternative 1
1. When the Council determines that management measures require modification, the Council will appoint an advisory panel (Group) that will assess the condition of species in the management units (including periodic economic and sociological assessments as needed). The Group will present a report of its recommendations to the Council. 2. The Council will consider the report and recommendations of the Group and may hold public hearings at a time and place of the Council's choosing to discuss the Group's report. The Council may convene its Scientific and Statistical Committee to provide advice prior to taking final action. After receiving public input, the Council will make decisions on the need for change. 3. If changes to management regulations are needed, the Council will advise the Regional Administrator (RA) in writing of its recommendations accompanied by the Group's report (where appropriate), relevant background material, draft regulations, Regulatory Impact Review, and public comments. 4. The RA will review the Council's recommendations, supporting rationale, public comments, and other relevant information. If the RA concurs that the Council's recommendations are consistent with the goals and objectives of the fishery management plan, the national standards, and other applicable laws, the RA will recommend that the Secretary take appropriate regulatory action for the fisheries on such date as may be agreed upon with the Council. 5. Should the RA reject the recommendations, the RA will provide written reasons to the Council for the rejection, and existing measures will remain in effect until the issue is resolved. 6. Appropriate adjustments that may be implemented by the Secretary include: a. Specification of MSY or MSY proxy and subsequent adjustment where this information is available; b. Specification of an ABC control rule and subsequent adjustment where this information is available; c. Specification of TAC and subsequent adjustment where this information is available; d. Specification of ACLs and Annual Catch Targets (ACTs), and subsequent adjustment; e. Specification of AMs and subsequent adjustment; f. Specification of OY and subsequent adjustment where this information is available; g. Specification of Minimum Stock Size Threshold (MSST) and subsequent adjustment; h. Specification of Maximum Fishing Mortality Threshold (MFMT) or OFL and subsequent adjustment; i. Specification (or modification) of quotas (including zero quotas), trip limits, bag limits (including zero bag limits), size limits, gear restrictions (ranging from modifying current regulations to a complete prohibition, including to respond to interactions with listed species), season/area closures (including spawning closures), and fishing year; j. Initial specification and subsequent adjustment of biomass levels and age structured analyses; k. Adjustments to the composition of Fishery Management Units (FMUs). Authority is granted to the RA to close any fishery (i.e. revert any bag limit to zero and close any commercial fishery), once a quota has been established through the procedure described above, and such quota has been filled. If NMFS decides not to publish the proposed rule of the recommended management measures, or to otherwise hold the measures in abeyance, then the RA must notify the Council of its intended action and the reasons for NMFS' concern, along with suggested changes to the proposed management measures that would alleviate the concerns. Such notice shall specify: 1) The applicable law with which the amendment is inconsistent; 2) the

Framework Procedures Available Under Alternative 1
nature of such inconsistencies; and 3) recommendations concerning the action that could be taken by the Council to conform the amendment to the requirements of applicable law.

Table 2.7.2. Base framework procedures included under Action 7, Preferred Alternative 2.

Framework Procedures Available Under Preferred Alternative 2

OPEN FRAMEWORK

1. Situations under which this open framework procedure can be used:

A. A new stock assessment or other information indicates changes should be made to: MSY, OFL, ABC, or other related management reference points and status determination criteria (SDC).

B. New information or circumstances indicates management measures should be changed.
- The Council will, as part of a proposed framework action, identify the new information and provide rationale as to why this new information indicates that management measures should be changed.

C. Changes are required to comply with applicable laws such as MSA, ESA, MMPA, or are required as a result of a court order.
- In such instances, the RA will notify the Council in writing of the issue and the action that is required. If there is a legal deadline for taking action, the deadline will be included in the notification.

2. Types of open frameworks:

A. Standard Framework
- Changes that do not qualify as routine or insignificant.
- Requires a completed framework document with supporting analyses.

B. Abbreviated Framework
- Can be used for routine or insignificant changes
- Request is made with letter or memo from the Council to the RA with supporting analyses (biological, social, economic).
- If RA concurs and approves action, it will be implemented through publication of FR Notice.

3. Actions available under the different open frameworks:

A. Abbreviated Framework

i. Gear marking requirements
ii. Vessel marking requirements
iii. Restrictions related to maintaining fish in a specific condition (whole condition, filleting, use as bait, etc.)
iv. Recreational bag and possession limit changes of not more than 1 fish per boat
v. Size limit changes of not more than 1-inch of the prior size limit for reef fish.
vi. Commercial vessel trip limit changes of not more than 10% of the prior trip limit
vii. Changes to the length of an established closed season by no more than 1 day of the existing season.
viii. Minor changes to gear modifications to address conservation issues including to respond to interactions with listed species.

B. Standard Framework

In addition to making changes specified under Abbreviated Framework (above) that exceed the established thresholds, the following actions can be completed via a standard framework:

i. Re-specify ABC

Framework Procedures Available Under Preferred Alternative 2
ii. Re-specify MSY and OY, and SDC iii. Re-specify SYL iv. Re-specify ACLs v. Re-specify ACTs vi. Rebuilding plans and revisions to approved rebuilding plans vii. Revise accountability measures (e.g., change AM triggers and AM timing) viii. Modify reporting and monitoring requirements ix. Modify seasonal or year-round closures and closure procedures x. Modify area closures and closure procedures
4. Open Framework Steps: • The Council will initiate the open framework process to inform the public of the issues and develop potential alternatives to address the issues. The framework process will include the development of documentation and public discussion during at least one council meeting. • Prior to taking final action on the proposed framework action, the Council may convene its Scientific and Statistical Committee (SSC) or applicable Advisory Panel (AP), as appropriate, to provide recommendations on the proposed actions. • For all framework actions, the Council will provide the letter, memo, or the completed framework document along with proposed regulations to the Regional Administrator in a timely manner following final action by the Council. • For all framework action requests, the Regional Administrator will review the Council's recommendations and supporting information and notify the Council of the determinations, in accordance with the MSA and other applicable law.
CLOSED FRAMEWORK
Consistent with existing requirements in the FMP and implementing regulations, the RA is authorized to conduct the following closed framework actions through appropriate notification in the Federal Register: • Reopen any sector of the fishery that had been prematurely closed. • Implement AMs, either in-season or post-season. Implement an in-season AM for a sector that has reached or is projected to reach, or is approaching or is projected to approach its ACL according to the process established in the FMP, or implement a post-season AM for a sector that exceeded its ACL according to the process established in the FMP, or any other established AM.

Table 2.7.3. Broad framework procedures included under Action 7, Alternative 3.

Framework Procedures Available Under Alternative 3
OPEN FRAMEWORK
1. Situations Under Which This Open Framework Procedure Can Be Used A. The Council may utilize open framework procedures to implement management changes in response to any additional information or changed circumstances. **a.** The Council will, as part of a proposed open framework action, identify any new information and provide rationale as to why this new information requires that management measures be adjusted. B. Open framework actions may be implemented at any time based on information supporting the need for adjustment of management measures or management parameters.
2. Actions Available Under the Open Framework: i. Re-specify ABC ii. Re-specify MSY and OY, and SDC

Framework Procedures Available Under Alternative 3
iii. Re-specify SYL iv. Re-specify ACLs v. Re-specify ACTs vi. Rebuilding plans and revisions to approved rebuilding plans vii. Revise accountability measures (e.g., change AM triggers and AM timing) viii. Modify reporting and monitoring requirements ix. Modify seasonal or year-round closures and closure procedures x. Modify area closures and closure procedures xi. Modify recreational bag and possession limits xii. Modify commercial trip limits xiii. Modify size limits xiv. Modify gear restrictions and marking requirements (ranging from altering current regulations to a complete prohibition, including to respond to interactions with listed species) xv. Other adjustment to management measures within the scope and criteria established by the FMP and implementing regulations deemed appropriate by the Council **3. Open Framework Steps:** • The Council will initiate the open framework process to inform the public of the issues and develop potential alternatives to address the issue. The framework process will include the development of documentation and public discussion during one council meeting. • For all framework actions, the Council will provide the letter, memo, or the completed framework document along with proposed regulations to the Regional Administrator in a timely manner following final action by the Council. • For all framework action requests, the Regional Administrator will review the Council's recommendations and supporting information and notify the Council of the determinations, in accordance with the Magnuson-Stevens Act and other applicable law.
CLOSED FRAMEWORK
Consistent with existing requirements in the FMP and implementing regulations, the RA is authorized to conduct the following closed framework actions through appropriate notification in the Federal Register: • Reopen any sector of the fishery that had been prematurely closed. • Implement AMs, either in-season or post-season. Implement an in-season AM for a sector that has reached or is projected to reach, or is approaching or is projected to approach its ACL, according to the process established in the FMP, or implement a post-season AM for a sector that exceeded its ACL according to the process established in the FMP, or any other established AM. • Take any other immediate action specified in the FMP and implementing regulations.

Table 2.7.4. Narrow framework procedures included under Action 7, Alternative 4.

Framework Procedures Available Under Alternative 4
OPEN FRAMEWORK
1. Situations Under Which This Open Framework Procedure Can Be Used A. A new stock assessment or other information indicates changes should be made to: MSY, OFL, ABC, or other related management reference points and status determination criteria (SDC). B. New information or circumstances indicates management measures below should be changed. **2. Actions Available Under the Open Framework:** i. Re-specify ABC ii. Re-specify MSY and OY, and SDC

Framework Procedures Available Under Alternative 4
iii. Re-specify SYL iv. Re-specify ACLs v. Re-specify ACTs vi. Modify recreational bag and possession limits vii. Modify size limits viii. Modify seasonal or year-round closures and closure procedures ix. Modify reporting and monitoring requirements x. Modify reporting and monitoring requirements **3. Open Framework Steps:** • The Council will initiate the open framework process to inform the public of the issues and develop potential alternatives to address the issue. The framework process will include the development of documentation and public discussion during at least three council meetings, and shall be discussed at separate public hearings within the areas most affected by the proposed measures. • Prior to taking final action on the proposed framework action, the Council shall convene its SSC and AP to provide recommendations on the proposed actions. • For all framework actions, the Council will provide the letter, memo, or the completed framework document and all supporting analyses, along with proposed regulations to the Regional Administrator in a timely manner following final action by the Council. • For all framework action requests, the Regional Administrator will review the Council's recommendations and supporting information and notify the Council of the determinations, in accordance with the MSA and other applicable law. The RA will provide the Council weekly updates on the status of the proposed measures.
CLOSED FRAMEWORK
Consistent with existing requirements in the FMP and implementing regulations, the RA is authorized to conduct the following closed framework actions through appropriate notification in the Federal Register: • Reopen any sector of the fishery that had been prematurely closed. • Implement AMs, either in-season or post-season. Implement an in-season AM for a sector that has reached or is projected to reach, or is approaching or is projected to approach its ACL according to the process established in the FMP, or implement a post-season AM for a sector that exceeded its ACL according to the process established in the FMP, or any other established AM.

2.7.2 Discussion of Action 7 Alternatives

A framework procedure is a mechanism that can be included in an FMP to allow the Council to address recurrent, routine, or foreseeable actions in an expedited manner. Under the framework procedures, certain management actions can be adjusted via an expedited process. This differs from revising the management program via an FMP amendment, which contains additional procedural steps. The alternatives in Action 7 describe the management measures that would be appropriate to revise via the framework procedures. If the action cannot be completed via framework, then the FMP must be amended. The purpose of establishing framework procedures is to make it possible to manage fisheries more responsively under conditions requiring "real time" management (EPA 2005).

The use of framework procedures is not intended to circumvent standard FMP amendment and rulemaking procedures under the Magnuson-Stevens Act, and must be done in a manner that is consistent with requirements of the Magnuson-Stevens Act, as well as other applicable law such as the Administrative Procedure Act, the Endangered Species Act, the National Environmental Policy Act, among others. To the extent that statutory requirements can be addressed up front when establishing the framework mechanism, this may result in less analysis and process being needed when individual actions are executed under that mechanism. The analyses and processes required for each individual action will depend on the specific facts and circumstances of that action. Every measure adjusted via framework must be analyzed under applicable law and be available to the public for comment at some time prior to implementation, either when the measure to be adjusted via framework was established or when the adjustment occurs, or both. The analysis may be provided at the same time the measure is added to the FMP, or it may be provided subsequently when the action is taken under the framework procedures in the FMP and/or its implementing regulations. The timing and extent of analysis and notification and comment required will depend on the specificity and analysis when the framework was established.

Types of Framework Procedures

Open framework procedures allow the Council to apply discretion to adjust certain management measures. Under an open framework procedure, the Council can select among various management options to address an identified management issue, such as changing a size limit to reduce discards. An example of a past Caribbean action done through an open framework procedure was Regulatory Amendment 4 to the Reef Fish FMP, completed in 2013, which established commercial and recreational minimum size limits for parrotfish harvest in the U.S. Caribbean EEZ (CFMC 2013c).

An open framework may be used to clarify Council intent or to interpret broad terms contained in approved FMPs; it also may be used to implement a portion of an approved FMP or FMP amendment that was reserved and the Council now desires NMFS to implement. Open frameworks can be used when a Council believes a specific problem may occur in the fishery that would require addition to or amendment of the original management measures, but the exact nature of the event or the remedial action cannot be foreseen at the time the FMP is being prepared. There are different types of open frameworks, namely abbreviated and standard frameworks. **Preferred Alternative 2** proposes the use of both types of open frameworks, while **Alternatives 1**, **3**, and **4** would only allow the use of the standard open framework. The two types of open frameworks are discussed below when discussing **Preferred Alternative 2**.

Closed framework procedures allow for adjustment of management measures in specific factual circumstances. In this case, the FMP and implementing regulations identify a specific action to be taken in the event of specific facts occurring, such as closing a sector of a fishery after their ACL has been harvested. Closed frameworks are appropriate when the action occurs without application of discretion. The action's ecological, economic, and social impacts have already been described in the analyses prepared when the framework measure was adopted. Examples of actions that can be taken through closed frameworks are in-season adjustments such as the closure of a fishery based on a projection of attainment of an ACL, adjustment of trip limits or hours of fishing, based on actual effort, or adjustment of ACLs, based on computational errors or late reporting.

All alternatives in Action 7 propose a framework procedure that includes both open and closed frameworks. However, the actions that can be taken under each of the open and closed frameworks vary among the alternatives. These are listed for **Alternatives 1**, **2 (Preferred)**, **3**, and **4** in Tables 2.7.1, 2.7.2, 2.7.3, and 2.7.4, respectively.

Alternative 1 (No Action) would retain without modification the existing framework procedures for implementing management measures in the St. Thomas/St. John FMP, as established in Action 1 of this document. The existing framework measures were those included in the Council's Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs. These framework procedures were developed in the Caribbean SFA Amendment (CFMC 2005) for stocks in the Reef Fish, Queen Conch, and Coral FMPs and further modified in the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b). Framework measures for the Spiny Lobster FMP were established in the 2011 Caribbean ACL Amendment. Table 2.7.1 lists the framework measures under these FMPs. **Alternative 1** would not allow for the inclusion of new and more specific framework measures that could be taken in a relatively shorter time, such as those that can be taken through an abbreviated framework proposed in **Preferred Alternative 2**. In **Alternative 1**, some of the framework measures listed need to be updated to comport with how management is being structured under the St. Thomas/St. John FMP.

Preferred Alternative 2 proposes a framework procedure that includes open and closed frameworks. Under **Preferred Alternative 2**, instances under which the open framework procedure may be used to implement management changes include: (A.) A new stock assessment or other information indicates changes should be made to the MSY, OFL, ABC, or other related management reference points and status determination criteria (SDC); (B.) New information or circumstances exist. In that instance, the Council will, as part of a proposed framework action, identify the new information and provide rationale as to why this new information indicates that management measures should be changed; (C.) Changes are required to comply with applicable laws such as the Magnuson-Stevens Act, ESA, Marine Mammal Protection Act (MMPA), or are required as a result of a court order. In such instances, the Regional Administrator (RA) will notify the Council in writing of the issue and that action is required. If there is a legal deadline for taking action, the deadline will be included in the notification.

In contrast to **Alternatives 1**, **3**, and **4**, actions under an open framework in **Preferred Alternative 2** can be implemented either by an abbreviated framework or by a standard framework. An abbreviated open framework can be used for routine or for insignificant changes. An abbreviated framework combines the attributes of closed frameworks (prior notice of the action, short timetable, and additional analysis likely unnecessary) and those of open frameworks (flexibility and Council input), allowing the action to be implemented quicker than a regular FMP amendment or than under a standard open framework. Examples of the type of actions that are routine or that constitute insignificant changes under **Preferred Alternative 2** are listed in Table 2.7.2, and include recreational bag and possession limit changes of no more than one fish per boat and size limit changes of no more than an inch, among others. In an abbreviated framework, a request is made with letter or memo from the Council to the RA containing the proposed action with supporting analyses (biological, social, economic). If multiple actions are proposed, a finding that the actions are also routine or insignificant must also be included. If the RA concurs and approves action, the action will be implemented through publication of notice in the Federal Register.

Changes that do not qualify as routine or insignificant would be addressed under a standard open framework. The process for standard open frameworks is similar to that described for **Alternative 1** above. A standard open framework under **Preferred Alternative 2** requires a completed framework document with supporting analyses. Actions that can be taken through a standard open framework are listed in Table 2.7.2, and include, among others, making changes specified under the abbreviated framework that exceed the established thresholds; re-specification of ABC and ABC control rule (CR); re-specification of MSY and OY, and SDC; re-specification of SYL. **Preferred Alternative 2** requires opportunity for public comment in at least one Council meeting, and specifies that the Council may convene the SSC or an AP as appropriate, which is similar to **Alternative 1,** although only for convening the SSC because the appointment of an AP is a requirement under **Alternative 1**.

The actions that can be taken through a closed framework under **Preferred Alternative 2** include: reopening any sector of the fishery that had been prematurely closed and implementing accountability measures, either in-season or post-season (implement an in-season AM for a sector that has reached or is projected to reach, or is approaching or is projected to approach its ACL according to the procedures established in the FMP, or implement a post-season AM for a sector that exceeded its ACL according to the procedures established in the FMP, or any other established AM).

Alternative 3 also proposes a framework procedure that includes the option for using open or closed frameworks. **Alternative 3** proposes a procedure that is broader than those included in **Alternatives 1**, **2 (Preferred)**, and **4**. Under **Alternative 3**, the Council may utilize this framework procedure to implement management changes in response to any additional information or changed circumstances. Under **Alternative 3**, the Council will, as part of a proposed framework action, identify any new information and provide rationale as to why this new information requires that management measures be adjusted. Open framework actions may be implemented at any time based on information supporting the need for adjustment of management measures or management parameters.

Actions that can be taken under a standard open framework in **Alternative 3** are similar to those proposed in **Preferred Alternative 2**, with the difference that **Alternative 3** also allows to use the procedure for any other measures deemed appropriate by the Council. **Alternative 3** requires public discussion in one Council meeting and similar to **Alternative 2**, does not require convening the SSC or APs to prior to final action. **Alternative 2** expressly notes that the Council may convene its SSC (similar to **Alternative 1**) or APs prior to taking action, but **Alternative 3** is silent as to this point, however, the Council may always exercise its discretion to convene its auxiliary bodies before taking action. Both alternatives differ from **Alternative 1** as **Alternative 1** requires convening an AP.

Actions that can be taken through a closed framework under **Alternative 3** are similar to those proposed under **Preferred Alternative 2** with the difference that **Alternative 3** also allows the Council to take any other immediate action specified in the regulations and **Preferred Alternative 2** does not provide for that. Although the procedure under **Alternative 1** is not explicitly identified as a "closed framework", actions related to the closure of a fishery (i.e. revert any bag limit to zero and close any commercial fishery) once an established quota has been met are comparable to those in both **Alternative 2** (**Preferred**) and **3**, however **Alternative 1** does not allow any other changes through the "closed" process.

Alternative 4 also proposes a framework procedure that includes open and closed frameworks, but, when compared to **Alternatives 1**, **2 (Preferred)**, and **3**, would not allow as many management measures to be implemented through a framework procedure (Table 2.7.4). An open standard framework in **Alternative 4** can be used when a new stock assessment or other information indicates changes should be made to the MSY, OFL, ABC, or other related management reference points or when new information or circumstances indicates management measures listed in Table 2.7.4 should be changed. The narrow list of measures that can be adjusted with limited conditions for use makes **Alternative 4** less efficient than the other alternatives proposed as it will not allow for a rapid adjustment of additional management measures that otherwise could be streamlined through the framework procedure.

Different than **Alternatives 1**, **2 (Preferred)**, and **3**, **Alternative 4** requires public discussion in at least three Council meetings and discussion at separate public hearings. Also, the Council shall convene its SSC and/or APs to provide recommendations on the proposed actions. These requirements may make the framework process for some actions longer than they could be under **Alternatives 1**, **2 (Preferred),** and **3**.

Actions that can be taken through a closed framework in **Alternative 4** are similar to those proposed in **Alternatives 2 (Preferred)** and at least one action in **Alternative 4** is comparable to the "closed" framework action in **Alternative 1,** but differs from **Alternative 3** in that **Alternative 3** also allows the Council to take any other immediate action specified in the FMP and implementing regulations. **Alternative 4** also does not allow management measures to be adjusted via an abbreviated standard framework, as under **Preferred Alternative 2**.

Table 2.7.5 highlights the major differences among the action alternatives proposed (**Alternatives 2-4**).

Table 2.7.5. Differences among the action alternatives in Action 7.

Description	Preferred Alternative 2 (base)	Alternative 3 (broad)	Alternative 4 (narrow)
When Open Framework Can Be Used	• New stock assessment or other information indicates changes should be made to MSY, OFL, ABC or other related management reference points and SDC • New information or circumstances • When changes are required to comply with applicable law or court order. * Abbreviated Open Framework can be used for minor or insignificant changes and Standard Open Framework for all other allowed changes.	• In response to any additional information or changed circumstances.	• New stock assessment or other information indicates changes should be made to MSY, OFL, ABC or other related management reference points and SDC. • New information or circumstances indicates management measures listed should be changed.
Actions That Can Be Taken	• Abbreviated Open Framework can be used for actions that are considered minor and insignificant • Standard Open Framework. List of actions that can be taken under Abbreviated and Standard Open Framework are given.	• Open Framework can be used for a representative list of actions, plus other measures deemed appropriate by the Council. • Closed Framework can be used for a specific list of actions, plus any	• Open Framework can only be used for specific listed actions. • Closed Framework can be used for a specific list of actions.

Description	Preferred Alternative 2 (base)	Alternative 3 (broad)	Alternative 4 (narrow)
	• Closed Framework can be used for a specific list of actions.	other immediate actions specified in the FMP and implementing regulations.	
Public Input	• Requires public discussion in at least one Council meeting.	• Requires public discussion at one Council meeting	• Requires public discussion during at least three Council meetings, and discussion at separate public hearings within the areas most affected by the proposed measures.
AP/SSC Participation	• The Council may convene its SSC or an AP(s), as appropriate	• Council may convene its SSC or an AP(s) at its discretion	• The Council shall convene its SSC and an AP(s).

Comparison of Action 7 Alternatives

A comparison of the alternatives can be found in the discussion above and is summarized as follows. Relative to **Alternative 1**, **Preferred Alternative 2** expands the range of management measures that can be implemented by the Council without going through a full plan amendment process. **Alternative 3** provides a broader suite of options that can be implemented under the framework procedure than either **Alternative 1** or **Preferred Alternative 2**. Lastly, **Alternative 4** provides a narrower set of options that can be implemented under framework than under **Alternative 1**, **Preferred Alternative 2** or **Alternative 3**.

Modifying the framework procedure in Action 7 is not expected to have direct effects on the physical or biological/ecological environments. However, if the level of fishing effort or the use of certain gears is affected by the management strategies modified by the framework, the physical environment could be affected by changing the interactions between gear types and the habitat. The biological/ecological environment could also be indirectly affected by those framework actions that modify fishing effort to protect the biological integrity of the managed resources and decrease the risk of overfishing those resources.

Positive indirect effects to the physical and biological/ecological environments would be expected from those framework measures that result in a faster protection of the habitat from gear/habitat interactions (physical effects) or a faster protection to the biology of the stocks (biological effects) than if the measure was changed through a regular FMP amendment. For example, these effects could be expected from the specification or modification of gear restrictions, including those that minimize the interaction of fishing gear with protected species such as listed habitat-forming corals (e.g., *Orbicella annularis*, *Orbicella franski*) found in **Alternatives 1**, **2 (Preferred)**, and **3**, with **Preferred Alternative 2** being the more beneficial for ESA-listed species than the other two alternatives because changes can be made faster through an abbreviated framework. Positive effects could also be expected from those actions that close/open areas to fishing, and regulate fishing effort (e.g., adjustment of trip limits, bag limits, size limits, ABCs, ACLs), among others, which are included in all alternatives proposed but with varied limitations.

The potential indirect physical and biological benefits from **Alternative 3** are expected to be slightly larger than those from **Alternatives 1**, **2 (Preferred)**, and **4**, given that **Alternative 3** allows for a broader spectrum of measures that can be rapidly implemented through framework. **Alternative 4** would be the least beneficial to the physical and biological/ecological environments because the range of actions that could be taken more expeditiously through framework is more limited than the other alternatives. Administratively, by allowing the use of both abbreviated and standard frameworks and the inclusion of a comprehensive list of actions, **Preferred Alternative 2** would provide the best balance between the actions allowed to be implemented under the framework and the procedure required to take these actions. Also when compared to **Alternatives 1**, **3**, and **4**, **Preferred Alternative 2** provides the opportunity for sufficient public review and involvement in the process, while still accommodating the ability for more streamlined implementation.

From an economic perspective, the alternatives listed in Action 7 represent administrative actions. Hence, none of the alternatives will have a direct economic impact on the economic environment. Framework procedures that reduce the amount of time needed to change a management measure, however, could provide benefits in the nature of stock/stock complex protection or rebuilding. In addition, regulations that may be forthcoming in response to a change in framework procedures could indirectly result in a change in the economic environment via a change in effort and/or fishing techniques. Given that **Alternative 3** provides a broader suite of options that can be implemented under the framework procedure than either **Alternative 1** or **Preferred Alternative 2**, indirect economic benefits from **Alternative 3** would be expected to exceed those of either **Alternative 1** or **Preferred Alternative 2**. Conversely, since **Alternative 4** provides a narrower set of options that can be implemented under framework than either **Preferred Alternative 2** or **Alternative 3**, economic benefits from **Alternative 4** are likely to be less than those from either **Preferred Alternative 2** or **Alternative 3**.

In terms of social effects, timing and public input become the parameters that are most constrained or alleviated by the various alternatives for a framework procedure. **Alternative 1** does not allow new framework procedures that may be tailored specifically to St. Thomas/St. John which may incur some indirect negative social effects. The framework procedure in **Preferred Alternative 2** provides the most flexibility (e.g., due to option of both abbreviated and standard frameworks) compared to **Alternatives**, **1**, **3**, and **4** and would likely have the most beneficial social effects. The proposed framework actions in **Alternative 3** are likely to have slightly fewer beneficial social effects as it does not require as much public input under certain procedures, whereas **Alternative 4** requires the most extensive input from the public, AP and SSC with three Council meetings which could extend the process unnecessarily when expedited action is needed.

Chapter 3. Affected Environment – Description of the St. Thomas/St. John Management Area

3.1 Introduction

Chapter 3 describes the environment and resources included within the St. Thomas/St. John fishery management plan (FMP). Additional information on the physical, biological/ecological, economic, social, and administrative environments of St. Thomas/St. John have been described in detail in the 2010 and 2011 Caribbean Annual Catch Limit (ACL) Amendments (CFMC 2011a, b), and in the environmental assessment (EA): Transitioning from a Species-based Management to an Island-based Management (NMFS 2014). Information from these documents is incorporated herein by reference and is summarized below along with information from additional sources. The documents can be found on the National Marine Fisheries Service (NMFS) Sustainable Fisheries, Caribbean Branch website. Information about the marine resources that span St. Thomas/St. John's territorial waters is also included, although the FMP only applies to the exclusive economic zone (EEZ) off St. Thomas/St. John.

The actions considered in this FMP and associated EA would affect the U.S. Caribbean exclusive economic zone (EEZ) off St. Thomas/St. John (Figure 3.2.1).

3.2 Physical/Habitat Environment

3.2.1 Geography and Geology

The U.S. Caribbean is located in the eastern portion of the Caribbean archipelago, about 1,100 miles (mi) (1,770 km) east-southeast of Miami, Florida (Olcott 1999). The region is composed of the Commonwealth of Puerto Rico in the Greater Antilles and the USVI in the Lesser Antilles island chains (Figure 3.2.1), both of which separate the Caribbean Sea from the western central Atlantic Ocean. The U.S. Caribbean EEZ covers an area of approximately 196,029 square kilometers (km^2) (75,687 square miles [mi^2]). St. Thomas/St. John EEZ waters are located 3 - 200 nautical miles (6 – 370 km) from the coast of the islands and cover approximately 2,856 km^2 (1,103 mi^2).

The USVI are part of the Virgin Islands chain, which lies in the northeastern Caribbean about 80 km (50 miles) east of Puerto Rico's main island. The USVI consist of four major islands, including St. Thomas, St. John, St. Croix, and Water Island, and about 50 cays (DPNR 2005). Together, the USVI constitutes approximately 347 km^2 (134 mi^2) of land area (Catanzaro et al. 2002).

The islands of St. Thomas and St. John are bordered by the Atlantic Ocean to the north and the Caribbean Sea to the south. Their respective areas are approximately 32 mi^2 (83 km^2) and 20 mi^2 (52 km^2) (Catanzaro et al. 2002). The island of St. Thomas is bordered to the west by the Puerto Rico islands of Vieques and Culebra, and to the east by St. John, USVI. St. John is bordered to the east by the British Virgin Islands (BVI). The shelf shared by the islands of St. Thomas and St. John is about 8 mi (12.9 km) wide on the south and 20 mi (32.2 km) wide on the north (Goenaga and Boulon 1992) with an area of approximately 510 nm^2 (1751 km^2). Most of the shelf area is greater than 80 ft (24.4 m) deep (Kojis and Quinn 2011).

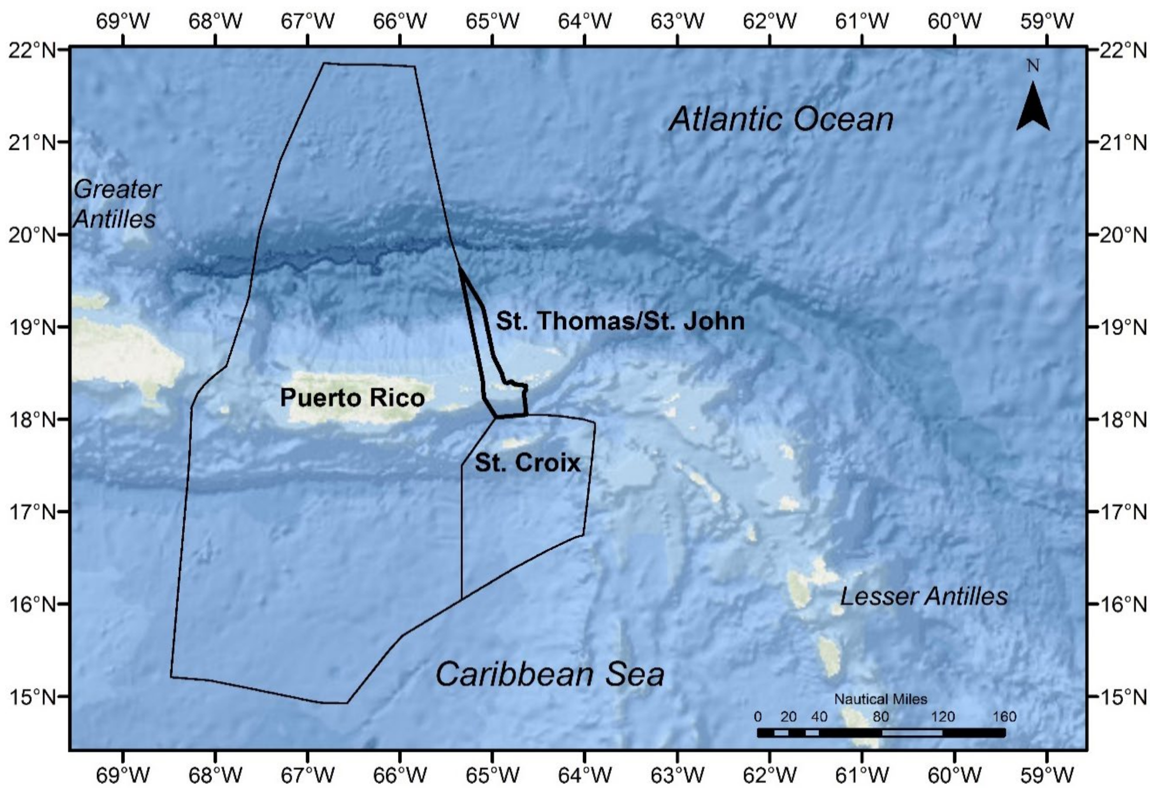

Figure 3.2.1. Boundaries of the U.S. Caribbean EEZ with St. Thomas/St. John EEZ outlined in bold.

Puerto Rico shares the same shelf platform as St. Thomas and St. John, and that shelf also extends east to include the British Virgin Islands. The St. Croix platform connects through a deep submerged mountain range (including Grappler Bank and Investigador, among other banks in the EEZ) to the southeast platform of Puerto Rico (Figure 3.2.2).

St. Thomas is known for having one long ridge of hills running east and west through the center of the island with smaller ridges branching off from the center. St. Thomas is thirteen miles long and four miles wide, encompassing a little over 31 square miles. The highest point is Crown

Mountain at 1,556 feet (474.3 m). St. Thomas has a natural harbor and many protected bays. There are relatively no flat areas on St. Thomas.

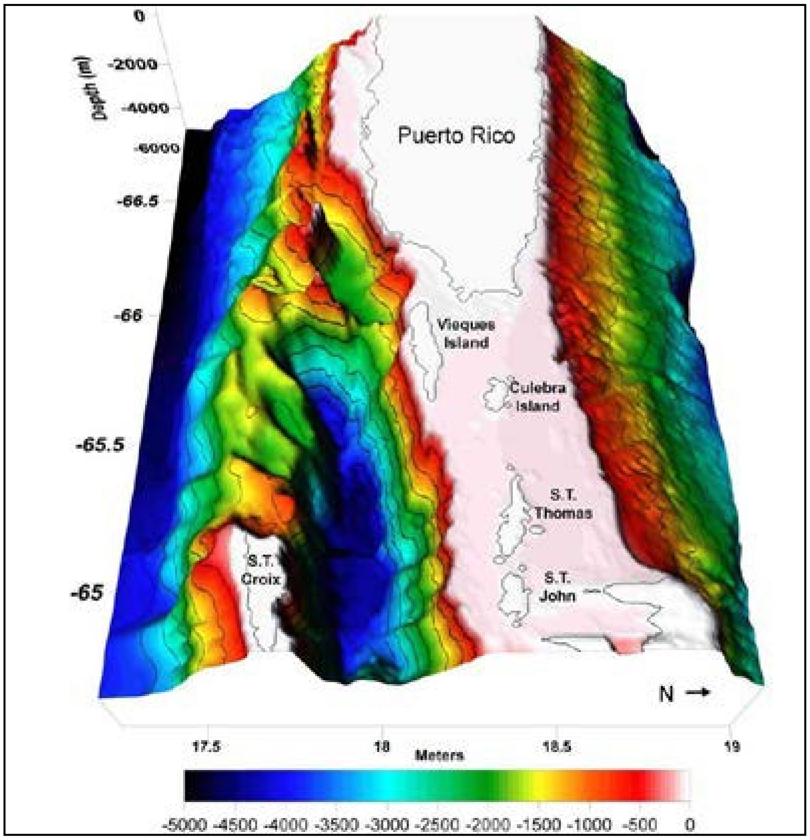

Figure 3.2.2. Shared platform between the east coast of Puerto Rico and St. Thomas/St. John. The deep trough between the Puerto Rico/St. Thomas/St. John platform and St. Croix is clearly seen in this graphic representation of depth. (Source: García-Sais et al. 2005).

3.2.2 Oceanography and Climatology

The North Equatorial Current is the predominant hydrological driving force in the Caribbean region. It flows from east to west along the northern boundary of the Caribbean plateau and splits at the Lesser Antilles. To the north, the current flows westward along the north coasts of the U.S. Caribbean islands, splitting north of the Mona Channel. The north branch flows north of Silver and Navidad Banks, past the Turks and Caicos, to form the Bahama Current. The south branch parallels the north coast of Hispaniola about 16 nm (30 km) offshore. To the south, the current enters the Caribbean Sea through the passages between the Lesser Antilles (Chakalall et al. 1998). The water then continues northwestward as the Caribbean Current, the main surface circulation in the Caribbean Sea.

The Caribbean Current flows about 62 mi (100 km) south of the U.S. Caribbean islands at an average speed of 0.5 to 1 knots (CFMC 2004). The current is characterized by large cyclonic and anticyclonic gyres. Its strength is influenced by changes in the position of the inter-tropical convergence zone (ITCZ). The zonal shift of the ITCZ is also responsible for the seasonal change in precipitation in the Caribbean. The dry season occurs when the ITCZ is near the equator, generally in the late winter to spring. The wet season occurs when the ITCZ is at its most northerly position in the Caribbean, generally in the late summer into late fall (CFMC 2011a and references therein).

Surface water salinity changes along with the seasonal change in precipitation and the position of the ITCZ. Discharge from the Amazon, Orinoco, and Magdalena rivers is the main contributor to buoyancy in the Caribbean Sea, increasing silica concentrations, decreasing salinity (Yoshioka et al. 1985) and increasing chlorophyll and pigments, as well as increasing the input of terrestrial materials (Kjerfve 1981). These parameters vary with changes in the outflow from these South American rivers, dependent on rainfall in the areas supplying water to these rivers and the ITCZ-driven currents transporting those discharges.

Sea surface temperature ranges from a minimum of 25 degrees Celsius (ºC) in February-March to a maximum of about 28.5ºC in August-September. Tidal regimes differ between the north and south coasts. The fluctuations range from a diurnal tide of about 3.9 in (10 cm) on the south coast to a semi-diurnal regime of between 24-39 in (60 to 100 cm) along the north coast, where waves are larger (CFMC 2004). But the astronomical tidal range is slight (8 to 12 in [20 to 30 cm]) (Kjerfve 1981).

Hurricane and storms can have a dramatic effect on the environment, especially in coastal habitats, causing a cascade of direct and indirect ecological responses[20]. These environmental effects can also affect the socio-economics of an area. More information about the impact of recent hurricanes to St. Thomas/St. John and its fisheries can be found in sections 2.5 and 3.12 of this document.

Detailed information about the oceanography and climate of the USVI and Puerto Rico can be found in CFMC (2011a) and is incorporated herein by reference. More information on the effects of climate change is included in the Cumulative Effects Analysis in Section 4.8 of this document.

[20] http://www.hurricanescience.org/society/impacts/environmentalimpacts/

3.2.3 Coastal and Marine Habitats

The fisheries of the U.S. Caribbean rely on healthy coastal and marine environments and habitats. While the islands of the U.S. Caribbean share physical and biological similarities, they exhibit unique differences. For instance, mangroves, seagrasses, coral reefs, and estuaries are found throughout the islands of the U.S. Caribbean. Yet, the distribution and magnitude of these environments vary, and those variations are reflected in the distribution and abundance of fish species that support the fisheries pursued on each island.

The fisheries of St. Thomas/St. John constitute an important part of the ecosystems in the U.S. Caribbean. NMFS defines ecosystem as a geographically specified system of organisms, involving complex connections between fishery resources, humans, their environments, and the processes that control their dynamics.

A description of the major habitat types in the U.S. Caribbean EEZ, along with information on their ecological functions and condition, can be obtained in Section 3.2 of the EFH-FEIS (CFMC 2004) and in Section 5.1.3 of the Caribbean Sustainable Fisheries Act (SFA) Amendment (CFMC 2005), which are incorporated herein by reference, and is summarized below. A description of the major habitat types of St. Thomas/St. John can be found in the USVI Marine Resources and Fisheries Strategic and Comprehensive Conservation Plan, prepared by the Department of Planning and Natural Resources (DPNR) of the USVI (DPNR 2005) and is incorporated herein by reference.

The coastal marine environments of the USVI and Puerto Rico are characterized by a wide variety of habitat types. Kendall et al. (2001) delineated 21 distinct benthic habitats types. The EFH-FEIS (CFMC 2004) summarized the percent distribution for all habitats in the U.S. Caribbean from the 5,494 km^2 (2,121 mi^2) of total bottom area mapped from aerial photographs. This total included both the USVI (485 km^2 [187 mi^2]) and Puerto Rico (5,009 km^2 [1,934 mi^2]), and covered from the shore line to about 20 m (66 ft) depth.

In the USVI, 24 km^2 (9 mi^2) of unconsolidated sediment, 161 km^2 (62 mi^2) of submerged aquatic vegetation, 2 km^2 (0.8 mi^2) of mangroves, and 300 km^2 (116 mi^2) of coral reef and hard bottom were mapped over an area of 485 km^2 (187 mi^2)(CFMC 2013a).

3.2.3.1 Essential Fish Habitat

The Magnuson-Stevens Act requires that FMPs describe and identify EFH in text that clearly states the habitats determined to be EFH for each life stage of the managed species. Additionally, FMPs must identify the specific geographic location or extent of habitats described as EFH and include maps of these geographic locations or boundaries within which EFH for each species and life stage is found.

EFH for life stages of species previously managed under the U.S. Caribbean-wide FMPs and retained in the St. Thomas/St. John FMP was identified in the Caribbean SFA Amendment (CFMC 2005) and mapped in the EFH-FEIS (CFMC 2004). EFH for species new to management is identified in Action 6 of this document according to functional relationships between life stages of the new federally-managed species and marine and estuarine habitats, as based on best scientific information available from the literature, landings data, fishery-independent surveys, and expert opinion (Section 2.6.2, Tables 2.6.1 and 2.6.2, and Appendix I).

The habitats described for the species new to management overlap with and occur within the same geographic extent as the habitats previously described for species managed under the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs. The highest degree of overlap occurs in the pelagic environment (i.e., the water column), because most of the species proposed for management share this habitat as eggs, larvae, juveniles, or adults.

Specific EFH identified for all species in the St. Thomas/St. John FMP include both estuarine/inshore and marine/offshore areas. Specifically, estuarine/inshore EFH includes estuarine emergent and mangrove wetlands, submerged aquatic vegetation, intertidal flats, palustrine emergent and forested systems, and the estuarine water column. Additionally, marine/offshore EFH includes live/hard bottom habitats, coral and coral reefs, seagrass and algal plains, sand and shell substrate, and the marine water column. Essential fish habitat includes the spawning area in the water column above the adult habitat.

Due to the steep continental slopes that occur off the USVI and Puerto Rico, the majority of fish habitat occurs within the 100 fathoms (183 m) contour line, as does the majority of fishing activity for Council-managed species. Beyond 100 fathoms, the sea bed drops off dramatically and is more difficult to fish, as it requires larger vessels and more gear (e.g., more line for fish traps, handlines, etc.).

As a result of the lack of discrete habitat mapping, as well as explicit spatial effort information, especially in the area between the 100-fathom contour and the outer boundary of the U.S. Caribbean EEZ, assumptions had to be made regarding the distribution of species with deep-water or pelagic life stages. Thus, for those deep-water species, in instances when the literature, data, or expert opinion reported the presence of one or more life stage occurring deeper than 100 fathoms (183 m), EFH was assumed to extend to the outer boundary of the U.S. Caribbean EEZ.

For a complete list of EFH per species included in the St. Thomas/St. John FMP, specified by life stage, see Section 5.14.

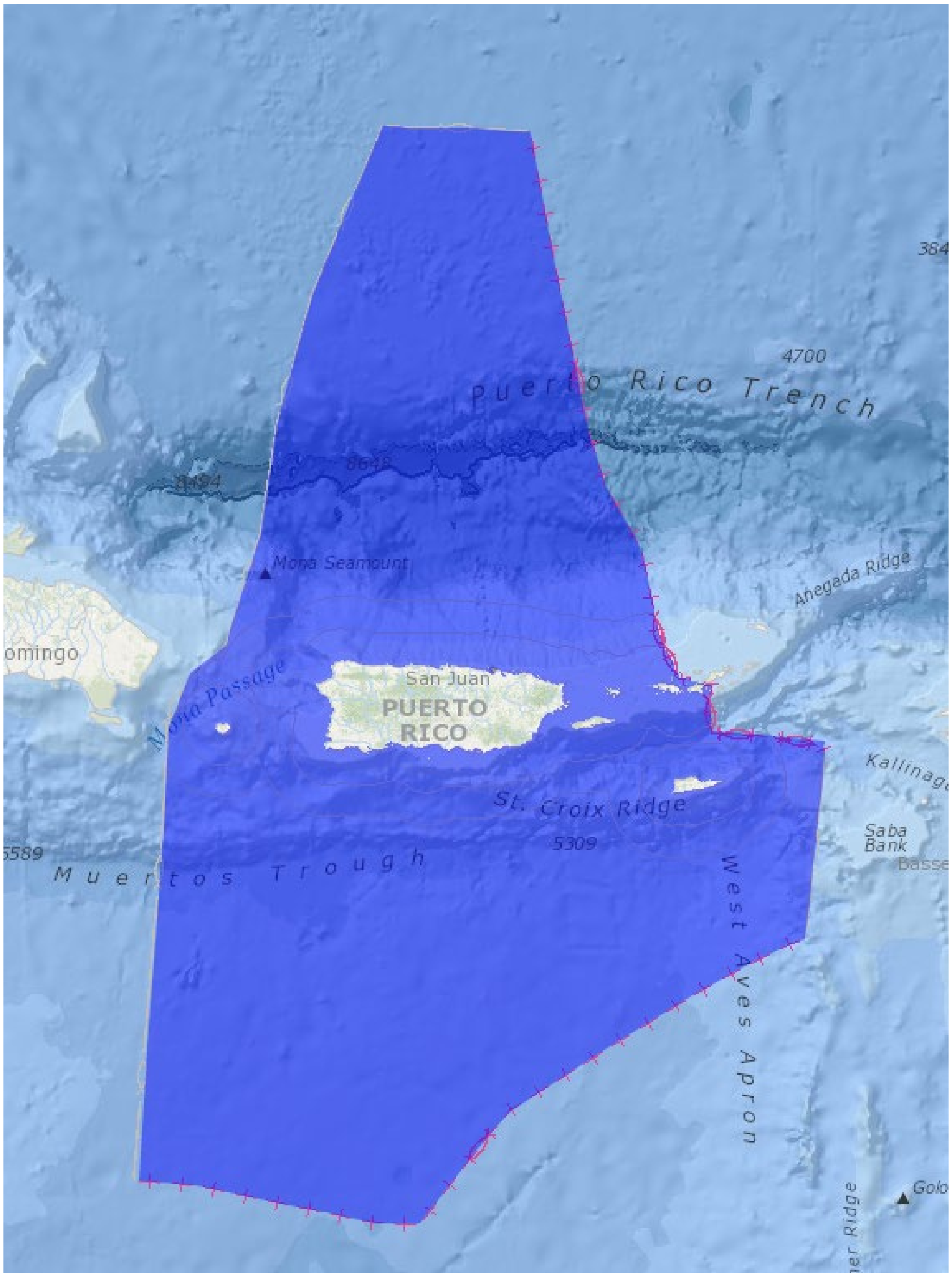

Figure 3.2.3. Shaded area representing EFH that ranges from mean high water to the outer boundary of the U.S. Caribbean EEZ, designated for eggs and larvae for all species[21] included in the St. Thomas/St. John FMP and also for juvenile and adult life stages for all pelagic species[22]. For all life stages of corals, sea urchins, and sea cucumbers EFH ranges from mean low water to the the outer boundary of the U.S. Caribbean EEZ.

[21] For spiny lobster, waters from mean high water to the outer boundary of the U.S. Caribbean EEZ are only designated for the phyllosome larvae life stage; the eggs are not pelagic
[22] See Section 5.1 for a list of species within the Pelagics functional group.

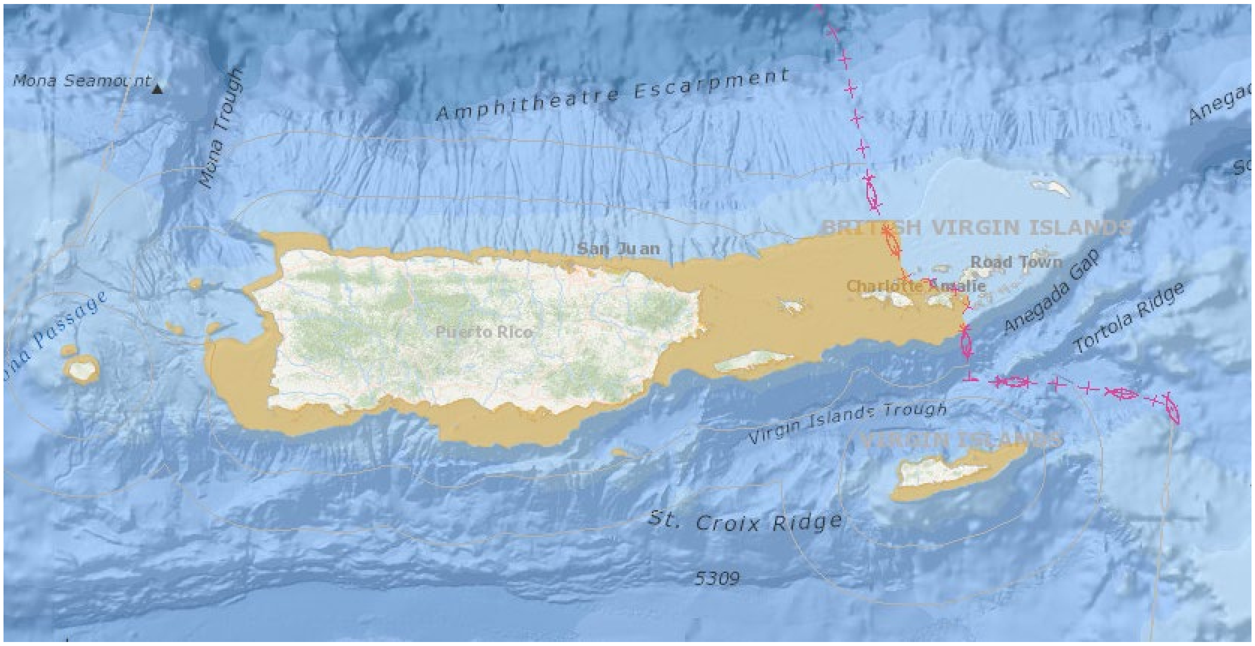

Figure 3.2.4. Shaded area representing EFH that includes all substrates from mean high water to 100 fathoms depth, designated for all life stages (excluding eggs and larvae) for spiny lobster, queen conch and Reef Fish[23] included in the St. Thomas/St. John FMP.

3.2.3.1.1 Habitat Areas of Particular Concern (HAPC)

Process and Designation of HAPC

Designated Areas

The 2005 Comprehensive Sustainable Fisheries Amendment designated HAPCs in the Reef Fish and Coral FMPs based on confirmed spawning locations and on areas or sites identified as having particular ecological importance to managed species.

Areas of St. Thomas/St. John designated as HAPCs based on the occurrence of confirmed spawning locations:

a. Hind Bank Marine Conservation District
b. Grammanik Bank.

Areas of St. Thomas/St. John designated as HAPC based on EFH or sites identified as having particular ecological importance to Caribbean reef fish species:

[23] See Section 5.1 for a list of species within the Reef Fish functional group.

a. Southeastern St. Thomas, including Cas Key and the mangrove lagoon in Great St. James Bay; and
b. Saba Island/Perseverance Bay, including Flat Key and Black Point Reef.

No areas in St. Thomas/St. John were designated as HAPC based on EFH for Caribbean coral species and no sites in St. Thomas/St. John were identified as having particular ecological importance to Caribbean coral species.

3.2.3.1.2 Effects of Fishing on Essential Fish Habitat

The effects of fishing on EFH were thoroughly described in the 2004 EFH-EIS. Specifically, 'Section 3.5.1.2 - Determination of identifiable adverse fishing effects' describes the impacts by gears including all gears currently in use for harvesting the new species proposed for management (e.g., hook and line; spear). All prohibited gear such as trawls and explosives are also discussed. The following is a summary of the information contained in the 2004 EFH-EIS.

The impacts of fishing gears on fish habitat in the southeastern U.S. and the U.S. Caribbean have been described in Hamilton (2000) and Barnette (2001). In most cases, limited data preclude definitive conclusions on the impacts of fishing gears on specific habitats in the U.S. Caribbean. However, these papers indicate the types of habitat most likely to suffer damage from each gear. Based on the analysis of the effects of fishing on EFH described in Section 2.1.5 of the 2004 EFH-EIS, the actions taken to limit the impact of fishing on EFH included modifications to anchoring techniques; modifications to construction specifications for pots/traps; and close areas to certain recreational and commercial fishing gears (i.e., pots/traps, gill/trammel nets, and bottom longlines) to prevent, mitigate, or minimize adverse fishing impacts in the EEZ.

As part of an effort to identify fishing impacts on fish habitat from the gears used in the Gulf of Mexico, South Atlantic, and Caribbean Regions, Rester (2000) completed an annotated bibliography that compiled a listing of papers and reports that addressed fishery-related habitat impacts. The bibliography included scientific literature, technical reports, state and federal agency reports, college theses, conference and meeting proceedings, popular articles, memoranda, and other forms of nonscientific literature, but did not include studies that pertained to the ecosystem effects of fishing (e.g. changes in the biological community structure). While recognizing that fishing may have many varying impacts on EFH, the bibliography focused on the physical impacts of fishing activities on habitat.

Hamilton (2000) summarized a December 1999 workshop concerning gear impacts on EFH attended by NOAA Fisheries scientists and managers. The workshop participants examined existing studies on gear impacts, and examined which factors made gear impact studies relevant to the Southeast region. The criteria included whether the specified gear was utilized in the Southeast Region, whether it was utilized in the same manner (similar fisheries), and whether the habitat was similar. This review recognized that in many instances numerous epifaunal and infaunal species are an integral part of benthic habitat. Such species act as ecosystem engineers and modify the habitats they occupy through burrowing activities (Coleman and Williams 2002). Therefore, studies that document impacts (i.e., reduction in biomass or species diversity) to benthic communities have been included in this section. Recommendations were made concerning future research needs, and a table of the relative impacts of various fishing gears on different habitats was developed.

Barnette (2001) used the over 600 papers compiled by Rester (2000) to examine fishing impacts in the Southeast Region. The following section is largely excerpted from Barnette (2001). Barnette found a paucity of readily available information on the numerous types of gear utilized within the Caribbean, South Atlantic, and Gulf of Mexico. While there have been hundreds of studies published on gear impacts worldwide, the majority of these focus on mobile gear such as dredges and trawls. Furthermore, in addition to the approved gears within the various FMPs, there are other gears utilized within state and territorial waters that also needed to be evaluated because EFH may extend into coastal and estuarine waters. However, there are few, if any, habitat impact studies that have been conducted on many of these gear types.

Johnson (2002) also reviewed literature (through May 2002) dealing with the effects of fishing gears on benthic habitats. The document focused on mobile gears, such as trawls and dredges, which are not typically used in Caribbean fisheries, but also contained some information on traps, pots, longlines, and gill nets.

Morgan and Chuenpagdee (2003) reviewed literature on gear impacts, summarized these findings, and presented them to an expert panel of fishers, scientists, and managers who then ranked habitat impacts for 10 fishing gears commonly used in U.S. fisheries. In this instance, gear impacts considered physical habitat damage, bycatch, and potential ghost fishing together. Based on the results of the panel workshop, a questionnaire was developed to assess fishing impacts, which was circulated among a broad range of marine fisheries experts. Results from the questionnaires were analyzed to rank fishing gear impacts and categorize gears as having high, medium, or low impacts. The report states that bottom trawls, bottom gillnets, dredges, and midwater gillnets have relatively high impacts; pots/traps, pelagic longlines, and bottom longlines have medium impacts; while midwater trawls, purse seines, and hook and line have relatively low impacts. On the Morgan and Chuenpagdee (2003) report, the gear impacts for gears used in Caribbean fisheries from high to low would be: bottom gillnets (high); pots/traps, bottom longlines, pelagic longlines (medium); hook and line (low).

The Council prohibited explosives and poisons (the latter when fishing for reef fish or harvesting Caribbean coral reef resources) due to the documented habitat damage associated with those methods, but the methods are briefly reviewed because of their historical use. While trawls are not used within the region, they are allowed for non-FMP fisheries (50 CFR 600.725).

The nature and magnitude of the effects of fishing activities depend heavily upon the physical and biological characteristics of a specific area in question. There are strict limitations on the degree to which probable local effects can be inferred from the studies of fishing practices conducted elsewhere (North Carolina Division of Marine Fisheries 1999). The extreme variability that occurs within marine habitats confounds the ability to easily evaluate habitat impacts on a regional basis. Obviously, observed impacts at coastal or nearshore sites should not be extrapolated to offshore fishing areas because of the major differences in water depth, sediment type, energy levels, and biological communities (Prena et al. 1999).

Of the gears used in the U.S. Caribbean (state and federal waters) pots and traps, longline, vertical gear, and gillnets and trammel nets have the highest individual impact and the greatest potential for adverse damage to fish habitat. Hand harvest of coral and live/hard bottom, if it were allowed, could also cause substantial habitat damage. Of the habitat types considered in the US Caribbean, coral has the greatest vulnerability to fishing impacts, followed by hard bottom and SAV. Barnette (2001) noted that several gears have negligible or minimal impacts on fish habitat, but that this conclusion was based on limited information. For the Caribbean region, specifically, less information is available than in other regions. Reduction of coral and reef heterogeneity due to damage or removal of physical structure can seriously impact available shelter for juvenile fishes and post-settlement larvae, and there is likely a correlation between topographic relief and fish abundance (Luckhurst and Luckhurst 1978). However, conclusions drawn on impacts, or lack of impacts, should be made cautiously.

A “Symposium on Impacts from Fishery Activities to Benthic Habitats” was held in Tampa, Florida on November 11-15, 2002. The following is a summary of the meeting prepared by SSC member R. Boulon for the Council.

The driving force for this symposium was the question of the relationship of EFH and impacts to benthic habitats by fishing activities. This requirement was instrumental in the development of three questions that were defined as the goals for this symposium: (1) What have we learned about fishery impacts (2) What more do we need to know (3) What do we know enough about to act on right now.

However, the greatest need (and where very little information exists beyond nearshore, shallow water areas) is accurate mapping of benthic habitats. Without knowing what exists and where it is, management measures to protect or conserve benthic habitat cannot be developed. The next step is identifying the level and distribution of fishing activities relative to our benthic habitats. Once mapped, habitats can be classified based on their availability (how much there is), their vulnerability (which is based on frequency of natural disturbance) and their risk (measured by frequency of disturbance from fishing activities).

NOAA's R/V Nancy Foster, Okeanos Explorer and others have contributed to the efforts of mapping the marine habitats by producing high resolution bathymetry, side scan sonar imagery and documenting the species and associated habitat at depth. However, to date we are still lacking a comprehensive map of the habitats in the area.

DeAlteris et al. (1999) stated that fishery-related impacts to fish habitat need to be compared to natural causes, both in magnitude and frequency of disturbance. Fishing can be adjusted or eliminated to complement particular habitats, whereas natural conditions continue unabated.

3.2.3.1.3 Non-Fishing impacts threats to the coastal and marine environments and essential fish habitat

Hurricanes Irma and Maria clearly demonstrated the extent to which coastal and marine environments and essential fish habitat can be altered by non-fishing impacts, the hurricanes themselves. Assessment of the impact to coral reefs is currently under way. These coral reef areas are found in shallower depths to about 30 m (98.4 ft). Mesophotic reefs are also currently being assessed to determine impacts to habitats at depths between 30 m (98.4 ft) and 50 m (164 ft) caused by the hurricanes.

The passage of storms and hurricanes through mangroves and seagrasses can cause uprooting, mechanical defoliation, and deposition of sediment and other materials. This stress can eliminate vegetation from some areas. For mangroves, following the acute stress, there is a rapid reestablishment of new seedlings on suitable habitats, and the system restores itself. Seagrasses also may recover quickly, if damage is slight and the substrate has not been severely altered. Some storms may have beneficial effects on mangroves such as removing accumulations of materials choking drainage ways, and reopening salt ponds to the sea. Such tropical disturbances are important agents that redistribute materials along the coast.

Damage to coral reefs in the USVI and Puerto Rico due to natural phenomena has been well documented. A large portion of the Caribbean lies within the hurricane belt and therefore reefs are frequently exposed to severe hurricane related impacts. Hurricanes can modify substantial portions of shallow reefs. Tropical storms David and Frederic in 1979 caused extensive damage on the outer east coast and southern coastal reefs, especially in the shallow *Acropora palmata* zone, off the eastern point of Vieques and off St. Croix (Goenaga and Cintrón 1979; Rogers et al. 1982). Hurricane Hugo caused a significant reduction in total living scleractinian cover on reefs on the south side of St. John (Rogers et al. 1991). It devastated portions of coral reefs and seagrass beds off St. Croix (Rogers et al. 1991). Rogers et al. (1991) were able to study the effect of Hurricane Hugo that hit the USVI in 1989 with an analysis of quantitative data collected before and after the storm, which allowed documentation of the effects of this powerful storm on coral community structure. The total living cover by scleractinians, including the dominant species, *Montastrea annularis*, decreased significantly. The amount of substrate available for colonization increased. Cover by macroscopic algae increased dramatically after the storm, later decreased, and then rose again one year later. It appears that the level of herbivory by urchins and fishes is too low to keep the macroalgae in check, and algae are inhibiting coral settlement and growth (Rogers et al. 1997). In spite of the reduction in live coral cover by the dominant coral species, neither diversity nor evenness increased. Hurricane Georges in 1998 was the worst hurricane since San Ciprián in 1932, with sustained winds of 185 km/hour.

The non-fishing impacts to EFH were also thoroughly discussed in Section 3.5.2 of the 2004 EFH-EIS (CFMC 2004) and in the EFH 5-year Review (CFMC 2011c) and are incorporated herein by reference. Currently there are two ongoing efforts to expand on the information on non-fishing impacts: the second 5-year EFH Review and the development of a Fishery Ecosystem Plan for the U.S. Caribbean.

3.2.3.2 Fishable Habitat

In the Caribbean SFA Amendment (CFMC 2005), fishable habitat was defined as those waters less than or equal to 100 fathoms (fms) (600 ft; 183 m). The majority of fishing activity for Council-managed species occurs in that area, except for fishing for deep-water snappers, which occurs primarily in the EEZ at depths greater than 100 fms (600 ft; 183 m) (CFMC 2005). The total area of fishable habitat (less or equal to 100 fms) in the U.S. Caribbean is estimated to be 2,214 square nautical miles (nm^2) (7,594 km^2) (Table 3.2.1), with only 13.7% of that area within the U.S. Caribbean EEZ. The total area of fishable habitat in the St. Thomas/St. John (territorial and EEZ) is 407 nm^2 (1396 km^2), of which 40.6% occurs in the EEZ.

Table 3.2.1. Estimates of fishable habitat areas in the U.S. Caribbean.

Region	Total Fishable Habitat Area	Fishable Habitat in EEZ Waters	Fishable Habitat in Territorial Waters
U.S. Caribbean (EEZ and Territorial Waters combined)	7594 Km^2 (2214.1 Nm^2)	1045 Km^2 (304.7 Nm^2)	6549 Km^2 (1909.4 Nm^2)
USVI (total)	1771 Km^2 (516 Nm^2)	635 Km^2 (185 Nm^2)	1136 Km^2 (331 Nm^2)
St. Thomas/St. John	1396 Km^2 (407 Nm^2)	567 Km^2 (165 Nm^2)	829 Km^2 (241.7 Nm^2)

(Source: NMFS-SERO 2015)

The Council's estimate of fishable habitat existing to 100-fathoms, is being re-evaluated as the fisheries have been expanding into deeper waters and as research and exploration continue in the deep-waters around Puerto Rico and the USVI. Data remain unavailable except those which allow a determination of maximum depth of species seen and the habitat in which they are found. However, the majority of the exploration being conducted in the U.S. Caribbean is well beyond the 100-fathom depth leaving a gap in the data needed to re-evaluate the definition of fishable habitat.

3.3 Biological and Ecological Characteristics

The biological and ecological environment of the U.S. Caribbean, including that which supports or influences the majority of the species included in the St. Thomas/St. John FMP, is described in detail in the Caribbean SFA Amendment (CFMC 2005), and the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b). Stocks affected by this action include those in the St. Thomas/St. John management area described in this section.

St. Thomas/St. John waters support hundreds of marine fish species and invertebrates including corals and organisms associated to coral reefs. Of those, the 26 stocks/stock complexes identified for inclusion in the management unit of the St. Thomas/St. John FMP, represent those that the Council believes requires conservation and management. Many of these stocks are taken primarily in commercial, subsistence, and/or recreational fisheries; the remainder are stocks that require protection from fisheries effects, such as coral species in shallow and deep-water habitats and species with an important ecological function.

Appendices I and J contain specific information about the distribution and habitat, life history, diet, reproduction and spawning characteristics for all species in the St. Thomas/St. John FMP.

3.3.1 Protected Species and Critical Habitat

Within the U.S. Caribbean, some species and their habitats are protected under the Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), or both. At least 17 species of whales and dolphins have been reported in or near U.S. waters in the northeastern Caribbean (Mignucci-Giannoni 1998), including waters around St. Thomas and St. John, USVI. All 17 species are protected under the MMPA. Three of these species (i.e., sperm, sei, and fin whales) are also listed as endangered under the ESA.[24] In addition to these three marine mammals, 16 other species that are known to occur in the U.S. Caribbean, including St. Thomas/St. John, are also protected under the ESA (Table 3.3.1), and include sea turtles, corals, and fish species. ESA designated critical habitat for *Acropora* corals (Figure 3.3.1) also occur within St. Thomas/St. John waters.

[24] Five DPSs of humpback whales are listed under the ESA; however, the West Indies DPS, which is the only DPS present in the U.S. Caribbean, is not listed as endangered or threatened (81 FR 62259).

Table 3.3.1. ESA-listed species that occur in U.S. Caribbean federal waters and could interact with fishing authorized under the St. Thomas/St. John FMP.

Common Name	Scientific Name	Status
Sei whale	*Balaenoptera borealis*	Endangered
Sperm whale	*Physeter macrocephalus*	Endangered
Fin whale	*Balaenoptera physalus*	Endangered
Green turtle (North Atlantic Distinct Population Segment [DPS])	*Chelonia mydas*	Threatened
Green turtle (South Atlantic DPS)	*Chelonia mydas*	Threatened
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle (Northwest Atlantic DPS)	*Caretta caretta*	Threatened
Elkhorn coral	*Acropora palmata*	Threatened
Staghorn coral	*Acropora cervicornis*	Threatened
Rough cactus coral	*Mycetophyllia ferox*	Threatened
Pillar coral	*Dendrogyra cylindrus*	Threatened
Lobed star coral	*Orbicella annularis*	Threatened
Mountainous star coral	*Orbicella faveolata*	Threatened
Boulder star coral	*Orbicella franksi*	Threatened
Scalloped hammerhead shark (Central and Southwest Atlantic DPS)	*Sphyrna lewini*	Threatened
Nassau grouper	*Epinephelus striatus*	Threatened
Oceanic whitetip shark	*Carcharhinus longimanus*	Threatened
Giant manta ray	*Manta birostris*	Threatened

Background information on the life history, habitat, diet, growth patterns, or other species-specific information for each of the ESA-listed species occurring in that action area are described below for reference.

3.3.1.1 Marine Mammals

The sei whale occurs in all ocean basins of the world, primarily in temperate to subpolar latitudes. Sei whales in the North Atlantic reportedly feed primarily on calanoid copepods, with a secondary preference for euphausiids (Hjort and Ruud 1929; Mitchell 1975a; Mitchell et al. 1986; Christensen et al. 1992). Throughout their range, sei whales occur predominantly in deep water. They are most common over the continental slope (Mitchell 1975b; Cetacean and Turtle Assessment Program 1982; Martin 1983; Olsen et al. 2009), shelf breaks (Committee on the Status of Endangered Wildlife in Canada 2003), and deep ocean basins situated between banks (Sutcliffe and Brodie 1977). Studies in various ocean basins indicate that sei whales are associated with ocean fronts and eddies (Nasu 1966; Nemoto and Kawamura 1977; Skov et al. 2008; Bost et al. 2009). Direct hunting was the main cause of initial depletion of sei whales.

Loss of prey base due to climate and ecosystem change presents an unknown, but potentially high impact to recovery.

The sperm whale occurs in all oceans of the world. Sperm whales are distributed throughout most oceanic areas, but are found in deeper waters seaward of the continental shelf. The primary cause of the population decline that precipitated ESA listing was commercial whaling for ambergris and spermaceti in the eighteenth, nineteenth, and twentieth centuries. Cephalopods (i.e., squid, octopi, cuttlefishes, and nautili) are the main component of sperm whale diets. Current threats to sperm whales include ship strikes and entanglements in fishing gear. Other threats to sperm whales include disturbance by man-made noise, for example from seismic surveys, and this threat is heightened in areas of oil and gas activities or where shipping activity is high. NMFS' Recovery Plan for Sperm Whales (NMFS 2010) identified four main categories of threats to the recovery of sperm whales in the Atlantic Ocean: (1) vessel interactions, (2) incidental capture in fishing gear, (3) habitat degradation, and (4) military operations.

The fin whale is found throughout the world in deep, offshore waters of all major oceans, primarily in temperate to polar latitudes. They are less common in the tropics. They occur year-round in a wide range of locations, but the density of individuals in any one area changes seasonally. Fin whales feed on krill, small schooling fish (including herring, capelin, and sand lance), and squid. Fin whales can become entangled in fishing gear, either swimming off with the gear attached or becoming anchored. They can become entangled in many different gear types, including traps, pots, or gillnets. Underwater noise also threatens whale populations, interrupting their normal behavior and driving them away from areas important to their survival. Increasing evidence suggests that exposure to intense underwater sound in some settings may cause some whales to strand and ultimately die.

3.3.1.2 Sea Turtles

After emerging from the nest, green sea turtle hatchlings swim to offshore areas and go through a post-hatchling pelagic stage where they are believed to live for several years. During this life stage, green sea turtles feed close to the surface on a variety of marine algae and other life associated with drift lines and debris. This early oceanic phase remains one of the most poorly understood aspects of green sea turtle life history (NMFS and USFWS 2007). At approximately 8-10 inches (20-25 cm) carapace length, juveniles leave the pelagic environment and enter nearshore developmental habitats such as protected lagoons and open coastal areas rich in sea grass and marine algae. Within the developmental habitats, juveniles begin the switch to a more herbivorous diet, and by adulthood feed almost exclusively on seagrasses and algae (Rebel 1974), although some populations are known to also feed heavily on invertebrates (Carballo et al. 2002). The diving abilities of all sea turtles species vary by their life stages. The maximum diving range of green sea turtles is estimated at 360 ft (110 m) (Frick 1976), but they most frequently make dives of less than 65 ft (20 m) (Walker 1994). The time of these dives also varies by life stage. The maximum dive length is estimated at 66 minutes with most dives lasting from 9 to 23 minutes (Walker 1994). Green sea turtles face threats including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (e.g., plastics, petroleum products, petrochemicals), ecosystem alterations (e.g., nesting beach development, beach nourishment and shoreline stabilization, vegetation changes), poaching, global climate change, fisheries interactions, natural predation, and disease.

Hawksbill sea turtles nest on sandy beaches throughout the tropics and subtropics. The most significant nesting within the United States occurs in Puerto Rico and the U.S. Virgin Islands, specifically on Mona Island and Buck Island Reef National Monument, respectively. Post-hatchlings (oceanic stage juveniles) are believed to live in the open ocean, taking shelter in floating algal mats and drift lines of flotsam and jetsam in the Atlantic ocean (Musick and Limpus 1997) before returning to more coastal foraging grounds. In the Caribbean, hawksbill sea turtles are known to almost exclusively feed on sponges (Meylan 1988; Van Dam and Diez 1997), although at times they have been seen foraging on other food items, notably corallimorphs and zooanthids (León and Diez 2000; Mayor et al. 1998; Van Dam and Diez 1997). Adult foraging typically occurs over coral reefs, although other hard-bottom communities and mangrove-fringed areas are occupied occasionally. NMFS believes it is probable that much of the Caribbean, down to 328 ft (100 m) or more, provides a foraging habitat for the adult turtles, particularly since sponges grow to this depth. Hawksbill sea turtles are currently subjected to the same suite of threats on both nesting beaches and in the marine environment that affect other sea turtles (e.g., interaction with federal and state fisheries, coastal construction, oil spills, climate change affecting sex ratios). Due to their preference to feed on sponges associated with coral reefs, hawksbill sea turtles are particularly sensitive to losses of coral reef communities. Because continued loss of coral reef communities (especially in the greater Caribbean region) is expected to impact hawksbill foraging, it represents a major threat to the recovery of the species.

Leatherback sea turtles are the most pelagic of all ESA-listed sea turtles and spend most of their time in the open ocean. Although, they will enter coastal waters and are seen over the continental shelf on a seasonal basis to feed in areas where jellyfish are concentrated. Leatherback sea turtles feed primarily on cnidarians (medusae, siphonophores) and tunicates. Unlike other sea turtles, leatherbacks' diets do not shift during their life cycles. Leatherback sea turtles are the deepest diving of all sea turtles, with recorded depths in excess of a half-mile (Eckert et al. 1989), but they may also come into shallow waters to locate prey items. Dive times range from a maximum of 37 minutes to more routines dives of 4 to 14.5 minutes (Standora et al. 1984; Eckert et al. 1986; Eckert et al. 1989; Keinath and Musick 1993). Leatherback sea turtles may spend 74% to 91% of their time submerged (Standora et al. 1984). Leatherback sea turtles face many of the same threats as other sea turtle species, including destruction of nesting habitat from storm events, oceanic events such as cold-stunning, pollution (plastics, petroleum products, petrochemicals, etc.), ecosystem alterations (nesting beach development, beach nourishment and shoreline stabilization, vegetation changes, etc.), poaching, global climate change, fisheries interactions, natural predation, and disease. Of all sea turtle species, leatherbacks seem to be the most vulnerable to entanglement in fishing gear, especially gillnet and pot/trap lines.

3.3.1.3 Corals

Acropora cervicornis and *Acropora palmata*, the only two species of acroporids in the Caribbean, are two of the major reef-building corals in the wider Caribbean. Elkhorn colonies form flattened to near-round branches that typically radiate outward from a central trunk that is firmly attached to the sea floor. Staghorn colonies are stag antler-like, with cylindrical, straight, or slightly curved branches. The branching morphology of these species provides important habitat for other reef organisms. Historically, both acroporid species formed dense thickets at shallow (16 ft [<5 m]) and intermediate (33 to 49 ft [10 to 15 m]) depths in many reef systems, including locations in the Florida Keys, western Caribbean (e.g., Jamaica, Cayman Islands, Caribbean Mexico, Belize), and eastern Caribbean. In the 1960s and 1970s in the USVI, elkhorn coral was the main reef-building coral at depths less than 33 ft (10 m) (Rogers et al. 2002). Elkhorn coral grew in nearly monospecific stands on the reef crest and in the upper and lower forereef zones of well-developed fringing and bank barrier reefs, as well as on isolated patch reefs (Rogers et al. 2002). Elkhorn coral commonly grows in turbulent water on the fore-reef, reef crest, and shallow spur-and-groove zone (Cairns 1982; Miller et al. 2008; Rogers et al. 1982; Shinn 1963) in water ranging from approximately 3-15 ft (1-5 m) depth, and up to 40 ft (12 m). The preferred habitat of elkhorn coral is the seaward face of a reef (turbulent shallow water), including the reef crest, and shallow spur-and-groove zone (Shinn 1963; Cairns 1982; Rogers et al. 1982). Historically, staghorn coral was reported from depths ranging from <3.28 to 197 ft (<1 to 60 m) (Goreau and Goreau 1973). It is suspected that 197 ft (60 m) is an extreme situation and that the coral is relatively rare below 66 ft (20 m) depth. The common depth range at which staghorn coral is currently observed is 16 to 56 ft (5 to 17 m). In the USVI, this species was abundant, but not often found in dense thickets or well-defined zones (Rogers et al. 2002); unlike in areas in the western Caribbean where this species was historically the primary constructor of mid-depth (33 to 49 ft [10 to 15 m]) reef terraces (Adey 1978).

Pillar coral (*Dendrogyra cylindrus*) forms cylindrical columns on top of encrusting bases. Colonies are generally grey-brown in color and may reach circa 10 ft (3 m) in height. Polyp tentacles remain extended during the day, giving columns a furry appearance. Pillar coral inhabits most reef environments in water depths ranging from ~3-75 ft (1-25 m), but it is most common between ~15-45 ft (5-15 m) depths (Acosta and Acevedo 2006; Cairns 1982; Goreau and Wells 1967). Pillar coral is a gonochoric (separate sexes) broadcast spawning species with relatively low annual egg production for its size. Sexual recruitment of this species is low, and reported juvenile colonies in the Caribbean are lacking. Pillar coral can reproduce by fragmentation following storms or other physical disturbance. Average growth rates of 0.7-0.8 inches (in) (1.8-2.0 centimeters [cm]) per year in linear extension have been reported in the

Florida Keys compared to 0.31 in (0.8 cm) per year in Colombia and Curaçao. Feeding rates (removal of suspended particles in seawater) are low relative to most other Caribbean corals, indicating it is primarily a tentacle feeder rather than a suspension feeder. However, pillar coral has a relatively high photosynthetic rate, and it receives substantial amounts of energy from its symbiotic algae. Pillar coral is uncommon but conspicuous with scattered, isolated colonies. In monitoring studies, cover is generally less than 1%. At permanent monitoring stations in the USVI, pillar coral has been observed in low abundance at 10 of 33 sites and, where present, ranged in cover from less than 0.05-0.22% (Smith 2013). It is rarely found in aggregations.

Rough cactus coral (*Mycetophyllia ferox*) forms a thin, encrusting plate that is weakly attached. Maximum colony size is ~20 in (50 cm) in diameter. It has been reported in reef environments in water depths of ~15 to 300 ft (5 to 90 m), including shallow and mesophotic habitats. Rough cactus coral is a hermaphroditic (simultaneously both sexes) brooding (fertilization occurs within the parent colony and grows for a period of time before release) species. Colony size at first reproduction is greater than 15 in^2 (100 cm^2). Recruitment of rough cactus coral appears to be very low, even in studies from the 1970s. Rough cactus coral has a lower fecundity compared to other species in its genus (Morales Tirado 2006). Over a 10 year period, no colonies of rough cactus coral were observed to recruit to an anchor-damaged site in the USVI although adults were observed on the adjacent reef (Rogers and Garrison 2001). Rough cactus coral is usually uncommon or rare, constituting less than 0.1% of all coral species at generally less than 1% of the benthic cover. Benthic cover of rough cactus coral in the Red Hind Marine Conservation District off St. Thomas, USVI, which includes mesophotic coral reefs, was 0.003 ± 0.004% in 2007, accounting for 0.02% of coral cover, and ranking 20th highest in cover out of 21 coral species (Nemeth et al. 2008; Smith et al. 2010). In the USVI between 2001 and 2012, cover of rough cactus coral appeared in 12 of 33 survey sites and accounted for 0.01% of the bottom, and 0.07% of the coral cover, ranking as 13th most common (Smith 2013).

Boulder star coral (*Orbicella franksi*) is one of the three species in the *Orbicella annularis* complex (mountainous star coral [*Orbicella faveolata*] and lobed star coral [*Orbicella annularis*] are the other two). These three species were formerly in the genus *Montastraea*; however, recent work has reclassified the three species in the *annularis* complex to the genus *Orbicella* (Budd et al. 2012). Boulder star coral is distinguished by large, unevenly arrayed polyps that give the colony its characteristic irregular surface. Colony form is variable, and the skeleton is dense with poorly developed annual bands. Colony diameter can reach up to 16 ft (5 m) with a height of up to 6.5 ft (2 m). Boulder star coral tends to have a deeper distribution than the other two species in the *Orbicella* species complex. It occupies most reef environments and has been reported from water depths ranging from ~16-165 ft (5 to 50 m), with the species complex reported to 250 ft (90 m). *Orbicella* species are a common, often dominant, component of Caribbean mesophotic reefs, suggesting the potential for deep refugia for boulder star coral. Boulder star coral is hermaphroditic (simultaneously having both sexes) broadcast spawners, with spawning concentrated on 6 to 8 nights following the full moon in late August, September, or early October. Boulder star coral spawning is reported to be about one to two hours earlier than lobed star coral and mountainous star coral. Fertilization success measured in the field was generally below 15% for all three species being closely linked to the number of colonies concurrently spawning. In Puerto Rico, minimum size at reproduction for the star coral species complex was 13 in^2 (83 cm^2). Boulder star coral is reported as common. In the USVI, boulder star coral is the second most abundant species by percent cover at permanent monitoring stations. However, because the species complex, which is the most abundant by cover, was included as a category when individual *Orbicella* species could not be identified with certainty, it is likely that boulder star coral is the most abundant. Population estimates of boulder star coral in the ~19 square miles (49 km^2) Red Hind Marine Conservation District are at least 34 million colonies (Smith 2013). Abundance was stable between 1998-2008 at nine sites off Mona and Desecheo Islands, Puerto Rico. In 1998, 4% of all corals at six sites surveyed off Mona Island were boulder star coral colonies in 1998 and approximately 5% in 2008; at Desecheo Island, about 2% of all coral colonies were boulder star coral in both 2000 and 2008 (Bruckner and Hill 2009).

Lobed star coral (*Orbicella annularis*) colonies grow in columns that exhibit rapid and regular upward growth. Unlike the other two-star coral species, margins on the sides of columns are typically dead. Live colony surfaces usually lack ridges or bumps. Lobed star coral is reported from most reef environments in depths of ~1.5-66 ft (0.5-20 m). The star coral species complex is a common, often dominant component of Caribbean mesophotic (deeper than ~100 ft) reefs, suggesting the potential for deep refuge across a broader depth range, but lobed star coral is generally described with a shallower distribution. Asexual fission and partial mortality can lead to multiple clones of the same colony. The percentage of unique genotypes is variable by location and is reported to range between 18% and 86% (14-82% are clones). Colonies in areas with higher disturbance from hurricanes tend to have more clonality. Although lobed star coral is still abundant, it may exhibit high clonality in some locations. Like the other species in the complex, lobed star coral is a hermaphroditic broadcast spawners, with spawning concentrated on 6-8 nights following the full moon in late August, September, or early October. Lobed star coral is reported to have slightly smaller egg size and potentially smaller size/age at first reproduction that the other two species of the *Orbicella* genus. In Puerto Rico, minimum size at reproduction for the star coral species complex was 12 in^2 (83 cm^2). Lobed star coral has been described as common overall. Demographic data collected in Puerto Rico over nine years straddling the 2005 bleaching event showed that population growth rates were stable in the pre-bleaching period (2001–2005) but declined one year after the bleaching event. Population growth rates declined even further two years after the bleaching event, but they returned to stasis the following year. Lobed star coral is the third most abundant coral by percent cover in permanent monitoring stations in the USVI. A decline of 60% was observed between 2001 and 2012 primarily due to bleaching in 2005. However, most of the mortality was partial mortality, and colony density in monitoring stations did not change (Smith 2013). At nine sites off Mona and Desecheo Islands, Puerto Rico, no species extirpations were noted at any site over 10 years of monitoring between 1995 and 2008. In 1998, 8% of all corals at six sites surveyed off Mona Island were lobed star coral colonies, dipping to approximately 6% in 2008. At Desecheo Island, 14% of all coral colonies were lobed star coral in 2000 while 13% were in 2008 (Bruckner and Hill 2009).

Mountainous star coral (*Orbicella faveolata*) grows in heads or sheets, the surface of which may be smooth or have keels or bumps. The skeleton is much less dense than in the other two-star coral species. Colony diameter can reach up to 33 ft (10 m) with heights of 13-16 ft (4-5 m). Mountainous star coral has been reported in most reef habitats and is often the most abundant coral between 33-66 ft (10-20 m) in fore-reef environments. The depth range of mountainous star coral has been reported as ~1.5-132 ft (0.5-40 m), though the species complex has been reported to depths of 295 ft (90 m), indicating mountainous star coral's depth distribution is likely deeper than 132 ft (40 m). Like the other species in the complex mountainous star coral is a hermaphroditic broadcast spawner with spawning concentrated on 6 to 8 nights following the full moon in late August, September, or early October. Fertilization success measured in the field was generally below 15% for all three species being closely linked to the number of colonies concurrently spawning. In Puerto Rico, minimum size at reproduction for the star coral species complex was 12 in^2 (83 cm^2). In many life history characteristics, including growth rates, tissue regeneration, and egg size, mountainous star coral is considered intermediate between lobed star coral and boulder star coral. Reported growth rates of mountainous star coral range between 0.12 and 0.64 in (0.3-1.6 cm) per year (Cruz-Piñón et al. 2003; Tomascik 1990; Villinski 2003; Waddell 2005). Szmant and Miller (2005) reported low post-settlement survivorship for mountainous star coral transplanted to the field with only 3-15% remaining alive after 30 days. Mountainous star coral is the sixth most abundant species by percent cover in permanent monitoring stations in the USVI. Population estimates in the 19-square-mile (49 kilometers squared) Red Hind Marine Conservation District are at least 16 million colonies (Smith 2013). At nine sites off Mona and Desecheo Islands, Puerto Rico, no species extirpations were noted at any site over 10 years of monitoring between 1998 and 2008 (Bruckner and Hill 2009). Both mountainous star coral and lobed star coral sustained large losses during the period. The number of colonies of mountainous star coral decreased by 36% and 48% at Mona and Desecheo Islands, respectively (Bruckner and Hill 2009). In 1998, 27% of all corals at six sites surveyed off Mona Island were mountainous star coral colonies, but decreased to approximately 11% in 2008 (Bruckner and Hill 2009). At Desecheo Island, 12% of all coral colonies were mountainous star coral in 2000 compared to 7% in 2008.

On November 26, 2008, a final rule designating *Acropora* critical habitat was published in the *Federal Register* and defined the physical or biological features essential to the conservation of the species (also known as essential feature). The essential features to the conservation of *Acropora* species is substrate of suitable quality and availability, in water depths from the mean high water line to 98 ft (30 m), to support successful larval settlement, recruitment, and reattachment of fragments. Substrate of suitable quality and availability means consolidated hard bottom or dead coral skeletons free from fleshy macroalgae or turf algae and sediment cover. Areas containing these features have been identified in St. Thomas/St. John (Figure 3.3.1).

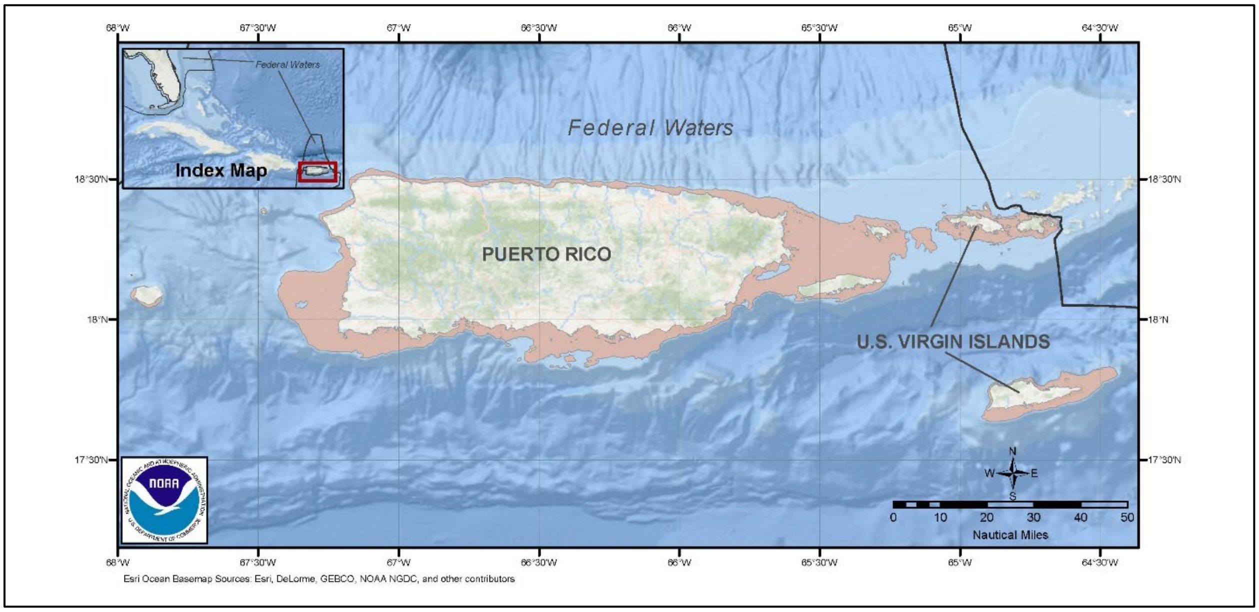

Figure 3.3.1. Area around the U.S. Caribbean region designated as *Acropora* coral critical habitat.

3.3.1.4 Fish

The Nassau grouper is primarily a shallow-water, insular species that has long been valued as a major fishery resource throughout the wider Caribbean, South Florida, Bermuda and the Bahamas (Carter et al. 1994). Nassau grouper are slow-growing and long-lived, with estimates up to 29 years (Bush et al. 1996). The Nassau grouper is considered a reef fish, but it transitions through a series of ontogenetic shifts of both habitat and diet. As larvae they are planktonic. As juveniles, they are found in nearshore shallow waters in macroalgal and seagrass habitats. They shift progressively deeper with increasing size and maturation into predominantly reef habitat (e.g., forereef and reef crest). Adult Nassau grouper tend to be relatively sedentary and are found most abundantly on high relief coral reefs or rocky substrate in clear waters (Sadovy and Eklund 1999), although they can be found from the shoreline to about 328-427 ft (100-130 m). Larger adults tend to occupy deeper, more rugose, reef areas (Semmens et al. 2007). Both adults and juveniles would use either natural or artificial reefs (Smith 1971, Beets and Hixon 1994, Colin et al. 1997). As a top predator in reef ecosystems, the Nassau grouper serves ecological functions that are still being clarified (Mumby et al. 2006). Its presence maintains grazers and grazing pressure on reef alga providing an important benefit to stony corals (Mumby at al. 2006). As with most large marine reef fish, Nassau grouper demonstrate a bi-partite life cycle with demersal juveniles and adults but pelagic eggs and larvae. Reproduction is only known to occur during annual aggregations, in which large numbers of Nassau grouper, ranging from dozens to tens of thousands, collectively spawn (Smith 1972, Olsen and LaPlace 1979, Colin et al. 1987, Fine 1990, Fine 1992, Colin 1992).

The scalloped hammerhead shark is a circumglobal species that lives in coastal warm temperate and tropical seas. It occurs over continental and insular shelves, as well as adjacent deep waters, but is seldom found in waters cooler than 22° C (Compagno 1984, Schulze-Haugen et al. 2003). It ranges from the intertidal and surface to depths of up to 1479-1680 ft (450-512 m) (Sanches 1991; Klimley 1993), with occasional dives to even deeper waters (Jorgensen et al. 2009), and has been documented entering enclosed bays and estuaries (Compagno 1984). Both juveniles and adult scalloped hammerhead sharks occur as solitary individuals, pairs, or in schools. The scalloped hammerhead shark is viviparous (*i.e.,* gives birth to live young), with a gestation period of 9-12 months (Branstetter 1987, Stevens and Lyle 1989), which may be followed by a one-year resting period (Liu and Chen 1999). Females attain maturity around 6.5-8.2 ft (200-250 cm) total length (TL) while males reach maturity at smaller sizes (range 4.2-6.6 ft [128 – 200 cm] TL); however, the age at maturity differs by region. Data from the northwest Atlantic and Gulf of Mexico indicate the von Bertalanffy growth parameters are: L_∞= 9.2 ft (279 cm) TL, k = 0.13 $year^{-1}$, t_0 = -1.62 years for males and L_∞= 9.9 ft (303 cm) TL, k=0.09 $year^{-1}$, t_0=−2.22 years for females (Piercy et al. 2007). Maximum size observed was 10.3 ft (313 cm) TL for a female and 10.0 ft (304 cm) TL for a male, corresponding to an age of 30.5 years.

The oceanic whitetip is considered the only truly oceanic (*i.e*., pelagic) shark of its genus (Bonfil et al. 2008). They are distributed worldwide in epipelagic tropical and subtropical waters, usually found far offshore between 30° North latitude and 35° South latitude (Baum et al. 2006). It has a clear preference for open ocean waters and is most abundant between 10° South latitude and 10° North latitude (Backus et al. 1956; Strasburg 1958; Compagno 1984; Bonfil et al. 2008). In the western Atlantic, oceanic whitetips occur from Maine to Argentina, including the Caribbean and Gulf of Mexico. The oceanic whitetip shark is a highly migratory species that is usually found offshore in the open ocean, on the outer continental shelf, or around oceanic islands in deep water, occurring from the surface to at least 499 ft (152 m) depth. The species can be found in water temperatures between 15°C and 28°C, but it exhibits a strong preference for the surface mixed layer in water with temperatures above 20°C, and is considered a surface-dwelling shark. Little is known about the movement or possible migration paths of the oceanic whitetip shark. Although the species is considered highly migratory and capable of making long distance movements, tagging data provides evidence that this species also exhibits a high degree of philopatry (i.e., site fidelity) in some locations. The oceanic whitetip has an estimated maximum age of 17 years, with confirmed maximum ages of 12 and 13 years in the North

Pacific and South Atlantic, respectively (Seki et al. 1998; Lessa et al. 1999). Other information from the South Atlantic suggests the species likely lives up to 20 years based on observed vertebral ring counts (Rodrigues et al. 2015). Sexual maturity is estimated to occur at an age of 6-7 years and the gestation period is 10-12 months. The number of pups in a litter ranges from 1-14 (mean=6) (Compagno 1984; Seki et al. 1998; Bonfil et al. 2008). When compared to other shark species, the oceanic whitetip is relatively productive, with an intrinsic rate of population increase (r) of 0.121 per year (Cortés et al. 2012). Oceanic whitetips are ranked among the highest in productivity when compared with other pelagic sharks in terms of pup production, rebound potential, potential for population increase, and growth rate (Chapple and Botsford 2013). However, although the oceanic whitetip shark has a relatively high productivity rate relative to other sharks, it is still considered low for a fish species (r <0.14), making them generally vulnerable to depletion and potentially slow to recover from overexploitation (Young et al. 2016).

The giant manta ray can be found in all ocean basins, but within this broad distribution, individual populations are scattered and highly fragmented (CITES 2013). In terms of range, the species has been documented as far north as New Jersey on the United States east coast (Gudger 1922; Kashiwagi et al. 2010; Moore 2012; CITES 2013). Clark (2010) suggests that giant manta rays may forage in less productive pelagic waters and conduct seasonal migrations following their prey. Despite this large range, sightings are often sporadic. The timing of these sightings also varies by region and seems to correspond with the movement of zooplankton, circulation and tidal patterns, seawater temperature, and possibly mating behavior (Couturier et al. 2012; De Boer et al. 2015; Armstrong et al. 2016). Within its range, the giant manta ray inhabits tropical, subtropical, and temperate bodies of water and is commonly found offshore, in oceanic waters, and near productive coastlines (Marshall et al. 2009; Kashiwagi et al. 2011). As such, giant manta rays can be found in cooler water, as low as 19°C, although temperature preference appears to vary by region (Duffy and Abbott 2003; Marshall et al. 2009; Freedman and Roy 2012; Graham et al. 2012). Additionally, giant manta rays exhibit a high degree of plasticity in terms of their use of depths within their habitat. Tagging studies show the species conducting nightly descents from the surface to 656-1,476 ft (200-450 m) (Rubin et al. 2008; Stewart et al. 2016), and that they are capable of diving to depths exceeding 3,281 ft (1,000 m) (A. Marshall et al. unpubl. data cited in Marshall et al. 2011). The giant manta ray gives birth to live young (*i.e.*, "viviparous"). They are slow to mature and have very low fecundity and typically give birth to only one pup every two to three years. Gestation lasts approximately 10-14 months. Females are only able to produce between 5 and 15 pups in a lifetime (CITES 2013; Miller and Klimovich 2017). Although giant manta rays have been reported to live at least 40 years, not much is known about their growth and development. Maturity is thought to occur between 8-10 years of age (Miller and Klimovich 2017). In the Atlantic, very little information on *M. birostris* populations is available, but there is a known, protected population within the Flower Garden Banks National Marine Sanctuary in the Gulf of Mexico. However, researchers are still trying to determine whether the manta rays in this area are only giant manta ray individuals or potentially also comprise individuals of a new, undescribed species (Marshall et al. 2009; Hinojosa-Alvarez et al. 2016). With populations potentially ranging from around 100 to 1,500 individuals (see Table 4 in Miller and Klimovich 2017), coupled with their life history traits and productivity estimates and particularly their low reproductive output and sensitivity to changes in adult survival rates, giant manta ray populations are inherently vulnerable to depletions, with low likelihood of recovery.

3.3.1.5 Consultations on ESA-listed species and designated critical habitat

As discussed in Chapter 2, the St. Thomas/St. John FMP would include fishery management measures (e.g., size and bag limits, seasonal and area closures) previously included in the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs that are applicable to the St. Thomas/St. John EEZ. Actions included in the St. Thomas/St. John FMP would modify the composition and organization of, and ACLs for, the stocks and stock complexes included for management in the St. Thomas/St. John EEZ. Those changes would not be expected to substantially change how the fishery operates (e.g., species targeted, amount and type of gear used). Under the St. Thomas/St. John FMP, ACLs for some stocks/stock complexes would increase while ACLs for others would decrease. However, for those stocks/complexes for which allowable catch would increase, that increase would not necessarily translate to increased effort, as fishers are constrained by factors such as vessel size, amount of gear owned, and market demand. Additionally, for those stocks new to management, the gear types used by St. Thomas/St. John fishermen would not be expected to differ from gear types used when fishing for previously managed stocks. Those stocks may be new to management, but they are not new to the fishery. For these reasons, it was assumed that fishing authorized under the St. Thomas/St. John FMP would be very similar to fishing authorized under the four previous FMPs.

NMFS is consulting on the effect of fishing on ESA-listed species under the new St. Thomas/St. John FMP, and has completed consultations on the effect of fishing under each of the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs. As mentioned above, the effects of fishing under the St. Thomas/St. John FMP would be expected to be comparable to effects of fishing under the four previous FMPs, and consultations on those previous FMPs would be informative for the St. Thomas/St. John FMP. Please see Appendix K for additional information on these consultations.

3.4 Description of the Socio-economic Characteristics of the St. Thomas/St. John Management Area

For a comprehensive description of the fisheries of St. Thomas/St. John, including its economic significance, please see the Environmental Assessment for the Island-Based FMP for St. Thomas/St. John (NMFS 2014). That description is incorporated by reference.

On February 9, 2018, Secretary of Commerce Wilbur Ross determined catastrophic fishery disasters occurred in the USVI because of impacts from Hurricanes Irma and Maria that made landfall in August and September of 2017, respectively.

With exception for 2011, the USVI does not export fresh/chilled/frozen finfish (NAICS code 114111) or shellfish (North American Industry Classification System [NAICS] code 114112). The USVI is a net importer of seafood and most of those imports are shellfish, although finfish imports exceeded shellfish imports from 2008 through 2017 (Table 3.4.1).

Table 3.4.1. Value (in dollars) of USVI finfish and shellfish imports and exports, 2008 - 2017.

Year	Imports by NAICS code			Exports by NAICS Code			Net Export
	114111	114112	Total	114111	114112	Total	
2008	$320,746	$65,508	$386,254	$0	$0	$0	-$386,254
2009	$206,403	$70,647	$277,050	$0	$0	$0	-$277,050
2010	$76,042	$45,300	$121,342	$0	$0	$0	-$121,342
2011	$0	$54,380	$54,380	$0	$8,711	$8,711	-$45,669
2012	$6,529	$63,893	$70,422	$0	$0	$0	-$70,422
2013	$6,528	$50,050	$56,578	$0	$0	$0	-$56,578
2014	$20,658	$63,700	$84,358	$0	$0	$0	-$84,358
2015	$0	$72,785	$72,785	$0	$0	$0	-$72,785
2016	-	$63,680	$63,680	$0	$0	$0	-$63,680
2017	$18,070	$82,086	$100,156	$0	$0	$0	-$100,156

(Source: https://usatrade.census.gov, August 9, 2018)

The closure of the HOVENSA refinery was a substantial loss to the USVI economy. Real Gross Domestic Product (GDP) declined from $4,241 in 2010 to $3,124 in 2016 (Table 3.4.2). From 2007 through 2010, average real GDP (2009 dollars) was $4,351.5 million. After the closure, average real GDP (2009 dollars) was $3,105.8 million from 2013 through 2016. Note that real GDP and per capita real GDP increased in 2016.

Table 3.4.2. USVI real GDP and per capita real GDP, 2010 – 2016.

Category	2010	2011	2012	2013	2014	2015	2016
Real GDP (Millions of 2009 Dollars)	$4,241	$3,895	$3,310	$3,117	$3,087	$3,095	$3,124
Per capita real GDP (2009 Dollars)	$39,859	$36,780	$31,404	$29,601	$29,372	$29,504	$29,838

(Source: U.S. Department of Commerce, Bureau of Economic Analysis BEA)

Services-producing industries combine to generate most of the USVI's gross domestic product (GDP). From 2011 through 2015, they accounted for an average of 62.4% of GDP (Table 3.4.3).

Those services-producing industries include industries in the travel and tourism sector, which are very important to the USVI and especially St. Thomas/St. John. The World Travel and Tourism Council (2015, 2017, 2018) estimates the travel and tourism sector generated 30.4% of USVI GDP in 2011, 29.9% in 2014, 31.8% in 2016, and 28% in 2017. Accommodation and food services industries are key components of travel and tourism, and they accounted for an average of 12.2% of GDP from 2011 through 2015 (Table 3.4.3). The contributions of each sector (percentages) in 2016 are the same as they were in 2015. After the closure of the HOVENSA refinery, the contribution by the goods-producing industries declined from 23% in 2011 to 14% in 2015.

Table 3.4.3. Percentage of USVI GDP by sector, 2011 – 2015.

Sector			Percentage of GDP				
			2011	**2012**	**2013**	**2014**	**2015**
Private	Goods-producing industries		23%	20%	16%	14%	14%
	Services-producing industries	Wholesale & retail trade	10%	10%	11%	11%	10%
		Accommodation & food services	10%	11%	12%	14%	14%
		Other services, except government	37%	40%	41%	40%	41%
		Total	*57%*	*61%*	*64%*	*65%*	*65%*
	Total Private		80%	81%	80%	79%	79%
Public	Federal government		3%	4%	4%	4%	4%
	Territorial government		17%	15%	16%	17%	17%
	Total Public		20%	19%	20%	21%	21%
Total			100%	100%	100%	100%	100%

(Source: U.S. Department of Commerce, Bureau of Economic Analysis).

The majority of the USVI's private sector employer establishments are located in St. Thomas/St. John (STT/STJ). In January 2016, for example, approximately 63% of USVI's employer establishments in the services-producing industries and 52% in the goods-producing industries were located in the island area (Table 3.4.4). Approximately 81% (155) of the goods-producing establishments in St. Thomas/St. John were in the construction industry, and they represented approximately 55% of all USVI employer establishments in construction during that month (Table 3.4.5).

Within the USVI's goods-producing sector there is one employer establishment in the computer and electronics products sector (NAICS code 334). It is located in St. Thomas.

Table 3.4.4. Number of employer establishments in STT/STJ and USVI and percentage that are in STT/STJ by product category, January 2016.

Product Category	Employer Establishments		
	STT/STJ	USVI	Percentage STT/STJ
Services	1,775	2,821	62.9%
Goods	191	365	52.3%
Total	1,966	3,186	61.7%

(Source: USVI Department of Labor, Quarterly Census of Employment and Wages by Island/County and Industry)

Table 3.4.5. Number of goods-producing employer establishments in STT/STJ and USVI and percentage that are in STT/STJ by industry, January 2016.

Industry(ies)	Employer Establishments			
	NAICS Code	STT/STJ	USVI	Percentage STT/STJ
Construction	23	155	282	54.96%
Manufacturing	31, 32, 33	35	71	49.30%
Agriculture, Mining	11, 21	1	12	8.33%
Total Goods Producing		191	365	52.33%

(Source: USVI Department of Labor, Quarterly Census of Employment and Wage by County/Island and Industry)

Within the services-producing industries during January of 2016, there were more employer establishments in the retail trade industry than any other industry in St. Thomas/St. John. The accommodation and food services industry had second largest number of employer establishments, followed by the professional, scientific & technical services industry that ranked third (Table 3.4.6).

Table 3.4.6. Number of services-producing employer establishments in STT/STJ and percentage that are in STT/STJ by industry, January 2016.

Industry	NAICS Code	Employer Establishments			Percent Total
		STJ	STT	STT/STJ	
Utilities	22	0	7	7	0.4%
Wholesale Trade	42	0	60	60	3.4%
Retail Trade	44-45	44	334	378	21.3%
Transportation & Warehousing	48-49	15	81	96	5.4%
Information	51	2	29	31	1.7%
Finance & Insurance	52	6	81	87	4.9%
Real Estate, Rental & Leasing	53	55	100	155	8.7%
Professional, Scient. & Tech Serv.	54	27	174	201	11.3%
Mgmt of Companies & Enterprises.	55	0	11	11	0.6%
Admin & Support Waste Mgmt	56	9	147	156	8.8%

Industry	NAICS Code	Employer Establishments			Percent Total
		STJ	STT	STT/STJ	
Educational Services	61	4	20	24	1.4%
Health Care & Social Assist.	62	8	131	139	7.8%
Arts, Entertainment & Recreation	71	5	39	44	2.5%
Accommodation & Food Services	72	56	163	219	12.3%
Other Services (Exc. Public Adm.)	81	19	148	167	9.4%
Total		250	1,525	1,775	100.0%

(Source: USVI Department of Labor, Quarterly Census of Employment and Wages by County/Island and Industry)

In St. Thomas/St. John, the government sector is the top employer (Table 3.4.7). From 2013 through 2017, it accounted for an average of approximately 25% of employees annually.

Within the private sector, the accommodation and food services sector is the top employer (Table 3.4.7). From January 2013 to 2017, the accommodation & food services sector accounted for an average of 22.1% of employees annually. There was an annual average of 5,296 employees in the accommodation and food services industry from January 2013 to 2017.

The accommodation and food services sector's sizeable contribution to GDP (Table 3.4.3) and it being a primary employer illustrate the importance of travel and tourism to the USVI economy. After Hurricane Irma, there were 2,623 employees in the accommodation & food services sector in January 2018 (Table 3.4.6). That was 50.5% below the January 2013–2017 average.

The retail trade sector had the second highest average number of employees from January 2013 to 2017. It had an annual average of 4,093 employees. After Hurricane Irma, employment in the retail trade sector fell from 4,057 in January 2017 to 3,058 in January 2018, a drop of 24.6%.

Employment did not decline in all sectors after the hurricane. Employment in the construction sector, which had averaged 632 employees from January 2013 to 2017, rose to 1,425 employees in January 2018. There was also an increase in the number of federal government employees, from an average of 572 from January 2013 to 2017 to 591 in January 2018. There were influxes of construction crews and federal relief workers in response to the damages created by Hurricane Irma.

Table 3.4.7. January employment in St. Thomas/St. John, 2013 - 2018.

Sector	Number of Employees						Ave. 2013 - 2017	Ave. % 2013-2017
	2013	2014	2015	2016	2017	2018		
Agriculture	0	0	0	0	1	0	0	0.0%
Utilities	40	42	25	29	36	23	34	0.1%
Construction	570	549	700	745	597	1,425	632	2.6%

Sector	Number of Employees						Ave. 2013 - 2017	Ave. % 2013-2017
	2013	2014	2015	2016	2017	2018		
Manufacturing	303	244	238	245	242	183	254	1.1%
Wholesale Trade	433	437	419	411	400	311	420	1.8%
Retail Trade	4,188	4,076	4,099	4,045	4,057	3,058	4,093	17.1%
Transportation & Communictn.	879	888	931	913	917	711	906	3.8%
Information	521	467	407	442	403	335	448	1.9%
Finance & Insurance	724	692	637	624	591	550	654	2.7%
Real Estate, Rental & Leasing	759	742	805	814	818	520	788	3.3%
Prof., Sci. & Tech. Services	628	645	709	815	856	678	731	3.1%
Management of Companies	311	275	183	130	105	69	201	0.8%
Admin., Support & Waste Mgt.	1,100	1,097	1,155	1,035	1,041	1,105	1,086	4.5%
Education Services	435	438	428	395	402	384	420	1.8%
Health Care & Welfare Serv.	837	867	840	902	936	670	876	3.7%
Arts, Entertainment & Rec.	571	623	593	600	595	330	596	2.5%
Accommodation & Food Serv.	5,120	5,176	5,305	5,486	5,393	2,623	5,296	22.1%
Other Services	566	533	545	538	557	455	548	2.3%
Private Sector Total	*17,985*	*17,791*	*18,019*	*18,169*	*17,947*	*13,430*	*17,982*	*75.2%*
USVI Government Sector	5,657	5,365	5,323	5,258	5,265	5,110	5,374	22.5%
Federal Government Sector	623	581	552	564	539	591	572	2.4%
Government Sector Total	*6,280*	*5,946*	*5,875*	*5,822*	*5,804*	*5,701*	*5,945*	*24.8%*
Grand Total	24,265	23,737	23,894	23,991	23,751	19,131	23,928	100.0%

(Source: USVI Dept. of Labor, Quarterly Census of Employment and Wages by County/Island and Industry)

More travelers and tourists visit St. Thomas/St. John than St. Croix, and St. Thomas is the most popular port of call. St. Thomas has two cruise ports: the West India Company Dock (almost universally referred to as Havensight, and the largest) and Crown Bay. Both are located on the south side of the island not far from Charlotte Amalie. Cruise ship passengers that visit St. John typically take a ferry from St. Thomas, although small cruise ships anchor off St. John at Cruz Bay. From 2010 through 2016, approximately 80% of air travelers and approximately 94% of cruise passengers visited the island area (Table 3.4.8). Approximately 93% of the cruise ships made call there.

Table 3.4.8. St. Thomas/St. John annual tourism indicators, 2010 – 2017.

Year	St. Thomas/St. John			Percent of USVI		
	Air Visitors (1000s)	Cruise Passengers (1000s)	No. Cruise Ships	Air Visitors	Cruise Passengers	No. Cruise Ships
2010	542.0	1,751.3	631	78.6%	94.2%	92.8%
2011	530.9	1,887.1	643	78.4%	93.9%	92.1%
2012	580.3	1,790.6	616	78.7%	94.0%	92.4%

Year	St. Thomas/St. John			Percent of USVI		
	Air Visitors (1000s)	Cruise Passengers (1000s)	No. Cruise Ships	Air Visitors	Cruise Passengers	No. Cruise Ships
2013	570.0	1,886.6	579	81.1%	94.4%	92.5%
2014	601.9	1,979.9	611	82.4%	95.0%	93.3%
2015	622.7	1,747.6	560	81.5%	93.0%	92.0%
2016	646.2	1,694.1	535	81.1%	95.4%	94.0%
Average	584.9	1,819.6	596.4	80.3%	94.3%	92.7%
2017	506.2	1,271.7	409	79.5%	97.5%	96.0%

(Source: USVI Bureau of Economic Research, Annual Tourism Indicators)

Hurricane Irma, which hit the island area on September 6, 2017, had a substantial adverse impact on tourism in the area. Charlotte Amalie suffered severe damage, and the two cruise ports near it were closed for weeks. While an average of 23 ships made call in September and another 29 in October from 2014 through 2016, there were only two cruise ship calls to St. Thomas in September and none in October of 2017. Although the numbers of monthly cruise passenger arrivals and ship calls rebounded in December 2017; their numbers from January through April of 2018 were less than they had been in previous four years (Figures 3.4.1 and 3.4.2). The peak cruise season run from December through April.

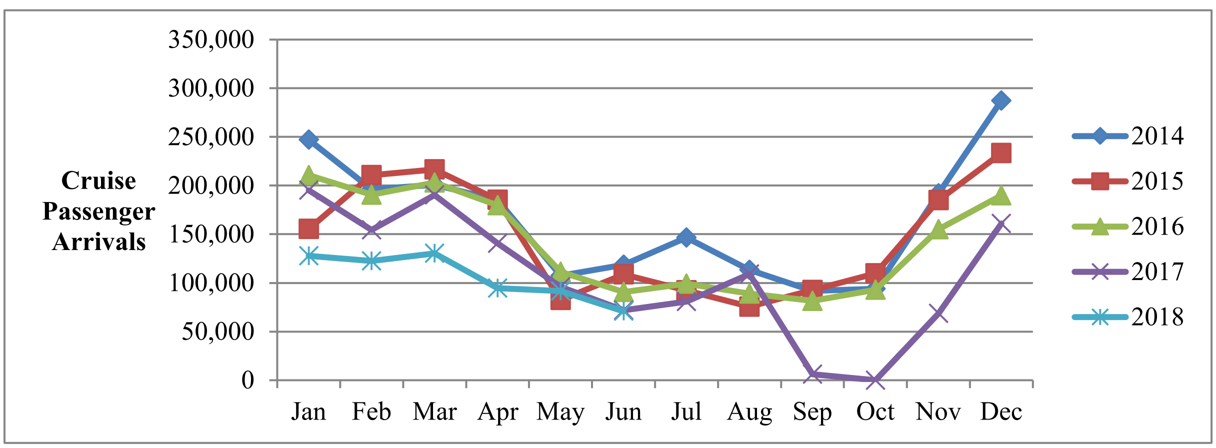

Figure 3.4.1. St. Thomas/St. John monthly cruise passenger arrivals, January 2014 – June 2018. (Source: USVI Bureau of Economic Research, Monthly Tourism Indicators)

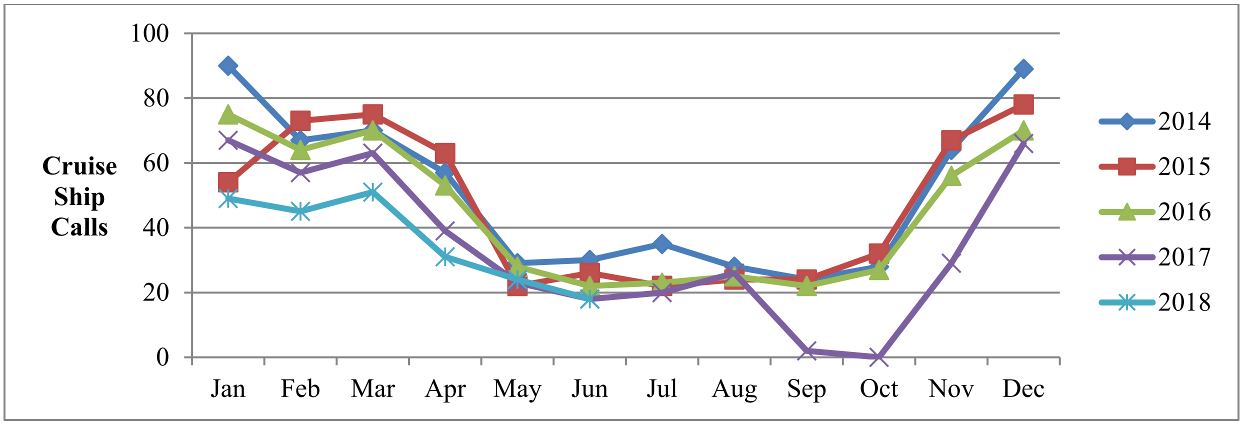

Figure 3.4.2. St. Thomas/St. John monthly cruise ship calls, January 2014 – June 2018.
(Source: USVI Bureau of Economic Research, Monthly Tourism Indicators)

Cruise passenger visits have significant beneficial economic impacts. The Florida-Caribbean Cruise Association (FCCA) estimates passenger and crew visits along with additional expenditures by the cruise lines generated a total of $344.3 million in cruise tourism expenditures in the USVI during the 2014/2015 cruise year, and the average passenger spent $150.21 in the USVI. The FCCA also estimates the total economic impact of that $344.3 million spent in the USVI generated direct employment of 3,396 jobs and $75.0 million directly in annual wages in the USVI. When indirect impacts are included, the $344.3 million spent generated 6,397 jobs and $11 million in annual wages in the USVI during the 2014/2015 cruise year (FCCA 2015). From 2012 through 2016, approximately 93% of ship calls to the USVI were in St. Thomas/St. John. If that meant the island area accounted for 93% of the $344.3 million in expenditures, the 2014/2015 cruise year generated a total of $320.2 million in cruise tourism in the St. Thomas/St. John. Furthermore, if approximately 93% of the impacts are in St. Thomas/St. John, the 2014/2015 cruise tourism expenditures generated 5,949 jobs and approximately $10.2 million in annual wages in the island area.

Air visitors are also important to the travel and tourism sector in St. Thomas/St. John. From 2014 through 2016, an annual average of 0.62 million visitors arrived by air. The air tourist season typically runs from December to July.

Hurricane Irma had a greater impact on air visitor arrivals to St. Thomas/St. John than cruise passenger arrivals. The Cyril E. King Airport in St. Thomas suffered heavy damage on September 6 and reopened to limited commercial flights on September 28 (Virgin Islands Daily News, September 29, 2017).

The average number of major carrier direct flight seats per week to St. Thomas has been substantially lower in the months after the hurricane, and especially during the first half of 2018 (Figure 3.4.3). However, the number trended upward during the first half of 2018.

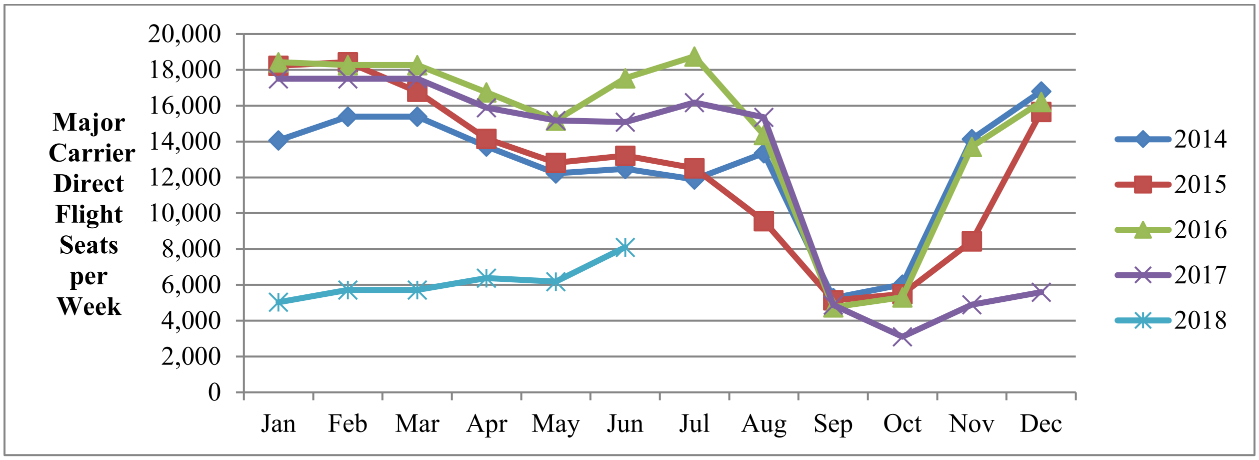

Figure 3.4.3. St. Thomas average number of major carrier direct flight seats per week, January 2014 – June 2018.
(Source: USVI Bureau of Economic Research, Monthly Tourism Indicators)

The changes in the number of air visitor arrivals largely mirror the changes in the average number of direct flight seats. The number of January 2018 air visitor arrivals was approximately 72% lower than the average number during that month from 2014 through 2017. During the first six months of 2018, the total number of air visitor arrivals was approximately 61% below the average total number during those months, although monthly figures improved.

Hurricanes Irma and Maria severely damaged hotels in the USVI. According to the USVI Department of Tourism, as of August 20, 2018, of the more than 4,500 pre-storm-available traditional overnight accommodations (hotels, bed and breakfasts, resorts, timeshares, etc.), only approximately 1,800 were available. Approximately 1,050 of those rooms were in St. Thomas and almost 150 in St. John. That figure, however, did not include the more than 600 villas and 200 charter yachts available in St. Thomas/St. John at that time. It also did not include Airbnb listings. From January to August 20, 2018, 12,400 visitors stayed at an Airbnb in St. Thomas/St. John. In August 2018, Airbnb had 830 active listings in St. Thomas and 250 in St. John (USVI Department of Tourism August 20, 2018).

In 2015 and 2016, the Marriott Hotel Service Frenchman's Reef ranked second, Caneel Bay Resort ranked fourth, and the Ritz Carlton Virgin Islands ranked third among the USVI's top 25 private sector employers. The Caneel Bay Resort was closed for the 2017/2018 season and is not scheduled to reopen this year, although it rented rooms to relief workers. The Marriott at Frenchman's Reef is closed until December 31, 2018 (www.vinow.com/recovery/hotel-property-updates/virgin-islands/). The Ritz-Carlton St. Thomas is not scheduled to reopen until January 1, 2019. The Sugar Bay Resort & Spa, which ranked sixth in 2015 and tenth in 2016 among the top

25 employers, has yet to reopen. The Westin Resort, which ranked ninth in 2015 and 2016, cancelled all reservations through January 3, 2019. Reconstruction of resorts, hotels and other structures caused employment gains in the construction sector, which rose from 597 in January 2017 to 1,425 in January 2018 (Table 3.4.6).

From January through August 2017, the average monthly unemployment rate in St. Thomas/St. John was 9.7%. After Hurricane Irma, the monthly unemployment rate rose to 16.7% in September and 18.6% in October (Figure 3.4.4). From April through July 2018, it averaged 9.7%.

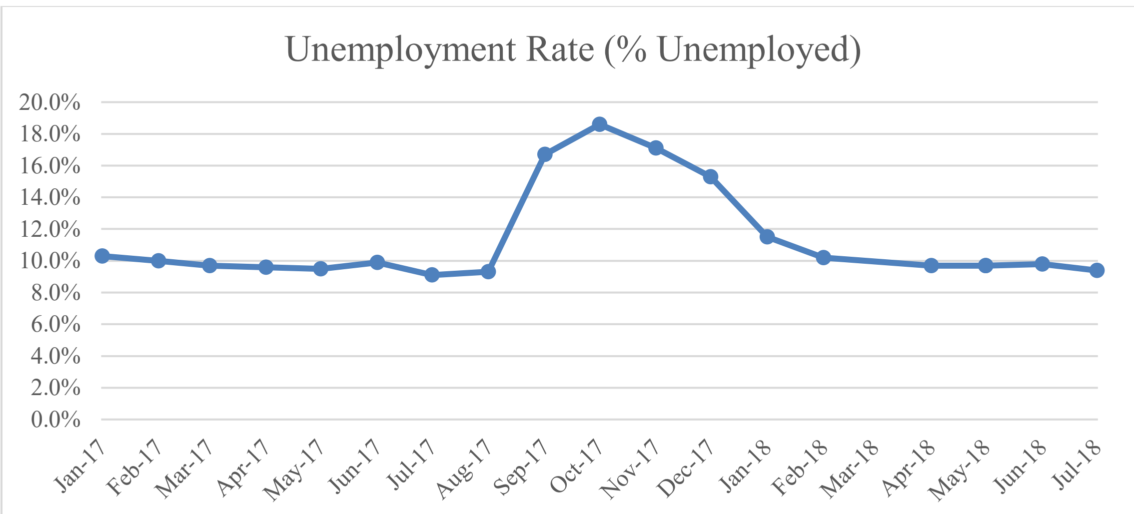

Figure 3.4.4. Unemployment rate in St. Thomas/St. John, January 2017-July 2018.
(Source: USVI Bureau of Economic Research)

The average number of employees per establishment decreased substantially in the travel and tourism sector after Hurricane Irma. For example, the average number of employees per establishment in the accommodation industry in the first quarter of 2018 was substantially lower than it had been in the first quarter of 2016: 83 in 2016 as compared with 43 in 2018 in St. Thomas and from 87 in 2016 to 19 in 2018 in St. John (Table 3.4.9). Similarly, the average number of employees per establishment in the food service and drinking places industry fell from 14 to 8 in St. Thomas and from 13 to 4 in St. John.

Table 3.4.9. Numbers of employer establishments, average monthly employees, and average monthly employees per establishment for three tourism-related industries, First Quarter 2016 and 2018.

Time Period	Accommodation		Food Serv. & Drinking Places		Scenic & Sightseeing Trans.	
	St. Thomas	St. John	St. Thomas	St. John	St. Thomas	St. John
First Quarter of 2016						
Establishments	27	9	136	47	12	5
Average Monthly Employees	2,241	785	1,884	619	102	9
Average Employees per Establishment	*83*	*87*	*14*	*13*	*9*	*2*
First Quarter of 2018						
Establishments	27	9	147	46	15	4
Average Monthly Employees	1,163	170	1,160	193	63	0
Average Employees per Establishment	*43*	*19*	*8*	*4*	*4*	*0*

(Source: USVI Department of Labor, Quarterly Census of Employment and Wages)

Although large resorts employ hundreds, most employer establishments in the island area have from one to four employees. Approximately 73% of the establishments in 2016, for example, employed from one to four employees (Table 3.4.10). There were only two establishments with over 500 to 999 employees and none with a 1,000 or more.

Table 3.4.10. Numbers of employer establishments by number of employees, 2016.

Number of Employees	Employer Establishments			Percent Employer Establishments		
	St. Thomas	St. John	Total	St. Thomas	St. John	Total
1 to 4	699	154	853	51.8%	60.4%	53.2%
5 to 9	281	45	326	20.8%	17.6%	20.3%
10 to 19	189	24	213	14.0%	9.4%	13.3%
20 to 49	126	28	154	9.3%	11.0%	9.6%
50 to 99	35	2	37	2.6%	0.8%	2.3%
100 to 249	13	0	13	1.0%	0.0%	0.8%
250 to 499	4	2	6	0.3%	0.8%	0.4%
500 to 999	2	0	2	0.1%	0.0%	0.1%
1,000 and more	0	0	0	0.0%	0.0%	0.0%
1 to over 1,000	1,349	255	1,604	100.0%	100.0%	100.0%

(Source: U.S. Department of Commerce, Census Bureau, American Fact Finder)

Employer establishments do not include non-employer businesses, such as sole proprietorships. Although the Census Bureau has annual non-employer statistics (NES) for the 50 states, the NES program does not include the USVI or any other territory.

The cost of living in the USVI remains very high relative to the U.S. mainland. In 2006, the U.S. Office of Personnel Management estimated the USVI's cost of living is 28.21% above that of Washington, DC (71 Federal Register 63179). Housing accommodations, groceries, and utilities have much higher prices in the USVI.

The USVI's economy is nearly six times more energy-intensive than the economy in the 50 states (U.S. Department of Energy, Energy Information Administration [EIA] September 21, 2017). As of February 2017, the average price of electricity paid by USVI consumers was greater than 32 cents per kilowatt hour (Kwh), which was about three times the average in the 50 states (U.S. Department of Energy, EIA September 21, 2017).

According to the EIA, USVI's energy efficiency has been low because of water desalination requirements, the predominance of small, simple-cycle generators, and operational constraints and power losses on the islands' isolated electric grids. However, the USVI government has set a goal of achieving a 60% reduction in fossil fuel demand by 2025 across all consuming sectors. More than half of the reductions are planned to come from energy efficiency, particularly in generation, transmission, street lighting, and desalination, with the balance coming from wind, solar, and biomass technologies, including waste-to-energy and landfill gas. The Virgin Islands Water and Power Authority is converting most petroleum-fired electric generators to cleaner-burning propane and adding substantial solar resources. Solar water heaters are required in all new construction and in major renovations.

There are two large solar arrays in St. Thomas. First, is the USVI Solar 1 commercial-scale solar plant in the Estate Donoe Township on St. Thomas that was capable of producing 5 megawatts; however, it suffered catastrophic damage during Hurricane Irma. At the time of the hurricane, it was owned by AES, a Colorado-based business with operations throughout the Caribbean. Now USVI Solar 1's future is uncertain. Second, is the solar field at the Cyril E. King Airport, which suffered minimal damage.

Food prices are high because the USVI imports most of its food. According to USVI Department of Agriculture Commissioner Denis Robles, the USVI has typically imported over 97% of its food (The Virgin Islands Consortium March 29, 2017). That figure is consistent with the United Nations Food and Agriculture Organization (FAO) estimate. That makes St. Thomas/St. John vulnerable to food shortages. After Hurricanes Irma and Maria, there was a serious food shortage in the USVI. Farmers lost crops, bees and livestock, and the USVI had to rely on food imports for all of its food (Robles in the St. Croix Source, February 26, 2018).

Historically higher costs of living coupled with higher unemployment rates contribute to the USVI having historically higher poverty rates than on the U.S. mainland. In 2009, for example, 22.5% of USVI residents had incomes below the poverty level as compared to 14% in the 50 states and DC (Census, American Fact Finder).

Like Puerto Rico, the USVI has a large public debt. Between fiscal years 2005 and 2015, USVI's public debt nearly doubled, reaching $2.6 billion and a debt to GDP ratio of 72 percent (Government Accountability Office [GAO] October 2017). Since 2010, most of USVI's debt funded general government operations. Revenue has been stagnant and net position negative and declining, which indicate a deteriorating financial position. While the USVI holds a year's worth of debt service payments in reserve, GAO found that economic uncertainty and looming government pension-fund insolvency by 2023 could hamper repayment. In early 2017, the USVI was unable to access capital markets to issue new debt at favorable rates. Although the government adopted a financial plan intended to reduce expenditures and increase revenue, the plan does not address USVI's significant unfunded pension and other post-employment benefit (OPEB) liabilities and it is unclear whether the plan would produce the intended level of savings.

On September 4, 2017, Governor Mapp declared a state of emergency. In the state of emergency, the governor may: (1) suspend the provisions of any statute prescribing the procedures for conduct of territorial business, or the orders, rules, or regulations of any territorial agency, (2) utilize all available resources of the “Territory” and (3) take any other action deemed necessary. The governor can also move government employees around at would, without regard to the territory’s civil service laws for classified employees. Since the declaration of September 4, the Governor has issued 11 proclamations to extend it. This has raised increased concerns about declining transparency regarding USVI government expenditures and increasing risk of default.

3.5 Description of the St. Thomas/St. John Fishery

3.5.1 Introduction

Today, fish and fishing contribute to the local economy and remain central to the island culture that characterizes the USVI, including St. Thomas and St. John. The fisheries include small-scale commercial fishing, recreational fishing, and subsistence fishing. Commercial fishing supplies sustenance and employment, and recreational fishing provides food and leisure activity for local residents, tourists and visitors. Subsistence fishing, or fishing for household consumption, characterizes both commercial and recreational fisheries. Sport fishing, or competitive fishing for game fish, represents an aspect of recreational fisheries of significance to USVI, especially St. Thomas. This chapter describes the characteristics of the commercial, recreational, and subsistence fisheries within the St. Thomas/St. John management area.

3.5.2 Commercial Fishing Activity

Commercial fishermen in St. Thomas/St. John pursue multiple species, commonly using multiple gear types. These fishermen have been characterized as "artisanal"[25] because their commercial fishing vessels tend to be less than (and commonly much less than) 45 feet (13.7 m) long, have small crews, yield small revenues, and their seafood processors are small-scale producers. Small-scale fisheries are defined as traditional fisheries involving families or households using relatively small vessels, taking short fishing trips to provide for local consumption or export (UN Food and Agricultural Organization). As mentioned in Section 3.4, the USVI does not export finfish or shellfish, but is a net importer of seafood (Table 3.4.1).

Commercial fishermen in St. Thomas/St. John primarily target benthic, coastal and deep-water pelagic fish, spiny lobster, and queen conch (Kojis et al. 2017). Only 4.6% of fishermen reported fishing solely in federal waters (3-200 nm). Of the remaining fishermen, about half reported that they fished only in territorial waters (<3 nm from shore) while the other half fished equally in federal and territorial waters. The majority (89.4%) of fishermen surveyed said that they fish throughout the year. The remaining 10.6% fished seasonally for such species as yellowtail snapper, dolphinfish, wahoo, tuna, kingfish, blue runner, red hind, queen triggerfish, gar, and lobster. In general, fishermen averaged 8.4 trips per month, at 8.2 hours per trip. A few fishermen reported fishing trips lasting several days. The length of the trip depends on the gear used.

Commercial landings were originally reported by gear type, but since 2000 have been reported per species or family group (e.g., groupers). Total annual landings for all species reported in St. Thomas/St. John peaked in 2002 at 819,373 pounds, and recent (2016) annual landings were approximately half of that value (Table 3.5.1). Average landings were generally greatest in January (6 of the 17 years), at 56,016 pounds (Table 3.5.1). The number of trips per year have decreased from a high of 6,000 in 2001 to a low of about 1,950 in 2013, but the number of pounds harvested per trip has increased recently peaking in 2014 (Figure 3.5.1).

[25] The NOAA Fisheries Glossary Revise Edition June 2006 defines artisanal fishery as a fishery based on traditional or small-scale gear and boats.

Table 3.5.1. Commercial landings in pounds for St. Thomas/St. John during 2000-2016, by year and month.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2000	51,026	51,763	56,766	53,746	52,455	46,674	43,730	48,727	51,057	57,393	53,060	51,490	617,886
2001	60,484	64,928	71,525	53,370	62,817	58,366	57,874	58,895	64,348	66,780	66,750	69,430	755,566
2002	72,333	69,112	66,617	72,011	69,199	64,123	71,180	67,046	69,306	70,290	65,691	62,467	819,373
2003	68,707	70,492	79,631	72,298	75,610	62,089	61,260	64,265	65,514	70,933	58,391	63,432	812,623
2004	75,747	68,708	64,580	64,347	62,437	61,830	74,075	62,504	65,199	73,466	62,419	66,399	801,710
2005	65,267	62,312	68,476	69,354	58,892	57,425	53,762	60,827	61,643	58,651	59,956	66,933	743,498
2006	63,489	64,799	66,742	60,135	65,104	57,346	65,057	71,937	65,378	70,859	74,151	64,881	789,877
2007	68,080	54,879	61,768	55,338	60,960	53,981	56,894	58,785	64,685	60,889	55,008	57,434	708,698
2008	62,928	60,875	64,070	59,532	58,669	39,986	53,632	56,355	59,048	60,267	56,974	58,235	690,570
2009	70,584	65,636	55,554	57,458	52,821	58,030	61,195	61,222	49,633	61,041	54,511	61,460	709,143
2010	61,841	62,182	68,477	58,263	49,400	52,796	47,419	45,103	49,777	52,192	46,948	47,366	641,764
2011	55,257	36,588	44,991	40,092	37,560	37,416	36,565	37,243	38,195	36,928	33,240	34,703	468,778
2012	33,680	36,343	33,088	29,985	38,638	32,402	32,727	31,574	34,026	33,041	31,195	25,881	392,581
2013	34,548	26,745	28,466	28,021	32,938	24,906	30,768	30,440	30,125	32,276	24,000	24,713	347,948
2014	32,381	32,668	39,582	36,557	33,434	32,078	38,975	36,060	29,064	39,564	27,551	36,598	414,511
2015	38,817	31,230	35,685	33,134	33,352	24,349	32,473	33,706	36,748	38,926	26,419	29,235	394,075
2016	37,104	36,326	34,605	33,490	33,469	32,942	35,183	35,908	34,928	43,447	37,707	37,947	433,055
Average	**56,016**	**52,682**	**55,331**	**51,596**	**51,633**	**46,867**	**50,163**	**50,623**	**51,098**	**54,526**	**49,057**	**50,506**	**620,097**

(Source: Southeast Fisheries Science Center, Feb 2018)

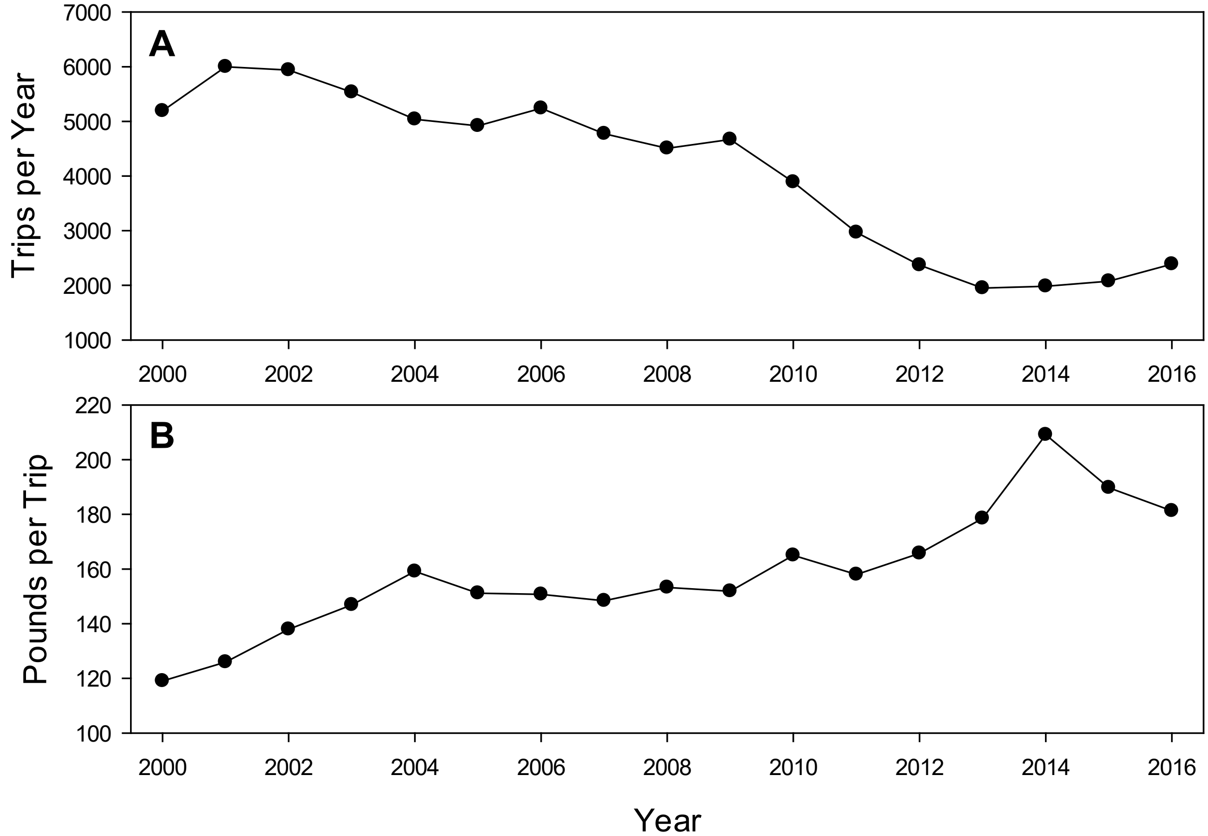

Figure 3.5.1. Number of fishing trips conducted each year in St. Thomas/St. John (A) and the pounds harvested per trip (B).
(Source: Southeast Fisheries Science Center, Feb 2018)

3.5.2.1 Commercial Fishermen

The most recent census of licensed fishermen in the USVI (Kojis et al. 2017) reported a total of 113 commercial fishermen on St. Thomas and six on St. John for a total of 119. That number was estimated using the list of fishermen applying for a fishing license renewal in 2015-2016 and in 2016-2017 as provided by the USVI's Department of Planning and Natural Resources (DPNR). Of those 119 fishermen, 23 were no longer actively fishing and the status of another 21 fishermen was unknown. See Section 3.5.9 for results from previous censuses of commercial fishermen conducted in the USVI.

Commercial fishermen in St. Thomas/St. John had an average of 26.3 years of experience and about half report that their sole employment comes from fishing (Kojis et al. 2017). In St. Thomas/St. John only 36.4% of surveyed fishermen reported that they fish using two different methods (*i.e.*, gear), with only 19.2% using one method (Kojis et al. 2017). Line fishing[26] was the most common method used by commercial fishermen, followed by trap, and then net fishing (see Section 3.2.3 for more information). Using multiple methods allows USVI fishermen to target multiple species per trip, which in St. Thomas/St. John includes reef fish, spiny lobster, and coastal pelagics.

The number of fishermen submitting catch reports from 2000-2016 ranged from a high of 136 in 2001 to a low of 66 in 2016. The catch reports were modified in 2011 to better reflect harvest, and since 2012 the catch per unit effort (CPUE = pounds landed/number of fishermen) has been increasing (Figure 3.5.2).

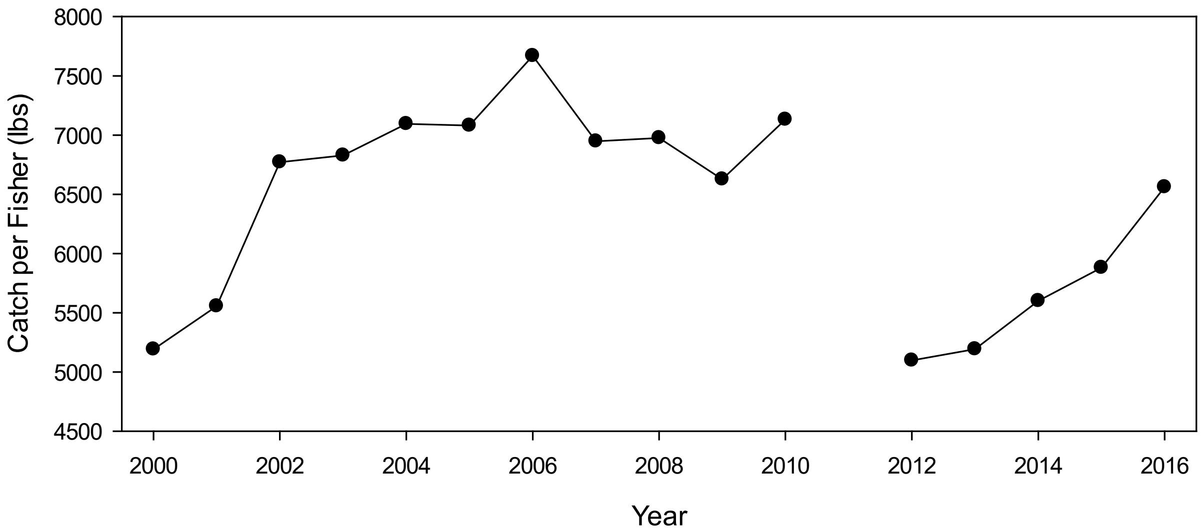

Figure 3.5.2. Total landings (pounds) per number of fisher each year in St. Thomas/St. John. Year 2011 was omitted due to changes in reporting form.
(Source: Southeast Fisheries Science Center, Feb 2018)

3.5.2.2 Commercial Fishing Vessels

According to the 2016 census, there was a total of 104 fishing boats on St. Thomas/St. John ranging from 14-47 feet in length with a mean length of 24.6 ± 7.8 (Kojis et al. 2017). That number does not include dinghies (generally < 12 feet in length), which fishermen generally use close to shore, when fishing with seine nets, and during calm weather. The St. Thomas/St. John fleet was comprised of older vessels, the majority of which were built in 1981-1990 and constructed of fiberglass and wood. The majority of fishing vessels have a single gas-powered engine ranging in horsepower from 20-300 hp for outboard engines and 40-671 hp for inboard

[26] Line fishing includes fishing with hand lines, rods and reels, tuna buoys, deep-water snapper fishing, surface and bottom longlines, etc.

engines. Inboard engines were generally in the 151-300 size range while the majority of outboard engines were 101-150 hp. Most fishermen reported using electronic equipment such as depth finders and GPS, but most relied on cell phones for communication rather than a marine radio or EPIRB.

3.5.2.3 Commercial Fishing Gear

Gear and methods used in the commercial fishery in St. Thomas/St. John include lines, traps, nets, and hand or spear collection via SCUBA or skin diving. The top three methods used by fishermen in St. Thomas/St. John were lines (77.8%), traps (43.4%), and nets (26.3%) (Kojis et al. 2017). Commercial landings for trap gear have consistently been greater in St. Thomas/St. John than landings reported for the other gear methods (Figure 3.5.3).

Of all the hook and line gear types used by fishermen in St. Thomas/St. John, yo-yo reels (handlines) were used the most, followed by rod and reel lines (Kojis et al. 2017). Only one fishermen reported using a bottom longline, and no fishermen reported using a surface longline. The number of hooks per line ranged from 1-10[27] and total hours fished ranged from one to 12 hours, with most gear fished for about four hours per set.

Fishermen in St. Thomas/St. John reported owning 6,287 traps (55% fish traps and 45% lobster traps) (Kojis et al. 2017). However, studies show that fishermen do not use all of their traps all the time (Sheridan et al. 2006; Kojis et al. 2017). During interview with trap fishermen, Sheridan et al. (2006) found that most fishermen in St. Thomas used trap lines (average of 13 traps per line; range 4-25 traps per line) and mechanized pot haulers. Traps lines were marked with buoys on each end of the trap lines and when those buoys were missing, employed grapple hooks to retrieve the trap line (Sheridan et al. 2006). All traps were made of wire materials, and all reported identical size specifications per trap: 4 ft (122 cm) length and width, 1.5 ft (46 cm) height, and 2 in (5 cm) mesh (Sheridan et al. 2006). Although the minimum mesh size for fish traps in federal waters is 3.8 cm, the minimum mesh size in territorial waters is 2 in (5.cm).

[27] Hook per line data was not available for the bottom longline gear.

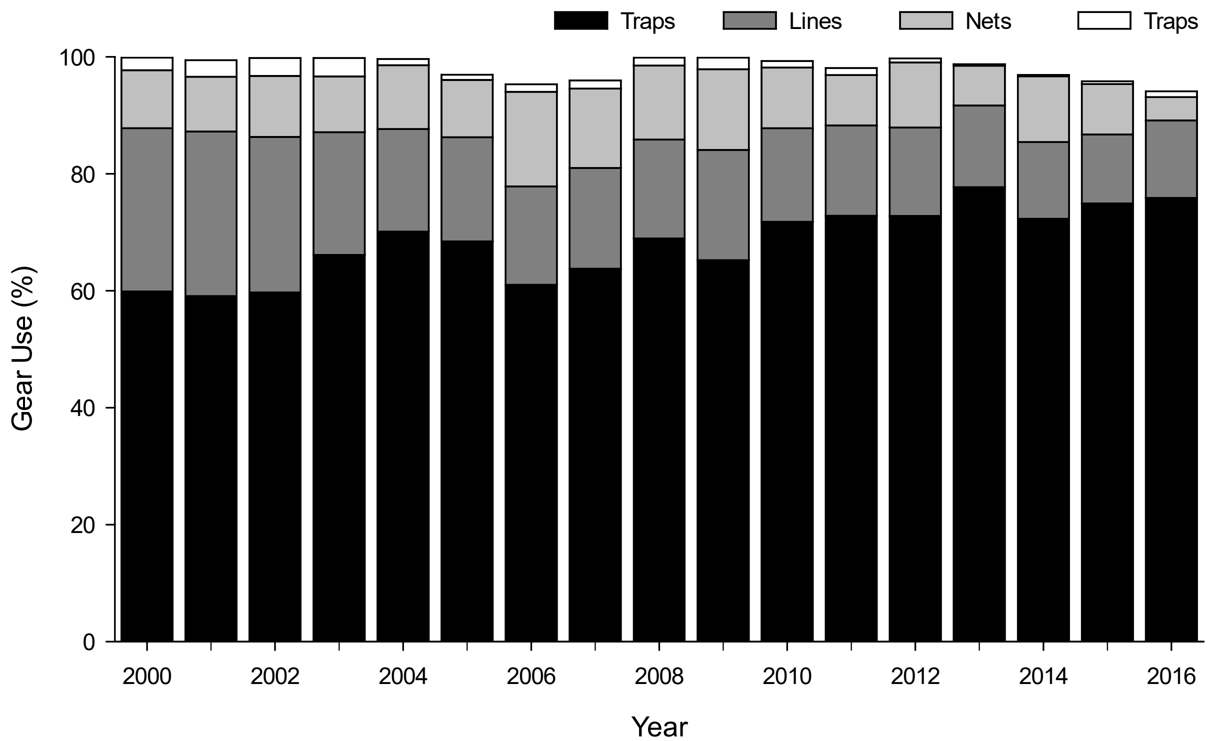

Figure 3.5.3. Percent of commercial landings (pounds) by top gear methods used by fishermen in St. Thomas/St. John.
(Source: Southeast Fisheries Science Center, Feb. 2018)

3.5.2.4 Targeted Species

Commercial fishermen in St. Thomas/St. John target a wide variety of species, usually depending on which fish or shellfish they would easily be able to sell, or would generate the greatest amount of money. Reef fish are targeted by >80% of the fishermen, which includes several species in the grouper, snapper, triggerfish, parrotfish, grunt, and surgeonfish families (Kojis et al. 2017). Close to half of the fishermen also reported that they target spiny lobster and coastal pelagic species such as jacks and mackerels. Fishermen also reported targeting dolphinfish, wahoo, and deep-water snappers. Commercial landings corroborated what the fishermen reported as targeted catch groups, with spiny lobster, snappers, groupers, and triggerfish dominating the historical landings (2000-2016) (Figure 3.5.4) and spiny lobster, queen triggerfish, and red hind grouper dominating the recent landings (2012-2016) (Figure 3.5.5).

One seasonal fisher reported targeting dolphinfish, kingfish, tuna and wahoo in October and November and several others reported that they fish seasonally for yellowtail snapper and potfish (Kojis et al. 2017). One year-round fisher targets blue runner and yellowtail in August.

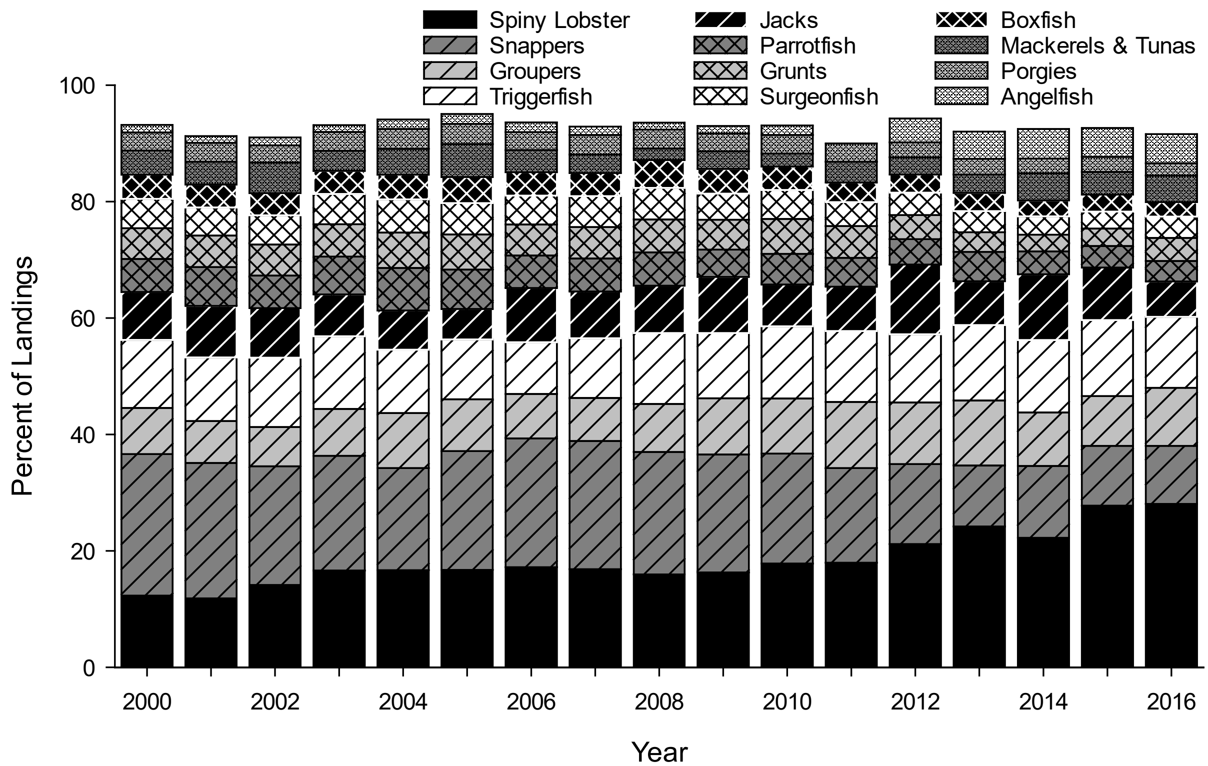

Figure 3.5.4. Most targeted (>90% of commercial landings) catch each year in St. Thomas/St. John.
(Source: Southeast Fisheries Science Center, Feb 2018)

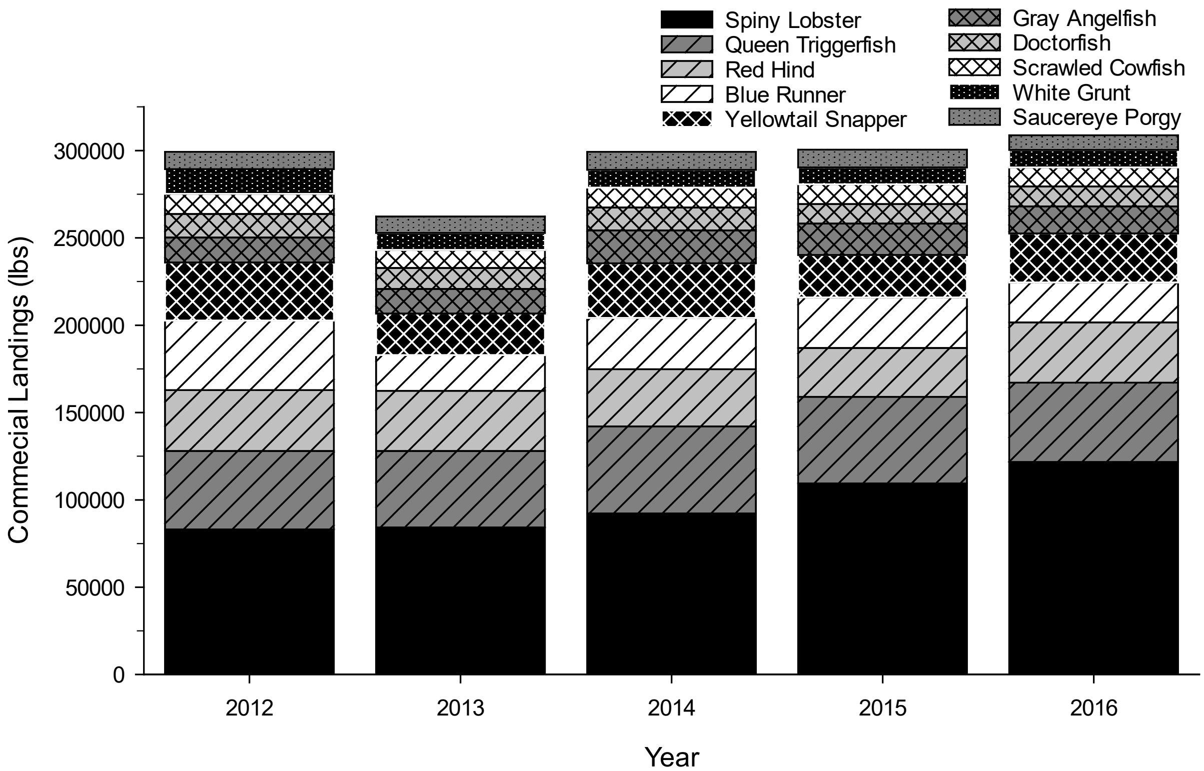

Figure 3.5.5. Most targeted (in pounds landed) stocks in 2012-2016 in St. Thomas/St. John. (Source: Southeast Fisheries Science Center, Feb 2018)

3.5.2.5 Fishing Areas

St. Thomas/St. John fishing areas include territorial (<3 nm) and federal (3-200 nm) waters and fishermen report their landings by the location code where the fish were caught (Figure 3.5.6). St. Thomas fishermen reported landing their catch at 18 different sites on the north, south and east end of the island and one site in the British Virgin Islands, while St. John fishermen reported using four sites (Kojis et al. 2017). Frenchtown on the south side of the island and Hull Bay on the north side were the most commonly used landing sites. Most fishermen permanently moor their vessels and use one landing site.

A survey of trap fishermen found that most traps were deployed on the southwest and southeast coasts of St. Thomas while few traps were deployed on the northeast coast of St. Thomas and the north coast of St. John (Sheridan et al. 2006). St. Thomas fishermen on average fished their traps at depths of 155.8 ft (47.5 m) with most of their traps deployed in seagrass, sand, and coral rubble.

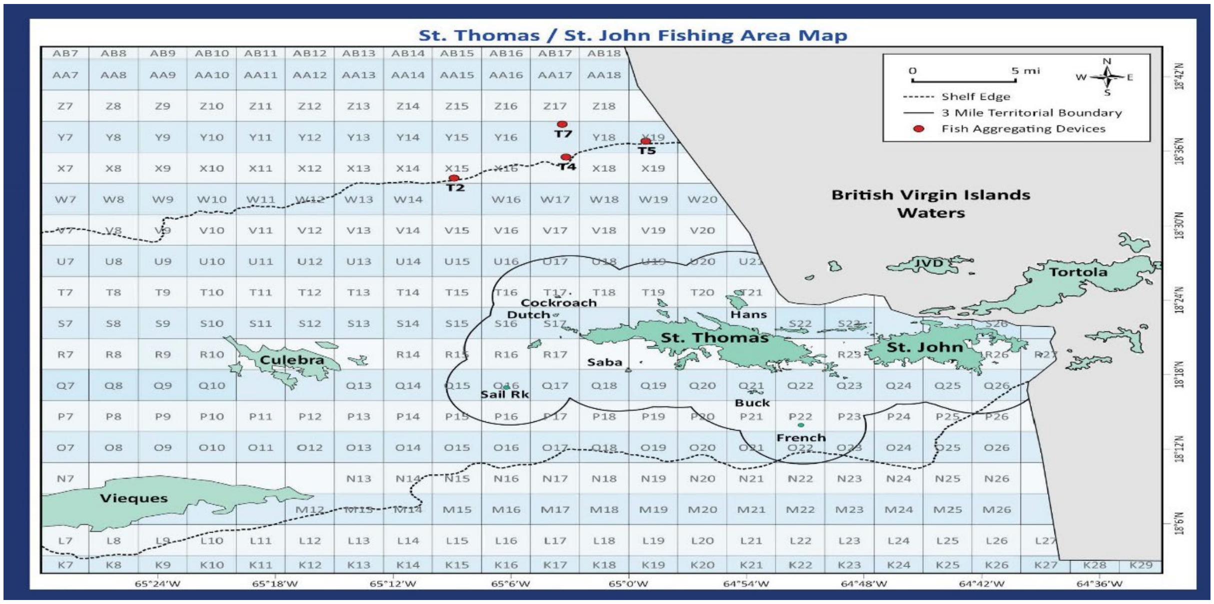

Figure 3.5.6. St. Thomas/St. John commercial fishing area map.

3.5.2.6 Licenses, Permits and Fees

Federal Waters

Fishing vessel permits are not required to commercially harvest any Council-managed species in federal waters of the U.S. Caribbean. Also, there are no federal licenses or permits required for the recreational harvest of reef fish, queen conch, spiny lobster, or aquarium trade species in the EEZ of the U.S. Caribbean. However, a federal permit may be issued to take or possess Caribbean prohibited coral only as a scientific research activity, exempted fishing, or exempted education activity. Efforts are underway to evaluate the development of a federal permit system in federal waters. Highly migratory species permits are required for commercial fishermen in the U.S. Caribbean EEZ.

Territorial Waters

The USVI requires commercial fishing licenses for (1) all commercial fishermen, (2) any person who uses a pot, trap, set-net, or haul seine, (3) any person who sells, trades, or barters any part of their catch (including charter boat operators who sell or trade their catch), and (4) commercial fishing helpers who must obtain a helper's permit to assist a licensed commercial fisher (the licensed commercial fisher must be onboard when the helper is fishing) (See USVI Handbook). USVI commercial fishermen are required to report their catch (all species) and effort for every trip (CFMC 2011a). Commercial Catch Report (CCR) forms must be submitted to the DPNR on a monthly basis, within two weeks after every fishing trip or within two weeks after the close of the month if no fishing took place (DPNR 2019). Commercial fishing licenses are only issued to U.S. citizens who are permanent residents of the USVI for at least one year. No licenses are issued to minors under 17 years old, except with written consent. Commercial fishermen are exempt from boat registration fees, provided they possess a valid Department of Licensing and Consumer Affairs (DLCA) business license ($1.00 license) and are in compliance with submitting their required CCRs. Fishermen must first have a commercial fishing license before obtaining a DLCA business license to sell their catch.

On August 24, 2001, the DPNR implemented a moratorium on issuance of new commercial fishing licenses, which remains in effect. License renewals are only issued to fishermen who have held a commercial fishing license within three years of June 2001 and have complied with catch reporting requirements.

3.5.3 Recreational Fishing

The unique topography of St. Thomas/St. John, south of the six-mile-deep Puerto Rico Trench, makes this management area known for some of the hardiest game fish in the world. Many recreational fishermen fish along these drop-offs. Two well-known fishing areas off of St. Thomas are the North Drop, about 20 miles north of St. Thomas; and the South Drop, 8 miles south of St. Thomas. Migrating schools of small fish gather in these areas, which attracts larger pelagics such as billfish, tuna, wahoo and dolphin.

Recreational fishermen also fish from shore (Figure 3.5.7), but there are various marine reserves around St. Thomas/St. John in which fishing is prohibited, limited, and/or requires a special permit.

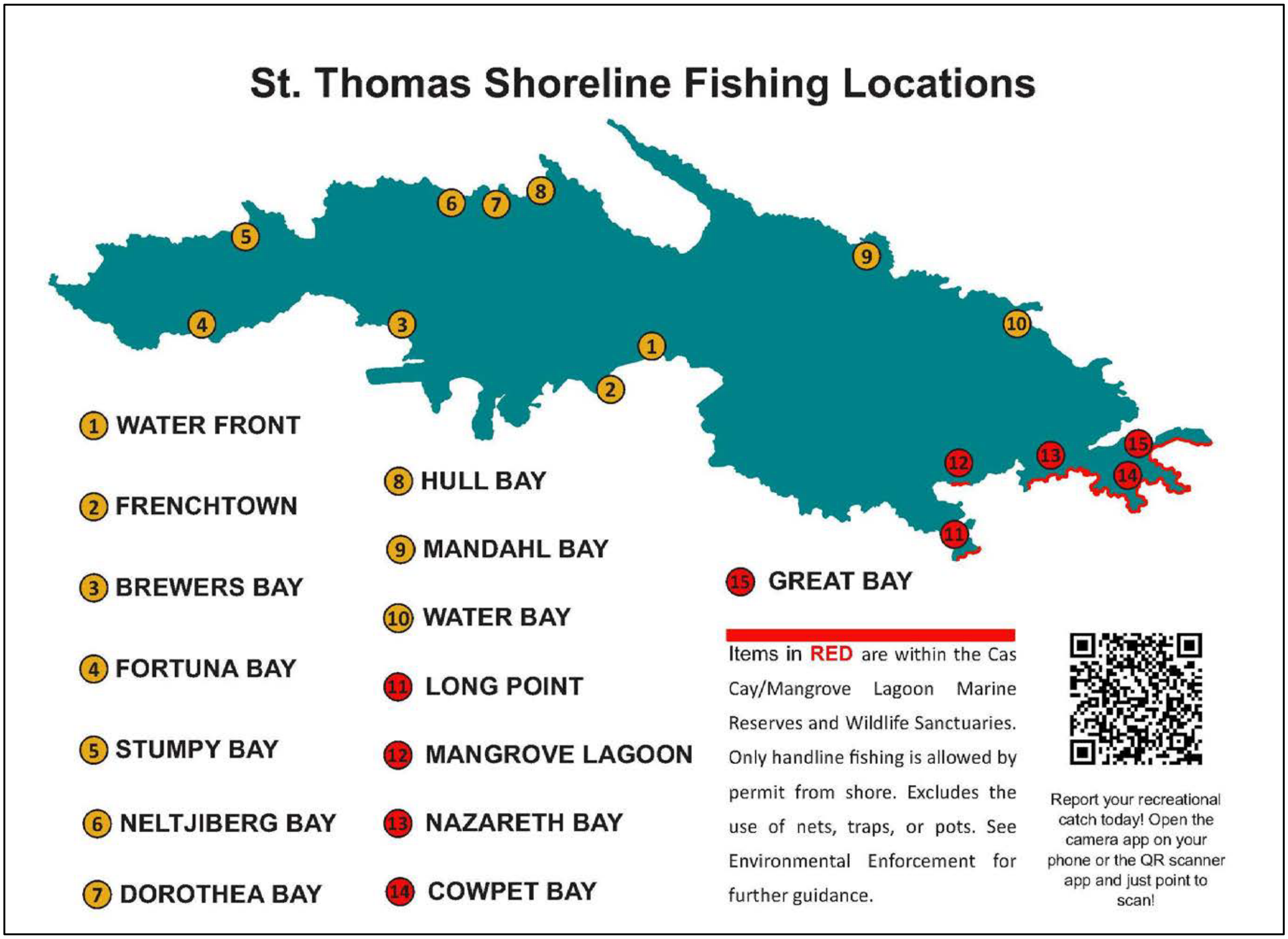

Figure 3.5.7. Shoreline fishing locations on St. Thomas.
(Source: DPNR DFW 2018)

3.5.3.1 Recreational Fishermen

Recreational fishermen are persons who primarily fish to provide food for themselves or their families and those who catch and release fish. Although Marine Recreational Fisheries Statistics Survey recreational data collection program does not operate in St. Thomas/St. John, the Division of Fish and Wildlife has made available three different ways for recreational fishermen to submit data for recreational fishing activities including traditional catch report forms, sport-fishing logbooks for charter companies or for those that fish often, and through a digital reporting form,[28] which can easily be accessed by scanning a QR code.

[28] https://form.jotform.co/80293727553866

3.5.3.2 Recreational Fishing Vessels

Fishermen reported a greater number of diesel engines in St. Thomas/St. John during the most recent census (Kojis et.al. 2017), which was due to the presence of an economically significant charter boat population that often fish the northern shelf edge, particularly the North Drop, to catch billfish and other deep-water pelagic species. This fleet caters to wealthy recreational fishermen and most augment the income of their crew by selling charter catches. A number of resident charter vessels also have commercial licenses and commercially fish when not chartered.

3.5.3.3 Recreational Fishing Gear

In territorial waters, the following gear types are considered commercial gear and may not be used by recreational fishermen: pots, traps, haul seines, and set-nets (a net consisting of a wall of fine mesh held up by a float line and anchored on the sea floor). Two of the most common gear used in the U.S. Caribbean recreational sector are hook-and-line and SCUBA diving equipment (Griffith et al. 2007).

3.5.3.4 Recreationally Targeted Species

The USVI DFW deploys and maintains fish aggregating devices (FAD) in federal waters around the USVI (DPNR DWF 2018). Both surface and submerged buoys are deployed offshore to attract pelagic sport fish species such as dolphinfish, tunas, and wahoo. By attracting pelagic sport fish, FADs reduce the effort, time, and money that anglers spend searching for fish, which enhances recreational fishing opportunities.

Popular offshore game fish targeted by recreational fishermen include blue and white marlin, sailfish, yellowfin tuna, and wahoo. Targeted inshore game fish include barracuda, bonefish, kingfish, mackerel, snook, and tarpon. Seasons and locations vary depending on the species targeted (Table 3.5.2). Methods for inshore fishing include fly rod, top water bait and trolling.

Table 3.5.2. Location and season for species targeted by recreational fishermen in St. Thomas/St. John federal and territorial waters.

Area	Species	Location	Season
Offshore	Atlantic Blue Marlin	STT North & South Drop, FADs	All year, best May-October
Offshore	White Marlin	STT North & South Drop, FADs	All year, best April-May
Offshore	Sailfish	STT North & South Drop	October-March
Offshore	Yellowfin Tuna	STT North & South Drop, shelf areas, FADs	August – February
Offshore	Blackfin Tuna	shelf areas on all islands, FADs	All Year
Offshore	Skipjack Tuna	shelf areas on all islands, FADs	All Year

Area	Species	Location	Season
Offshore	Dolphinfish (Mahi-Mahi)	STT North & South Drop, shelf areas on all islands, FADs	October-January (peak season) May, July
Offshore	Wahoo	shelf areas on all islands, FADs	All year, best September-May
Inshore	Bonito (Little Tunny)	most inshore areas, drop-offs and around schools of bait fish	All year, best January-May
Inshore	Barracuda	reef & bank areas	All Year
Inshore	Hardnose	most inshore areas and around schools of bait fish and FADs	April-September
Inshore	Bar Jack	most inshore areas and around schools of bait fish	All Year
Inshore	Crevalle Jack	most inshore areas and around schools of bait fish	All Year
Inshore	Rainbow Runner	STT North and South Drops, reefs & banks, FADs	April – September
Inshore	Yellowtail Snapper	near reefs & bank areas	All Year
Inshore	Kingfish	reefs, most mid-shelf areas and drop-offs	All year, best February-May
Inshore	Cero	Near shore, reefs	All Year

(Source: https://www.vinow.com/general_usvi/fishing-guide/)

3.5.3.5 Tournament Fishing

Several fishing tournaments occur in St. Thomas/St. John throughout the year, many of which are scheduled by local clubs such as the Virgin Islands Game Fishing Club[29].

3.5.3.6 For-Hire/Charter Fishing

Fishing charters in St. Thomas include inshore, offshore, and marlin trips. A few charters offer trips starting at 2 hours, however the most common are ½ day trips (4 hours, typically between 8am and noon, or 1 pm and 5 pm); ¾ of a day (6 hours); full day (8 hours); and Marlin trips (10 hours, usually 7:30 am to dusk). Short trips are generally inshore fishing only. Boat capacity of 4 to 6 passengers is common. Rates for fishing charters varies depending on length of trip, size of boat, inclusion of fuel in the rate versus fuel being a surcharge, and differences in services and equipment provided.

Some fishing charters are available for tournaments, such as the Memorial Day Tournament (May), Bastille Day Kingfish Tournament (July), and Wahoo Windup Tournament (November). The biggest of the fishing tournaments in St. Thomas is the USVI Open/Atlantic Blue Marlin Tournament in August.

[29] https://www.vigfc.com/

3.5.3.7 Licenses, Permits, and Fees

USVI Federal Waters

There are no federal licenses or permits required for the recreational harvest of any species managed by the Council in the St. Thomas/St. John EEZ. However, there are specific requirements for for-hire vessels and highly migratory species (HMS) fishermen operating in state and/or federal waters.

Since 2010, all anglers fishing recreationally in the U.S. Caribbean federal waters, including the St. Thomas/St. John EEZ, are required to be registered through the National Angler Registry. Tables 3.5.3 and 3.5.4 show the number of anglers resident or non-resident who purchased registrations through the National Anglers Registry, respectively, in years 2012 through January 2018. "Anglers" in the tables below refer to anglers with an address in that state (Table 3.5.3) or anglers which have marked that state as an intended fishing location on the registration regardless of where the angler actually resides (Table 3.5.4).

Table 3.5.3. Number of anglers fishing recreationally in the USVI that are residents from 2012 through January 2018.

Year	Number of Fishermen from the USVI
2018	0
2017	0
2016	4
2015	4
2014	8
2013	4
2012	11

(Source: NMFS Office of Science and Technology [February 2018])

Table 3.5.4. Number of anglers who intended to fish in the USVI (registered).

Year	Number of Registered Fishermen in the USVI
2018	2
2017	78
2016	93
2015	128
2014	192

Year	Number of Registered Fishermen in the USVI
2013	305
2012	441

(Source: NMFS Office of Science and Technology [February 2018])

In addition, there are recreational permit requirements for the harvest of highly migratory species (HMS) in the U.S. Caribbean EEZ including St. Thomas/St. John. For more information on the HMS permit requirements please visit https://www.fisheries.noaa.gov/resource/educational-materials/atlantic-hms-recreational-compliance-guide.

USVI Territorial waters

In the USVI territorial waters, sale, barter, or trade of recreational catch is prohibited. Pots, traps, haul seines, and set-nets are considered commercial gear and may not be used by recreational fishermen. Fishing licenses are not required for recreational anglers in the USVI, but monthly or annual permits are required in order to fish in the following locations:

1. St. James Reserve, St. Thomas - a permit is required to collect baitfish with a cast net within 50 feet of the shoreline or to fish with a hook and line.
2. Cas Cay/Mangrove Lagoon Marine Reserves - a permit is required to collect baitfish using a cast net within 50 feet of the north and west shorelines of Cas Cay, St. Thomas.

Additional permits are required in the USVI for HMS and marine life harvested. For billfish, swordfish, tuna, and shark HMS, federal regulations and permit requirements apply in territorial waters. The Commissioner may issue permits to aquarists, collectors, and other persons desiring to collect specimens of marine life forms. Additional information regarding fishery management in territorial or federal waters is found in the USVI's Commercial and Recreational Fisher's Information Handbook, updated in 2019.

3.5.4 Subsistence Fishing

Some fishermen fish only for subsistence, which is primarily fishing to provide food for household consumption (Griffith et al. 2007). Subsistence fishing remains an important aspect of fishing in the USVI, but is not fully understood with respect to participation, catch, or disposition of that catch. During stressful times and high levels of unemployment, subsistence fishing becomes an important activity to provide high quality protein to households.

Griffith et al. (2007) discuss that the subsistence fishery is made up mostly of people from working class backgrounds whose gear use is very similar to recreational gear. Subsistence fishing gear is primarily hook and line, including handline and cane pole, with few people using SCUBA gear, and the fishermen most commonly target snappers, groupers, dolphin fish, and king mackerel (Griffith et al. 2007). Subsistence fishermen appear to rarely target shellfish (Griffith et al. 2007).

Lack of selectivity, coupled with large landings, indicates intermixing between recreational and subsistence fishermen, making it difficult to differentiate the two (Schmied and Burgess 1987).

3.5.5 Foreign Fishing

Under Section 201(d) of the Magnuson-Stevens Act, fishing by foreign nations is limited to that portion of the OY that cannot or will not be harvested by vessels of the United States. See also 50 CFR 600.310(e)(3)(v). There is enough capacity within the U.S. EEZ off St. Thomas/St. John to harvest and process the available optimum yield (OY). Therefore, all management measures apply to the domestic fishermen and no portion of the OY is allocated by the Council to a foreign fleet.

3.5.6 Illegal, Unreported, and Unregulated Fishing

Foreign fishing in the EEZ waters surrounding St. Thomas/St. John is allowed as long as fishing vessels meet numerous requirements established in Section 201. Foreign Fishing (16 U.S.C. 1821) of the Magnuson-Stevens Act. For example, a foreign fishing vessel could legally be fishing in the EEZ if it has on board a valid permit issued under a governing international fishery agreement. However, there could be illegal, unreported, and unregulated (IUU) fishing taking place in the U.S. Caribbean EEZ waters off St. Thomas/St. John. The IUU fishing is a global problem that threatens ocean ecosystems and sustainable fisheries. The IUU products often come from fisheries lacking the strong and effective conservation and management measures to which U.S. fishermen are subject. The IUU fishing most often violates conservation and management measures, such as quotas or bycatch limits, established under international agreements. By adversely impacting fisheries, marine ecosystems, food security and coastal communities around the world, IUU fishing undermines domestic and international conservation and management efforts. Furthermore, IUU fishing risks the sustainability of a multi-billion-dollar U.S. industry.

3.5.7 Tribal Fishing Rights

The Magnuson-Stevens Act requires that FMPs contain a description of the nature and extent of Indian treaty fishing rights (16 U.S.C. 1853 (a)(2)). Historically, the United States has not negotiated any treaties over fishing rights with Native Tribes in the U.S. Caribbean, including in federal waters of St. Thomas/St. John.

3.5.8 Economic Characteristics of the St. Thomas/St. John Fishery

3.5.8.1 Commercial Fishing

The St. Thomas/St. John commercial fishing industry is largely artisanal in nature with about 120 registered and licensed fishermen. These fishermen, with few exceptions, make single day trips and during the course of the year may fish for a large number of species using a multitude of gear types. Given the artisanal nature of the fishery, furthermore, most fishing related activities, including the selling of their catches, are carried out by the fishermen themselves. Depending upon several factors - including size of the vessel, species being sought, and time of year - fishing may occur in territorial waters (<3 nm from shore), federal waters (>3 nm to 200 nm from shore), or both.

Economic information pertaining to the commercial fishing sector in St. Thomas/St. John is limited; particularly in comparison to many of the larger U.S. mainland fisheries where both statistics and research are plentiful. This section presents a general overview of the St. Thomas/St. John commercial seafood industry based primarily on trip ticket data and the few economic studies pertaining to the islands.

3.5.8.1.1 Trip Ticket Information

<u>Pounds, value, and price</u>

Lacking an established marketing structure – particularly seafood dealers - on the islands, most of the St. Thomas/St. John commercial fishermen sell their daily catches directly to various outlets (e.g., along the road and restaurants). This complicates the collection of reliable basic statistics - including pounds landed, the value of landings, and trips – which are based on self-reporting by the fishermen via the submission of trip tickets. Thus, industry statistics, representing the aggregation of trip tickets submitted by each of the fishermen, are only as reliable as the information provided by the fishermen.

Given this caveat, reported commercial landings from St. Thomas and St. John spanning the period from 2000 through 2016 totaled 10.5 million pounds, or approximately 620 thousand pounds per year. As indicated by the information in Table 3.5.5, reported landings prior to 2011, and the implementation of Annual Catch Limits, tended to exceed comparable figures after 2011. Specifically, reported annual landings from 2000 through 2010 averaged about 735 thousand pounds, or about 80% more than the 408 thousand pounds annually harvested during the 2011-2016 timeframe.

Table 3.5.5. St. Thomas/St. John reported commercial landings statistics, 2000-2016.

Year	Pounds (thousands)	Value ($1,000s)	Deflated Value[a] ($1,000s)	Price ($/lb)	Deflated Price[a] ($/lb)	Trips	Pounds Per Trip	Deflated Value Per Trip[a]
2000	617.9	2,498.5	3,482.3	4.04	5.64	5,191	119	671
2001	755.6	3,092.9	4,191.5	4.09	5.55	6,000	126	699
2002	819.4	3,124.5	4,168.3	3.81	5.09	5,939	138	702
2003	812.6	3.612.3	4,711.6	4.45	5.80	5,533	147	852
2004	801.7	3,516.9	4,468.2	4.39	5.57	5,039	15	887
2005	743.5	3,320.9	4,081.0	4.47	5.49	4,918	151	830
2006	789.9	3.993.3	4,753.9	5.06	6.02	5,240	151	907
2007	708.7	3,581.8	4,146.9	5.05	5.85	4,776	148	868
2008	690.1	3,068.2	3,420.2	4.44	4.95	4,507	153	759
2009	709.1	3,697.2	4,136.7	5.21	5.83	4,669	152	886
2010	641.8	3,325.4	3,659.3	5.18	5.70	3,889	165	941
2011	468.8	2,589.5	2,763.3	5.52	5.89	2,967	158	932
2012	392.6	2,323.4	2,428.7	5.92	6.19	2,369	166	1,025
2013	347.9	2,255.6	2,323.3	6.48	6.68	1,949	179	1,192
2014	414.5	2,673.2	2,710.5	6.45	6.54	1,982	209	1,368
2015	394.1	2,645.0	2,678.5	6.71	6.80	2,077	190	1,290
2016	433.1	2,883.2	2,883.2	6.66	6.66	2,389	181	1,207

[a]Based on the 2016 Consumer Price Index (CPI-U, U.S. Department of Labor)

The value of the reported commercial harvest during the 2000-2016 timeframe totaled $52.2 million which equates to annual revenues to the fishing fleet of approximately $3.1 million. As with poundage, the dockside value in later years (*i.e.*, post 2010) declined from that reported in earlier years (Table 3.5.5). Specifically, the average annual dockside value in the terminal five-year period of analysis ($2.56 million) was lower than that of the initial five-year period of analysis ($3.17 million) by about 20%. This difference, furthermore, does not account for the influence of inflation on prices. After removing inflation, the reported value of landings in the terminal five-year period was nearly 40% lower than in the initial five-year period.

The dockside price for the St. Thomas/St. John harvested product gradually increased from about $4.15 per pound in the earlier years of analysis to about $6.50 per pound in the later years (Table 3.5.5); an increase of approximately 55%. Much of this increase represents the influence of inflation. Removing this influence indicates a much more modest price increase of about 20%. Several factors could be contributing to the observed increase in deflated price received by St. Thomas/St. John commercial fishermen. First, demand for the harvested product may have increased. Second, and as previously discussed, reported annual harvests (i.e., supplies) declined during the 17-year period of analysis, which, all other factors being the same, would in theory result in an increase in price.[30] Third, the composition of the harvested product may have changed with higher valued products comprising an increased share of the total.[31]

The changing composition of harvested product can be examined, in part, via the landings statistics for spiny lobster. Spiny lobster represents one of the higher valued species harvested by commercial fishermen in St. Thomas/St. John and, as indicated by the information presented in Table 3.5.6, the price of the harvested product increased from about $7.00 per pound to $9 per pound during the 17-year period of analysis. This represents a 25%-45% premium over the average price of all harvested seafood. During the early 2000's, as based on the information presented in Tables 3.5.5 and 3.5.6, spiny lobster represented from about 20-25% of the total St. Thomas/St. John commercial seafood landings by value. This percentage increased to more than 35% by the end of the period of analysis. Thus, one can surmise that the increased share of spiny lobster harvest (in relation to the total St. Thomas/St. John commercial harvest) has contributed to the observed increase in deflated price of the harvested product.

Table 3.5.6. St. Thomas/St. John reported commercial spiny lobster landings, 2000-2016.

Year	Pounds (thousands)	Value ($1,000s)	Deflated Value[a] ($1,000s)	Price ($/lb)	Deflated Price[a] ($/lb)	Trips	Pounds Per Trip	Deflated Value Per Trip[a]
2000	76.2	533.1	743.0	7.00	9.76	1,215	62.7	611
2001	89.7	628.0	851.0	7.00	9.49	1,412	63.5	603
2002	116.0	811.8	108.3	7.00	9.34	1,582	73.3	685
2003	135.3	947.0	123.5	7.00	9.13	1,703	79.4	725
2004	134.0	937.9	1,191.6	7.00	8.89	1,717	78.0	694
2005	124.6	872.5	1,072.2	7.00	8.60	1,605	77.7	668
2006	136.0	1,088.2	1,295.5	8.00	9.52	1,495	91.0	867
2007	119.6	957.1	1,108.1	8.00	9.26	1,428	83.8	776
2008	110.5	662.8	738.8	6.00	6.69	1,452	76.1	509
2009	115.8	845.2	945.7	7.30	8.17	1,394	83.0	678
2010	114.6	819.7	902.0	7.15	7.87	1,256	91.2	718
2011	84.3	629.2	671.5	7.46	7.97	1,086	77.6	618
2012	83.2	665.3	695.4	8.00	8.36	1,054	78.9	660
2013	84.2	766.5	789.5	9.10	9.37	975	86.4	810
2014	92.3	839.6	851.3	9.10	9.23	926	99.6	919
2015	109.5	985.1	997.6	9.00	9.11	1,005	108.9	993
2016	121.7	1,095.3	1,095.3	9.00	9.00	1,111	109.5	985
[a]Based on the 2016 Consumer Price Index (CPI-U, U.S. Bureau of Labor								

[30] This statement, of course, is based on the assumption that close substitutes for the harvested product (either imported seafood or non-seafood products) are limited. There is no information regarding how much seafood is imported into St. Thomas/St. John.
[31] Changes in the trip ticket database over time (primarily changes related to the aggregation of species) impede detailed analysis of the influence of this factor on price.

Trips and catch in relation to trips

Overall, the reported number of trips by St. Thomas/St. John commercial fishermen declined steadily over the time period spanning from 2000 through 2016 (Table 3.5.5). During 2000-2004, for example, the reported number of trips averaged 5,540 annually. This figure had fallen by more than half to an average of 2,153 during 2012-2016. During the earlier years of analysis, furthermore, spiny lobster was harvested on approximately one-quarter of the reported number of trips (based on information in Tables 3.5.5 and 3.5.6). Since 2012, the harvest of spiny lobster was reported on approximately 45% of the total commercial trips.[32]

In relation to the declining number of reported trips, the catch per trip gradually increased over time; averaging 185 pounds during 2012-2016 compared to 138 pounds during 2000-2004. With the increased average pounds landed per trip, the inflation adjusted per trip revenues increased nearly 60% from an average of $760 during 2000-2004 to $1,215 during 2012-2016 (expressed in 2016 dollars). Among those trips reporting the harvest of spiny lobster, catch of that species increased from an average of 72 pounds per trip during 2000-2004 to almost 100 pounds during 2012-2016 (Table 3.5.6).

Trips and catch in relation to number of fishermen

Kojis et al. (2017) reported that the number of licensed fishermen in St. Thomas/St. John equaled about 119 in 2016[33] of which about 82%, or 98, were "active"[34]. Based on reported dockside value of $2.88 million, average revenue per "active" commercial fisherman in 2016 is estimated to approximate $29 thousand (approximately $24 thousand based on a population of 119 "active" and "inactive" fishermen). This compares favorably with a 2014 survey of St. Thomas/St. John commercial fishermen by Fleming et al. (2017) who reported an average value of landings among respondents of $24.5 thousand.[35] The average number of trips per St. Thomas/St. John fisherman in 2016, based on 98 active fishermen in conjunction with the 2,389 reported trips, is estimated to approximate 24 (or approximately 20 based on the universe of 119 "active and "inactive" fishermen).[36]

[32] Other species were also frequently harvested in conjunction with spiny lobster on these trips.
[33] Because all fishermen do not renew their fishing licenses on a timely basis, Kojis et al. (2017) estimated the universe of fishermen based on both the 2015-16 and 2016-17 lists of fishermen provided to the authors by the appropriate management agency.
[34] Kojis et al. (2017) designated those fishermen who no longer commercially fished as "inactive".
[35] Fishermen participating in St. Thomas/St. John portion of the survey (a total of 41) were not asked for revenues in the survey. Instead, Fleming et al. (2017) utilized the landings data records for these 41 fishermen to derive revenues. It is worth noting, however, that revenue data among the 41 fishermen are highly skewed with the median value of landings being only $10.0 thousand.
[36] Kojis et al. (2017), based on results of a survey of St. Thomas/St. John commercial fishermen, report that "active" fishermen make an average of 9.0 trips per month, or in excess of 100 trips per year (when both "active" and "inactive" fishermen are included in the analysis, the average number of monthly trips is equal to 8.4). Several explanations can be forwarded regarding the large discrepancy between the reported number of trips associated with the trip tickets and those derived from the survey by Kojis et al. (2017). First, fishermen may only report some

Much of the decline in reported number of trips since 2000 can be explained by a reduction in the number of licensed fishermen. Specifically, Kojis (2004), in a 2003 census of USVI commercial fishermen, reported 160 St. Thomas/St. John licensed fishermen. Of licensed fishermen surveyed, 77% reported being full time.[37] The deflated value of harvest in 2003 (expressed in 2016 dollars) equaled \$4.71 million which equates to \$29.4 thousand per licensed fishermen. This figure increases to about \$38.3 thousand if all harvest is assigned to those fishermen considered full-time (about 123 based on 160 licensed fishermen and 77% being considered full time).

Comparing 2016 estimates with 2003 estimates suggests a relatively large decline in the value of harvest per fishermen. Based on all licensed fishermen, the deflated value of harvest per fishermen fell approximately 20% (from \$29.4 thousand to \$24 thousand). If one equates the 2003 "full time" fisherman to being synonymous with the 2016 "active" fisherman, one can infer that the decline in value of landings per fisherman to be almost one-quarter (from \$38.3 thousand to \$29 thousand).[38]

Profitability

In addition to estimating the value of landings among the 41 St. Thomas/St. John fishermen interviewed, Fleming et al (2017) provided estimates of fishing costs and profits among this group of fishermen. They estimate average net revenues of \$12.3 thousand (median value of \$2.3 thousand) after subtracting variable costs and \$7.2 thousand (median of \$1.8 thousand) after subtracting both variable and fixed costs. The relatively low income estimates presented by Fleming et al. (2017) cannot be explained by a large proportion of part-time fishermen. Specifically, the researchers report that 60% of the interviewed St. Thomas/St. John commercial fishermen considered themselves full-time in nature. As considered later in this section of the report, however, a sizeable portion of licensed fishermen are retired and likely receiving benefits from other sources. In addition, many licensed fishermen also work as 'helpers' on other boats and receive income from such activities (Kojis, 2017)

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fraction of their trips on the trip ticket forms (which also calls into question total industry landings and associated revenues). Second, fishermen may aggregate trips (as well as landings and revenues) when submitting trip tickets (i.e., include several trips on a given form). Third, monthly trips as given by the fishermen and reported by Kojis et al. (2017) may be upward biased. Finally, the discrepancy may reflect an amalgam of all the aforementioned factors. Any significant aggregation of trips in the trip ticket database would, of course, distort estimated harvests and revenues per trip derived from the trip ticket database. Similarly, any significant fraction of trips going unreported raises doubt regarding total annual commercial landings and revenues.

[37] Full-time in the 2003 census was defined as spending in excess of 36 hours per week engaged in fishing activities (e.g. catching fish, selling fish, and repair work on boats and gear). The term "active" and "inactive" as Kojis et al. (2017) used in the 2016 census was not used in the 2003 census.

[38] As discussed in later detail in Section 3.9, St. Thomas/St. John licensed commercial fishermen appear to be less dependent upon fishing as a source of household income than was the situation in 2003.

3.5.8.2 Characteristics of commercial fishermen (including income) and equipment (including boat)

3.5.8.2.1 Age of licensed commercial fishermen

Kojis et al. (2017) conducted a 2016 census of USVI licensed commercial fishermen. They found that the average age of licensed fishermen in St. Thomas/St. John was 55.0 years with a range from 22 years to 86 years. Fishing experience by the St. Thomas/St. John licensed fishermen equaled about 31 years and ranged from one year to 70 years. In a 2003 census conducted by Kojis (2004), the average age among St. Thomas/St. John licensed fishermen was found to be almost 49 years (range from 21 years to 85 years) with a comparison of the two censuses indicating an aging population of commercial fishermen. Fishing experience among the St. Thomas/St. John licensed fishermen in 2003 was found to equal 25 years with a range from two to 67 years. Comparison of the two censuses suggests that, associated with the increased age comes an increase in fishing experience.[39]

3.5.8.2.2 Household income derived from fishing

Kojis et al. (2017), in their 2016 census of USVI licensed commercial fishermen, report that almost one-half of the St. Thomas/St. John fishermen relied on fishing for 50% or more of their household income with more than one-quarter of the interviewed fishermen indicating that commercial fishing represented their sole source of household income.[40] Conversely, almost 30% of the fishermen indicated that fishing contributed 25% or less of their household income. On average, respondents indicated that 56% of household income was derived from fishing with a range from 0% to 100%. Those licensed fishermen who indicated employment outside that of fishing relied on fishing for only 10% of their household income, on average. By comparison, those interviewees reporting that they were not employed (but not retired) depended on fishing for almost 80% of their household income. Finally, household income from fishing among retirees averaged just less than 40%.

3.5.8.3 Fishing Practices

3.5.8.3.1 Equipment used in fishing activities

According to Kojis et al. (2017), more than 90% of the 2016 licensed commercial fishermen in St. Thomas/St. John owned or co-owned the primary boat engaged in fishing activities. Two-thirds of the boats were built before 1991 with only three percent being built since 2010. The

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[39] One caveat is that the 2003 census asked about fishing experience in the USVI whereas the question in the 2016 census was not region specific.

[40] Kojis (2004) in her 2003 census of commercial fishermen reported that 45% indicated that fishing was the sole source of household income and, like the case in 2016. About one-half of the fishermen stated that 50% or more of household income was derived from fishing.

average boat length was just under 25 feet and ranged from 14 feet to 47 feet.[41] Fishermen placed the value of their boats and equipment (excluding fishing gear) at $75 thousand but with significant variation (i.e., standard deviation of $110,000). The value of the fishing gear, based on responses among St. Thomas/St. John fishermen averaged $26.5 thousand.

3.5.8.3.2 Assistance in fishing activities

Kojis et al. (2017) report that most commercially licensed fishermen in St. Thomas/St. John fish with a crew (almost 90%). The crew may consist of other commercial fishermen, with helpers (not licensed), or both. On average, the total number of helpers and/or other commercial fishermen equaled 1.58. Assistance can take any a variety of forms ranging from operation of the boat to help in selling the catch. With few exceptions, those assisting tend to be family, friends, or acquaintances.

3.5.8.3.3 Degree of engagement in fishing

In their 2016 census of USVI licensed fishermen, Kojis et al. (2017) examined engagement in fishing based upon whether the fisherman was considered "active" or "inactive". Eighty-two percent of the St. Thomas/St. John fishermen considered themselves to be "active". This statistic, however, fails to indicate the degree of activity by the fishermen that are "more" engaged in fishing.

Crosson (2018), in an analysis of the impact of the 2017 Hurricanes Irma and Maria on the USVI commercial fishing industry utilized the Department of Fish and Wildlife license data for 2017 to generate the population of commercial fishermen in St. Thomas/St. John and the characteristics of this group. Crosson (2018) found that 64 of the 104 licensed fishermen, or 62%, were considered to be regularly active in the fishery where an "active" fisherman, as defined by Crosson, as one who was (a) registered and licensed and (b) who fished for at least three months out of the year. Those who submitted nine or more "did not fish" reports during the year were considered "inactive". This analysis indicates that a large proportion of the St. Thomas/St. John commercial fishing sector (38%) is rather seasonal in nature; i.e., fishing three months or less.[42] This figure compares favorably with that reported by Fleming et al. (2017) who, in a 2014 economic survey of USVI commercial fishermen, found that 60% of the St. Thomas/St. John fishermen surveyed (63 in total) considered themselves to be full time.[43]

While the 2016 census of USVI commercial fishermen did not elicit information as to the full-time versus part-time status of fishermen, the 2003 census, conducted by Kojis (2004) did elicit

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[41] This compares to a mean boat length of 2003 of 21.4 feet (Kojis, 2004).

[42] This finding, of course, is premised on fishermen accurately completing their submitted trip tickets.
[43] No criteria were provided by Fleming et al. (2017) by which to guide respondents in selecting full-time versus part-time status.

such information.[44] Based on the definition provided to fishermen, more than three-quarters of respondents in St. Thomas/St. John considered themselves to be full-time fishermen. To the extent that the findings by Kojis (2004) are comparable to those reported by Fleming et al. 2017), one can conclude that the proportion of full-time fishermen in relation to the total population of licensed fishermen fell considerably between 2003 and 2014 (i.e., from more than 75% to 60%). Caution, however, is warranted with respect to this conclusion because, as noted, no criterion was used in defining "full-time" by Fleming et al. (2017) whereas a specific criterion was used by Kojis (2004).

3.5.8.3.4 Time spent on fishing related activities

Given the artisanal nature of the commercial fisheries in the USVI, fishermen often conduct many of the activities related to fishing (e.g., selling the fish and repairing the boat and gear). Kojis et al. (2017) found that among St. Thomas/St. John fishermen, the "average" commercial fisherman spent approximately 8.2 hours fishing per trip (including fishing and traveling). Another 8.4 hours per week was spent by the "average" fisherman selling his catch, approximately seven hours per week fixing boat/engine/gear, and 2.4 hours per week preparing for fishing.

3.5.8.3.5 Types of fishing

Various types of gear, as noted, are used by the St. Thomas/St. John commercial fishing fleet. Kojis et al. (2017), in their 2016 census of fishermen, found that 80% of the fishermen engaged in more than one type of fishing with about 45% of the fishermen engaged in three or more types of fishing.

Line fishing (covering a wide variety of line based gear) was the most common fishing technique used by commercial fishermen in St. Thomas/St. John with 78% of fishermen reporting this type of fishing. This was followed by trap fishing (43%), net fishing (26%), and free diving (20%)[45]. Summation of these four types of fishing, equal to 167%, yields some indication as to the many types of fishing practices among the 'average' fisherman. In terms of revenues generated from the different fishing practices, almost half ranked line fishing as the most important. Trap fishing was ranked as the most important revenue-generating practice by about 35% of the interviewed fishermen.

3.5.8.3.6 Targeted Species

The multitude of species available for harvest in the USVI allows for the targeting of numerous species throughout the course of the year (or even on a given trip). Targeting behavior may be in

[44] For purposes of the study, full time was defined as fishermen spending greater than 36 hours per week on fishing related activities.
[45] This precludes both free diving and scuba diving which was practiced by 7% of those interviewed.

response to a large number of factors including, but not limited to, weather conditions, prices of the respective species, migration patterns of certain species, size of boat, and location of the fisherman.

Given this to be the case, Kojis (2004), in her 2003 census of USVI commercial fishermen, elicited information on targeting behavior. For purposes of the study, the researcher provided eight categories to which participants could respond (reef fish, coastal pelagics, deep pelagics, deepwater snappers, bait fish, conch, whelk, and lobster). Thirty percent of the interviewed fishermen in St. Thomas/St. John reported that they targeted only species in one of the eight categories of fish in 2003 while 37% targeted species in two of the categories. A third of the study participants reported the targeting of species in three or more of the previously defined categories.

Based on the 2003 census, seventy-eight percent of the commercial fishermen in St. Thomas/St. John reported that they targeted reef fish with coastal pelagics representing the next most targeted category of species (54%). Lobsters were targeted by 36% of respondents while bait fish were targeted by 30% of respondents. Whelk was targeted by another 14% of the interviewed fishermen followed by deep pelagic (10%), and conch (9%). Less than five percent of the commercial fishermen on the islands (St. Thomas/St. John) targeted deep water snappers.

In their 2016 census of USVI fishermen, Kojis et al. (2017) elicited information regarding targeting behavior among St. Thomas/St. John commercial fishermen.[46] With minor exceptions, the same categories of species were used in the 2016 census as those found in the 2003 census.[47] With respect to the 2016 census, 22% of the St. Thomas/St. John fishermen indicated targeting species in only one of the categories while 38% stated that they harvested species from two of the listed categories. The remaining 40% targeted species in three or more of the stated categories.

Similar to the findings of the 2003 census, species in the reef fish category were the most frequently targeted with 93% of the respondents doing so. Forty-four percent of the interviewed fishermen stated that they targeted spiny lobster with the same percentage reporting the targeting of coastal pelagics. Dolphinfish and wahoo were targeted by 30% of the St. Thomas/St. John fishermen while deepwater snapper and whelk were targeted by 15% of the fishermen. Less than four percent of the commercial fishermen reported the targeting of baitfish.

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[46] The question was asked somewhat differently than that in the 2003 survey. Specifically, whereas the 2003 survey specifically elicited information on targeting behavior, the 2016 census queried species that generated the highest revenues. To the extent that 'highest revenues' does not relate directly to 'targeting', comparison of the two studies may be problematic.
[47] Specifically, two new categories, not included in the 2003 census, were included in the 2016 census: "dolphinfish & wahoo" and "other". It is likely that dolphinfish and wahoo were included in the category "deep pelagic" in the 2003 census.

3.5.8.3.7 Fishing in territorial and federal waters

As noted by Kojis et al. (2017), a large percentage of fishing activities among St. Thomas/St. John licensed commercial fishermen occurs in territorial waters. Overall, 53% of the fishermen indicated that territorial waters were their primary fishing grounds. Only five percent of the fishermen indicated fishing primarily in federal waters. The remaining 43% reported fishing in both territorial and federal waters in (nearly) equal amounts.

3.5.8.3.8 Sales of harvested product

Given the lack of established marketing channels in the USVI, fishermen of sell their daily catches in a variety of methods. Some fishermen, furthermore, use more than one method. For example, 43% of St. Thomas/St. John licensed fishermen in 2016 reported selling their catch along roads (usually from the back of trucks) while 39% sold their catch to restaurants (Kojis et al. 2017). Thirty-seven percent of the St. Thomas/St. John fishermen reported the use of government markets to sell their product. Only 5% indicated selling to stores (either retail stores or supermarkets). On average, St. Thomas/St. John fishermen used 2.3 outlets, on average, to sell their 2016 catch. The multitude of methods employed by the fishermen in selling product highlights in inherent problem of collecting adequate industry catch data and other relevant information.

3.5.8.4 Impacts from Hurricanes Irma and Maria

Crosson (2018) estimated losses to the USVI commercial fishing sector from Hurricanes Irma and Maria. For St. Thomas/St. John, losses to the commercial fishing fleet were estimated to equal $3.6 million.[48] Of this total, gear damage accounted for 44%, or $1.6 million, represented gear damage while 32% ($1.2 million) represented vessel damage. Other losses included facilities damages ($154 thousand) and lost income ($486 thousand). These estimates, according to Crosson (2018) should be considered preliminary.

3.5.8.5 Recreational Fishing

As noted by Crosson (2018), the Marine Recreational Information Program (MRIP) has not been implemented in the USVI. He further states that, as such, long-term recreational landings are generally not available and economic contribution estimates are also not available.

A pilot study for 2016-2017, however, was completed right before the hurricane impacts (Crosson, 2018). Some salient features of this pilot study include: (a) visitors to St. Thomas spent 7.3 nights on the island, on average, and fished an average of 3.2 days; (b) less than 10% of the visitors coming to the island reported that fishing was the primary purpose of the visit but average trip expenditures among this group equaled $1,295; (c) the charter fleet in St. Thomas,

[48] This estimate does not include losses to the charter fleet.

as might be expected, operated primarily out of the capital and Red Hook; (d) peak landings were noticed at eh beginning of the calendar year which coincides with peak tourism; and (e) 55% of recreational fishermen queried in St. Thomas as part of the pilot project were visitors with the remainder being residents of the USVI (though not necessarily St. Thomas).

Crosson (2018) estimated damages to the St. Thomas/St. John charter at $1.684 million due to Hurricanes Irma and Maria. Of this total, $957 thousand (57%) represented vessel damage, $533 thousand (32%) represented lost income, and $144 thousand (9%) represented gear damage.

3.5.9 Social and Cultural Characteristics of the St. Thomas/St. John Fishery

The following description of the social environment is an overview of historical and recent fishing patterns and location of fishing infrastructure and fishermen in St. Thomas and St. John. The description relies a great deal on work by Overbey (2016) and incorporates much of the information compiled in that report. It is important to note that this baseline description is prior to the devastating hurricanes of 2017.

3.5.9.1 Historical Fishing in St. Thomas/St. John

Inhabitants of the U.S. Caribbean including the U.S. Virgin Islands of St. Thomas, St. John, and St. Croix have relied on fishing and fishery resources for thousands of years. The Arawak and Carib peoples living in the USVI at the time of European exploration depended on the abundant fish and shellfish in the coastal waters to feed their population. Bountiful resources of the coastal and marine environment enabled native peoples, European, African and other settlers to survive and thrive.

3.5.9.2 Fishing Communities

To identify and describe fishing communities and levels of engagement and dependence in fishing in the U.S. Caribbean including St. Thomas and St. John, NOAA/NMFS sponsored a series of community profiles on U.S. Caribbean fishing communities.

The profile on St. Thomas and St. John by Impact Assessment, Inc. (IAI 2007), NMFS-SEFSC-557, considered fishing activity of coastal districts and, as a result of research, identified five potential fishing communities in St. Thomas and St. John. In St. Thomas, these included: Northside, Southside, and East End. In St. John, these included: Cruz Bay (West End) and Coral Bay (East End).

Follow up research by Stoffle et al. (2011) revisited St. Thomas and the findings and recommendations of IAI (2007). Stoffle et al. (2011) recommended the island of St. Thomas be considered a fishing community due to fishermen's connectedness and use of all of the island.

While there may not be clearly defined “fishing communities” on St. Thomas and St. John, for the purposes of developing certain indicators, the sub district geography (see Figure 3.5.8) was chosen to delineate a smaller unit of analysis that may be more appropriate when examining fishing activities, locating fishing infrastructure or determining social vulnerabilities. Areas that are shaded purple represent Census Designated Places on the islands.

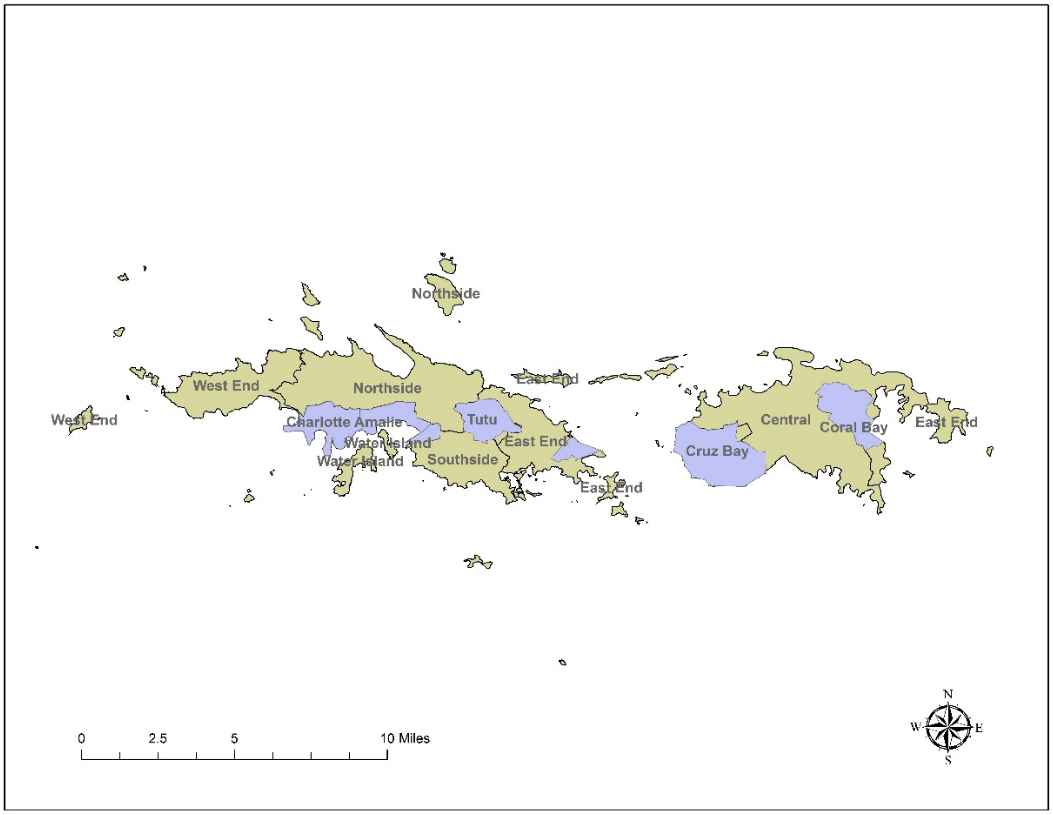

Figure 3.5.8. St. Thomas/St. John coastal communities and sub districts.
(Source: SERO Social Science Branch/US Census Tigerline Shapefiles 2018)

3.5.9.3 Characteristics of Commercial Fishing

Commercial Fishermen

The number of commercial fishermen in USVI has been limited by a moratorium on issuing new commercial fishing licenses since 2001. Comparing the results of three recent censuses of commercial fishermen in USVI illustrate continuity and change within the population of commercial fishermen and the commercial fisheries. These censuses were conducted in 2003-2004 (Kojis 2004), 2010-2011 (Kojis and Quinn 2011) and 2016 (Kojis et al. 2017).

In 2003-2004, there were 383 licensed commercial fishermen in USVI, with 160 fishermen in St. Thomas and St. John (Kojis 2004; IAI 2007). In a census of licensed commercial fishermen, Kojis (2004) interviewed 116 (70%) of the licensed commercial fishermen in St. Thomas and St. John. In 2009-2010, there were 401 licensed commercial fishermen in USVI, with 187 fishermen in St. Thomas and St. John (Kojis and Quinn 2011). As of March 18, 2011, there were 297 registered licensed commercial fishermen in USVI, with 120 fishermen in St. Thomas and St. John (Kojis and Quinn 2011). While the number of licensed commercial fishermen appears to have declined dramatically from 2009-2010 and March 2011, approximately 26%, the number of commercial fishermen may be higher and other factors may account for the discrepancy. A similar decline in licensed commercial fishermen occurred in Puerto Rico yet observations indicated that the number of commercial fishermen was greater than registered (Matos-Caraballo and Agar 2011; Valdés-Pizzini and Schärer-Umpierre 2014). In 2016, that number of licensed fishermen had changed little from the previous census in St. Thomas and St. John to 119, 75 of which were active (Kojis et al. 2017).

In the follow up census of 2010-2011, Kojis and Quinn (2011) interviewed 83 (69%) of the 120 fishermen in St. Thomas and St. John. The average age of commercial fishermen and the average number of years fishing had increased slightly. In 2003-2004, the average age of commercial fishermen in St. Thomas and St. John was 49 (Kojis 2004). In St. Thomas and St. John, fishermen fished an average of 25 years (Kojis 2004). In St. Thomas and St. John, 74% of fishermen expected to fish for the rest of their lives (Kojis 2004). In 2010-20I1, the average age of commercial fishermen in St. Thomas and St. John was 52 years and fished an average of 27 years (Kojis and Quinn 2011). The age for active fishermen was the same in 2015-17, but for all fishermen the average was 55, this included those not active. Overall experience for all fishermen averaged 30 years (Kojis et al. 2017).

Fishing effort has changed, with fewer fishermen working full-time and more fishermen working part-time. In 2003-2004 in St. Thomas and St. John, 73% of fishermen reported working full-time, more than 36 hours per week. In USVI in 2003-2004, full-time fishermen spent over 38 hours a week on fishing and fishing-related activities, with fishing constituting 22.32 hours, repairing vessels 3.1 hours, repairing gear 4.9 hours, and 8 hours a week selling their catch (Kojis 2004). In St. Thomas and St. John, 19% of fishermen worked part-time and another 3% reported fishing as the opportunity arose (Kojis 2004). In 2015-17 that number increased to 45% of fishermen working in other employment yet 90% of fishermen said they fished year-round (Kojis et al. 2017).

In 2010-2011, only 30% of St. Thomas and St. John fishermen worked more than 36 hours per week, fishing and carrying out fishing-related activities (Kojis and Quinn 2011) while in 2016, that number jumped to 42% (Kojis et al. 2017). In St. Thomas and St. John, 27% of fishermen worked between 15-36 hours per week fishing and in fishing related activities (Kojis and Quinn

2011). In St. Thomas and St. John, 30% of fishermen reported working less than 15 hours per week fishing and conducting fishing-related activities in 2010-2011 (Kojis and Quinn 2011) but that number dropped to 24% in 2016 (Kojis et al. 2017).

A decline of 43% in full-time fishing-related effort in St. Thomas and St. John over the seven-year period between 2003-2004 and 2010-2011 is significant. However, Kojis and Quinn (2011) conclude that the decline may not be as great as it appears, noting that the census survey questions on fishing effort were worded differently in 2003-2004 and 2010-2011. In 2003, the question included the terms “full-time” and “part-time” with the definitions “more than 36 hours per week” and “less than 36 hours per week” (Kojis and Quinn 2011). In 2010, the terms were deleted and only the hours of effort were included, with options “more than 36 hours,” “15-36 hours,” “less than 15 hours” per week (Kojis and Quinn 2011).

The self-reported ethnic identity of commercial fishermen has changed slightly. In 2003-2004 in St. Thomas and St. John, about 55% of fishermen identified themselves as being of French descent, with 33% identifying as black or West Indian, 9% as white and about 4% as Hispanic (Kojis 2004). In 2010-2011, about 70% of fishermen identified themselves as being of French descent, with 22% identifying as West Indian, and 3% as Hispanic (Kojis and Quinn 2011). With slightly different categories, in 201660% identified themselves as white with 40% reporting as black or mixed. Of those reporting 60% also identified as French with the next largest group being West Indian at 29% (Kojis et al. 2017).

French immigrants with a fishing tradition arrived in St. Thomas in the 19th century establishing Frenchtown, as it is now known, on the south side followed by another group with fishing and farming tradition settling in the north side (Fiedler and Jarvis 1932; Johnston 1987; Kojis 2004). Although the two groups remained separate historically (Johnston 1987), differences between them are indiscernible today (Stoffle et al. 2011).

Residents from Puerto Rico, mostly from Vieques and Culebra, began migrating to USVI in the 1920s through the 1940s, with those from Vieques settling in St. Croix and those from Culebra settling in St. Thomas (Valdés-Pizzini et al. 2010). Historic migration of residents from St. Thomas and St. Croix to Puerto Rico, particularly Vieques, is recorded as well (Valdés-Pizzini et al. 2010).

In USVI, the majority of fishermen, 86% fish with helpers (Kojis and Quinn 2011). In 2003-2004, 59% of fishermen fished with helpers (Kojis 2004) or crew. Usually the fishing trip includes the fisherman who owns the vessel (captain) and one helper or sometimes two helpers. About 32% of fishermen in USVI fish with other commercial fishermen, with 24% of St. Thomas and St. John fishermen (Kojis and Quinn 2011). In 2003-2004, 17% of USVI fishermen fished alone (Kojis 2004). In 2010-2011, 16% of St. Thomas and St. John fishermen fished alone (Kojis and Quinn 2011) with that percentage dropping to 11% in 2016 (Kojis et al. 2017).

In USVI in 2003-2004, approximately 80% of commercial fishing trips were less than nine hours, averaging 7.2 hours (Kojis 2004). In 2010-2011, USVI fishermen averaged 3.1 trips per week with each trip lasting 6.8 hours (Kojis and Quinn 2011). Fishermen in St. Thomas and St. John in 2010-2011 took fewer trips, 2.6 trips per week, but the trips lasted 7.4 hours (Kojis and Quinn 2011) and that average changed little in 2016 (Kojis et al. 2017).

Fishermen's Organizations

The majority of fishermen in St. Thomas and St. John do not belong to any fishermen's or fishing-related organizations. In 2010-2011, 73% of fishermen in St. Thomas and St. John reported they did not belong to a fishing-related organization (Kojis and Quinn 2011). However, 25% of fishermen reported belonging to the St. Thomas Fishermen's Association (Kojis and Quinn 2011). That number declined in 2016 with only 16% reporting belonging to that organization. Overall the number of fishermen reporting they belonged to an organization rose to 33% in 2016 (Kojis et al. 2017).

Commercial Fishing Vessels

Commercial fishing vessels in St. Thomas and St. John are relatively small. In 2003-2004, the average boat size was approximately 21' in length, with a range of 6' to 48' (Kojis 2004). In 2010-2011, the average boat length in St. Thomas and St. John was about 24' in length, with a range of 13' to 47' (Kojis and Quinn 2011). However, boat size has not increased appreciably, as the census of commercial fishermen in 2010-2011 excluded vessels 12' or smaller in length, defining them as dinghies (Kojis and Quinn 2011). The same is true for the 2016 census as average boat length was 24.6 ft. (Kojis et al. 2017).

In St. Thomas and St. John, the majority of vessels are composed of fiberglass, followed by fiberglass and wood, with few to none of wood (Kojis et al. 2017; Kojis and Quinn 2011; Kojis, 2004). In St. Thomas and St. John, about 72% of boats had an outboard engine (Kojis and Quinn 2011). In 2016 that number decreased to 67% with 32% having an inboard engine (Kojis et al. 2017). In USVI, most outboard engines range from 26 -150 hp (Kojis and Quinn 2011; Kojis 2004) and inboard engines having a higher average range of horsepower between 40-671 hp (Kojis et al. 2017).

In 2010-2011, there were 319 fishing boats (including 15 dinghies) in USVI, with 132 boats in St. Thomas and St. John (Kojis and Quinn 2011). That number decreased in 2016 to 104 in St. Thomas and St. John (Kojis et al. 2017). Nearly all fishermen own their vessel or co-own a vessel (Kojis et al. 2017; Kojis and Quinn 2011; Kojis 2004). In 2010-2011, over 90% of fishermen owned or co-owned the boat they used for fishing, with 80% in St. Thomas and St. John (Kojis et al. 2017). Most fishermen own one vessel and some own two or more vessels. In St. Thomas and St. John, 60% of fishermen owned one boat, 26% owned two boats, and 4% owned three or four boats in 2010-2011 (Kojis and Quinn 2011) and those numbers are close to the same in 2016 (Kojis et al. 2017).

In St. Thomas and St. John, the majority of fishing vessels are moored on the coast although residence patterns of fishermen have changed from coastal community to more inland. Some fishermen who reside in the Northside of St. Thomas moor their vessels on the Southside. In 2010-2011, fishermen kept their boats at 28 different locations, of these 23 were on St. Thomas and 5 on St. John (Kojis et al. 2017; Kojis and Quinn 2011). Frenchtown on St. Thomas was the most common location for keeping boats. Despite mountainous terrain and steep, winding roads, some fishermen keep their boats at home and trailer their boats to coastal launching and landing sites (Stoffle et al. 2011; Kojis and Quinn 2011) with 9.8% of respondents trailering their boats from home in 2016 (Kojis et al. 2017).

Fishermen in St. Thomas and St. John land their catch at different locations. In 2010-2011, St. Thomas fishermen reported landing their catch at 27 different locations on the Northside, Southside, and East End of the island (Kojis and Quinn 2011) with that number decreasing to 18 in 2016 (Kojis et al. 2017). St. John fishermen landed their catch at three sites on St. John and one site on the British Virgin Islands (Kojis et al. 2017; Kojis and Quinn 2011). Frenchtown and Hull Bay were the most common landing sites on St. Thomas (Kojis et al. 2017; Kojis and Quinn 2011).

Commercial Fishing Gear

Commercial fishermen in USVI, including St. Thomas and St. John, use a variety of gear types to catch many types of fish and shellfish. Traditionally, a trap-based fishery characterized St. Thomas. Historically, fishermen of French descent in the south side and north side of St. Thomas use traps. Today, traps remain important to the fisheries, with fish and lobster traps constituting the second most common gear in St. Thomas and St. John reported by fishermen in 2010-2011 and 2016 (Kojis et al. 2017; Kojis and Quinn 2011).

Lobster traps and fish traps or "pots" are used to catch lobster and reef fish, particularly snappers and groupers. Although an effective gear, trap fishing requires space and time on the ocean floor and fishermen tend to recognize areas traditionally fished as territory. In St. Thomas, trap territories have been reported (Johnston 1987; IAI 2007) along with adverse effects associated with displacement of fishermen' traps from closures associated with establishment of marine protected areas in former trap territories (IAI 2007).

In St. Thomas and St. John, line fishing was the most common gear reported by fishermen in 2010-2011 (Kojis and Quinn 2011) and in 2016 (Kojis et al. 2017). Most hook and line fishing is by handline at anchor, drift, and while trolling as well as trolling with rod and reel (IAI 2007; Stoffle et al. 2011). Line fishing is used to catch reef fish and coastal pelagic fish.

Cast nets, ballyhoo nets, and seine nets (beach seine and haul seine) are also used. These gear types catch bait and consumable fish. Seine fishermen target schools of fish like yellowtail snapper, blue runner, and jacks in boats and surround the school and purse the net to harvest (Stoffle et al. 2011). In St. Thomas and St. John, nets were the 3rd most common fishing gear reported by fishermen in 2010-2011 and in 2016 with cast nets being most reported (Kojis et al. 2017; Kojis and Quinn 2011).

Only a few fishermen fished with gill or trammel nets. The USVI implemented and enforced a ban on trammel nets and limited use of gill nets to specific fish like ballyhoo, gar, and flying fish (Kojis and Quinn 2011).

Free or skin diving and SCUBA diving with related gear (spear, snare, net, hand, and gaff) are becoming more popular. These gear types are used to target reef fish, lobster, and pelagic fish. In St. Thomas and St. John, diving with related gear was the 4th most common gear reported by fishermen in 2010-2011 (Kojis and Quinn 2011).

Targeted Species

Commercial fishermen in USVI including St. Thomas and St. John target multiple species of fish and shellfish. These include reef fish (especially snappers, groupers), coastal pelagic fish, deepwater pelagic fish, and lobster. There is very little conch in St. Thomas and St. John (Stoffle et al. 2011).

In St. Thomas and St. John in 2003-2004, the top targeted species categories identified by fishermen were reef fish (78%), coastal pelagic fish (54%), lobster (36%), baitfish (30%), whelk (14%), deepwater pelagic fish (10%), and deepwater snapper (5%) (Kojis 2004; IAI 2007). In 2010-2011, St. Thomas and St. John fishermen targeted reef fish (84%), coastal pelagic fish (51%), lobster (30%), deepwater pelagic fish (10%), whelk (10%), queen conch (9%), and deepwater snapper (8%) (Kojis and Quinn 2011).

In St. Thomas and St. John, deep waters are farther away from shore and fewer fishermen target deepwater fish species. Fishing for deepwater pelagic fish and deep-water reef fish, snappers and groupers, require larger vessels and, as such, are not as commonly targeted by small-scale commercial fishermen in St. Thomas and St. John (IAI 2007).

In USVI, fish constitute the majority of the catch. In 2012, fish composed 77% of the total catch, and shellfish 23% of the overall landings in USVI (NMFS 2017). Fish represented 71% of the total value, and shellfish represented 29% of the total value of landings in USVI (NMFS 2017).

The most common fish caught in traps are red hind grouper, yellowtail and other snappers, parrotfish, and olewife (queen triggerfish) (Stoffle et al. 2011). Wahoo, king and cero mackerel, dolphin fish, yellowtail snapper, blue runners and jacks are among the fish caught by hook and line and handline (Stoffle et al. 2011; IAI 2007).

Lobster, caught in traps and by diving and SCUBA gear, yellowtail snapper, grouper, and pelagic species (especially dolphin fish and tunas) are highly valued. Due to preference among tourists and visitors, commercial fishermen find ready customers for these species in hotels and restaurants catering to tourists (IAI 2007; Stoffle et al. 2011).

Dolphin fish, king mackerel, and olewife (queen triggerfish) appear to hold cultural significance among fishermen in St. Thomas and St. John. Both dolphin fish and king mackerel are deepwater and coastal pelagic fish, preferred seafood, and a popular game fish. Both dolphin fish and king mackerel have named fishing tournaments in St. Thomas. These are the Dolphin Derby in April, and Bastille Day Kingfish Tournament (Stoffle et al. 2011). Dolphin fish follow only sailfish, marlin, and tuna in popularity as offshore game fish; it can reach over 5 feet and 70 pounds (McClane 1974). King mackerel is a deepwater and coastal pelagic fish, a popular game fish that reach a size of 5 feet and 100 pounds (McClane 1974).

Key Areas of Fishing

The key areas of fishing in St. Thomas and St. John correspond with the coastal districts. In St. Thomas, these are Southside, East End and Northside. In St. John, these are Cruz Bay (West End) and Coral Bay (East End).

The Southside, often called "Town," is home to the original fishing village on St. Thomas. French immigrants from St. Barthelemy (St. Bart's), who fished for market and subsistence, settled Frenchtown in the 19th century (Johnston 1987). The majority of commercial fishermen live in Frenchtown, and Frenchtown serves as the major port for the St. Thomas' fishing fleet, and the location of the primary fish market for the island (IAI 2007). In addition, Charlotte Amalie, the capital of USVI and hub of USVI tourism, is located in Southside. Charlotte Amalie features a deepwater port that accommodates cruise ships (IAI, 2007). Trap fisheries, mostly for reef fish, and hook and line fishing for coastal pelagic fish are most common from Southside.

French immigrants, who farmed and fished for subsistence, settled the Northside in the 19th century (Johnston 1987). The Northside fishermen turned to commercial fishing as well. Although the French of the Northside and Southside maintained separateness historically

(Johnston 1987), differences today are difficult to discern (IAI 2007; Stoffle et al. 2011). Most of the Northside fishing fleet is moored at Hull Bay, yet some Northside fishermen moor their vessels in the Southside (IAI 2007; Stoffle et al. 2011). Some trap fishing and, with proximity to deepwater drop-off, coastal and deepwater pelagic fishing are found off Northside.

The East End is home to St. Thomas' sports and recreational fishing. Red Hook is the base for the charter boat fishing of the island (IAI 2007). Some commercial vessels operate off the East End.

On St. John, there are very few commercial fishermen and they are distributed between Cruz Bay (West End) and Coral Bay (East End) of the island (IAI 2007). The Virgin Islands National Park constitutes 3/5's of the island. Hook and line fishing for coastal and deep water pelagic fish and are most common.

Markets

Commercial fishermen in St. Thomas and St. John market their catch in formal and informal ways. In St. Thomas and St. John, fishermen sell their catch directly to consumers. In USVI, fish are usually marketed whole and iced, in coolers with ice. In 2010-2011, 94% of fishermen in St. Thomas and St. John sold their fish whole and more than 90% iced their fish (Kojis and Quinn 2011). About 15% marketed their fish cleaned (gutted and scaled), 12% filleted, and 10% gutted (Kojis and Quinn 2011).

Marketing whole fish reflects a preference among local residents for consuming the whole fish, usually fried or steamed, a common practice in the Caribbean (Stoffle et al. 2011). Most local residents prefer "plate size" fish and view the filleting of fish and discarding parts of the fish as "wasteful and unnecessary" (Stoffle et al. 2011).

Fishermen sell their catch at a variety of locations. In St. Thomas and St. John, the most common locations for marketing fish was along the road (43%), to private customers (42%), to restaurants (39%), government markets (37%), and at landing sites (7%) (Kojis et al. 2017). On St. Thomas, Gustave Quetel Fish House in Frenchtown Market and Lionel Roberts Stadium Fish House near Ball Park are the only government fish markets with running water and facilities for cleaning and selling fish (Kojis and Quinn 2011). Other important locations used by fishermen to market their catch on St. Thomas are Market Square in Charlotte Amalie, Coki Point and Smith Bay, serving the East End, and roadside near Fort Mylner Shopping Center in the Tutu district (Kojis and Quinn 2011).

St. John has no government fish markets and fishermen market their catch near the customs house as well as across the street from the post office in Cruz Bay (IAI 2007). A few fishermen sell their catch from a small grocery store in Coral Bay (IAI 2007).

On St. Thomas and St. John, fishermen sell their catch from stands and the back of their trucks, with scales for weighing fish and coolers of ice to keep fish fresh. Fishermen follow the market demands closely and would throw fish back to the water if the market cannot handle the catch (IAI 2007). To take an excess of fish that would not be consumed is considered wasteful.

3.5.9.4 Characteristics of Recreational Fishing

Recreational fishing is a popular activity in USVI including St. Thomas and St. John providing food and enjoyment for residents, tourists and other visitors. Recreational fishermen fish from shoreline, private boat, charter boat, and by diving. Recreational fishermen target many of the same species as commercial fishermen using similar gear types. Recreational fishing may range from subsistence fishing solely for household consumption of all the catch to sport fishing solely for pleasure with no consumption of catch.

St. Thomas is considered the blue marlin capital of the world, drawing sport fishermen worldwide to the island. Tourism, the major contributor to the economy of USVI and St. Thomas and St. John, attracts visitors to recreational fishing as well.

Recreational Fishermen

The actual number of recreational fishermen in St. Thomas and St. John is unknown. Survey research estimates of resident participation in recreational fisheries indicate that between 9.2% and 10.8% of residents in USVI fish recreationally (Mateo 2004; Jennings 1992). Given the USVI population of 106,405 in 2010 (U.S. Census Bureau), this would mean between 9,576 to 11,705 residents or 9% to 11% of the territory's population fish recreationally. For St. Thomas and St. John, the estimate of recreational fishermen would be between 5,022 to 6,138 or 9% to 11% of the resident population of 55,804 in 2010 (U.S. Census Bureau).

In 1985, 2,300 resident and 500 visitor participants, 2,718 private recreational boats, and 5 saltwater tournaments were reported for the marine recreational fisheries in USVI (Schmied and Burgess 1987). In 1985, resident recreational fishermen reported fishing from private or rental boat (50%), beach or bank (32%), charter or party boat (11%), and bridge, pier or jetty (7%) (Schmied and Burgess 1987).

In telephone survey research from 1998 to 1999, Mateo (2004) found 50% of recreational anglers in St. Thomas fished from boats, 38% fished from boats and shore, and only 12% fished only from shore. Both St. Thomas/St. John and St. Croix recreational anglers preferred to fish at night, 50% and 43%, respectively (Mateo 2004). In St. Thomas and St. John, the most popular fishing location for boat anglers was the north side of St. Thomas and shore anglers preferred the waterfront of Charlotte Amalie (Mateo 2004).

Analysis of a telephone survey in 2000 of registered boat owners who fish recreationally estimated a total of 2,509 boat-based recreational fishermen in USVI (Eastern Caribbean Center 2002). Of these, 1,797 were from St. Thomas and St. John, and 712 in St. Croix. The USVI fishermen were almost all male, with an average age of about 47 and varied levels of education and income (Eastern Caribbean Center 2002).

In St. Thomas and St. John, economic backgrounds of recreational fishermen vary substantially. Some resident recreational fishermen are fishing for food for their families, and subsistence fishing provides food security and nutrition for those in need and living under conditions of poverty. Some resident and visiting recreational fishermen enjoy fishing offshore in billfishing tournaments, and the competition and company of others meet their interests and needs.

Marinas and sport fishing tournaments are important to recreational fishermen and recreational fishing. Marinas provide a location to convene fishermen and dock, launch and land recreational vessels. Sports fishing tournaments bring fishermen together to compete and benefit others.

Recreational Vessels

Recreational fishing vessels in USVI vary. In 1985-1986, there were 31 coastal marinas in USVI and 8 charter boats (Schmied and Burgess 1987). In St. Thomas, Stoffle et al. (2011) notes 8 marinas, with four located on the south side and 4 on the east side. With fishermen ranging from resident commercial and recreational to visiting recreational bill fishermen, the marinas house and service many different sizes of vessels, “with the largest running up to 400 feet” (Stoffle et al. 2011).

In the East End of St. Thomas, recreational and sport fishing predominate at Red Hook. Many charter boats are based at Red Hook (IAI 2007), and the offshore fishing for blue marlin and other highly migratory species is based here.

Among registered boat owners in USVI, the average recreational boat is nearly 23’ in length, with 82% less than 30’ and only 5% being 40’ or more in length (Eastern Caribbean Center 2002). In 1985, 65% of fish landed by recreational fishermen came from federal waters beyond three miles from shore, and 34% came from territorial waters, three miles from shore (Schmied and Burgess 1987). The Eastern Caribbean Center (2002) found that about 53% of private recreational boat fishing in USVI occurred within territorial waters, three miles from shore (IAI 2007).

Fishing Gear and Targeted Species

Recreational fishermen predominantly use hook and line and handline gear to fish. Appeldoorn and Valdés-Pizzini (1996) found that 80% of recreational vessels used hook and line or rod and reel gear to fish. In a survey of USVI recreational fishermen, Mateo (2004) found 46% of anglers used rod and reel and 39% used handline in St. Thomas and St. John. In contrast, 64% of St. Croix anglers used handline and 23% used rod and reel (Mateo 2004).

Recreational fishermen target the same species that commercial fishermen target. Some 65 species are important to the recreational fishermen in USVI (IAI 2007). These include reef fish, particularly red hind grouper and yellowtail snapper, lobster, as well as coastal and offshore pelagic fish with preference for dolphin fish, wahoo, and tuna.

Tournament Fishing

Tournament fishing is an important activity in the USVI. Fishing tournaments usually focus fishing participant efforts on a particular species. In most tournaments, the fishermen who lands the largest catch or weight receives a prize, with a portion or all net proceeds bestowed on a worthy effort.

St. Thomas is world renown for blue marlin fishing with fishermen from all over the world coming to the island to fish for blue marlin and other billfish. One of the largest fishing tournaments in St. Thomas was the USVI Open – Atlantic Blue Marlin Tournament, known as the Boy Scout Tournament, which provided as much as $75,000 annually to the scout troops (Stoffle et al. 2011).

Other fishing tournaments in St. Thomas include the Bastille Day Kingfish Tournament and the Dolphin Derby, among others. The Bastille Day Kingfish Tournament is the largest annual fishing tournament in USVI with about 250 anglers and 75 boats participating each year (Toller et al. 2005). The Tournament is an only offshore coastal pelagic tournament with great barracuda and king mackerel dominating the catch (Toller et al. 2005).

In a study of fishing tournaments in USVI, Toller et al. (2005) found that dolphin and wahoo were the predominant species landed in offshore recreational tournaments during a five-year period from 2000 to 2005. Research at 25 offshore pelagic tournaments on St. Thomas revealed dolphin accounting for about 36% of the number and 48% of the weight of total landings, followed by barracuda at around 22% of the number and 13% of the weight, and wahoo at 15% of the number and 23% of the weight (Toller et al. 2005).

Dolphin and wahoo are valued and targeted by commercial fishermen and recreational fishermen in USVI. Both dolphin and wahoo are prized game fish and preferred fish to eat by residents and visitors. Toller et al. (2005) suggest that recreational harvests of dolphin may be more than commercial harvests in USVI. If so, competition between commercial and recreational fishermen, particularly for dolphin, may result in conflict as it has in Puerto Rico (Valdés-Pizzini and Schärer-Umpierre 2014).

3.5.9.5 Characteristics of Subsistence Fishing

Many fishermen in St. Thomas and St. John fish for sustenance, to provide food for their family and household. Subsistence fishing characterizes both commercial and recreational fishing in USVI. With unemployment rates of over 11% -12% in St. Thomas and St. John in 2014 (Virgin Islands Department of Labor 2014) and many residents living in conditions of poverty, fishing and fishery resources are important in helping to make ends meet (IAI 2007).

Schmied and Burgess (1987) observed that in 1979, 50% of recreational anglers in the USVI reported no preferences in species targeted. Lack of selectivity, coupled with large landings, indicated intermixing between recreational and subsistence fishermen, making it difficult to differentiate the two (Schmied and Burgess 1987).

Issues affecting fisheries

The main socio-economic problem that fishermen mentioned in the USVI was regulation with 37.8% of respondents mentioning an issue with regulation (Kojis et al. 2017). In general, fishermen thought that there were too many regulations and restrictions, but only 27.5% of St. Thomas and St. John fishermen commented on regulations with several supporting the need for or understood that certain regulations, especially the closed areas that protected spawning aggregations were needed.

Fishermen from St. Thomas and St. Johns objected to closed seasons remarking they thought the practice was wasteful. Some claimed that fish caught and released were eaten by sharks and others who fished deep water said that fish died even if their air bladder was punctured. The second most common problem for USVI fishermen was environmental issues (18.6%). Fishermen in both districts mentioned that climate change (including global warming) and bad weather affected the fishery. Fishermen from St. Thomas and St. Johns were more concerned about pollution from live-aboard boats and development (Kojis et al. 2017).

Fishermen felt that fishing conditions were better today (2016) than they were previously and results have indicated improvement in each census (Kojis et al. 2017).

3.5.10 Environmental Justice (EJ) Considerations

In order to assess whether a community may be experiencing EJ issues, a suite of Community Social Vulnerability Indices (CSVI) created to examine the social vulnerability of coastal communities was developed for the majority fishing communities in the U.S (Colburn and Jepson 2013). Originally, the territories were not included in the development of the CSVIs. A recent attempt to develop similar indicators at the community or Census Designated Place level for Puerto Rico and the USVI was not successful. However, by changing the unit of analysis to the county or sub county level (rather than census designated places), a viable suite of social vulnerability indices was successfully created using the same methodology for all counties within the coastal Southeast including municipalities in Puerto Rico and sub districts in the USVI. Using the same variables with minor adjustments, a principal component factor analysis was conducted with results meeting the same criteria used previously in creating the CSVIs. The resulting index factor scores for each sub district is reported here.

The three indices reported most often in the Southeast Region are poverty, population composition, and personal disruptions. The variables included in each of these indices have been identified through the literature as being important components that contribute to an individual's or community's vulnerability. Indicators such as increased poverty rates for different groups, more single female-headed households and children under the age of five, disruptions such as higher separation rates, and unemployment all are signs of vulnerable populations. These indicators are closely aligned to previously used measures of EJ, which used thresholds for the number of minorities and those in poverty, but are more comprehensive in their assessment. For those sub districts that exceed the threshold it would be expected that they would exhibit vulnerabilities to sudden changes or social disruption that might accrue from regulatory change.

Figure 3.5.9. Social vulnerability indices for St. Thomas and St. John coastal sub districts. (Source: SERO County Social Vulnerability Indicators database [ACS 2014] 2018)

As is evident in Figure 3.5.9, the majority of sub districts for St. Thomas and St. John show few vulnerabilities with only one exceeding both thresholds of ½ and 1 standard deviation for at least two of the indices. Charlotte Amalie is the only sub district that has two indices exceeding both thresholds. Most other communities show few if any vulnerabilities. Several communities do exceed the threshold for population composition, which is likely a reflection of a higher population of minorities. However, these vulnerabilities do not take into consideration the recent devastation from Hurricanes Irma and Maria. It is expected that even though these municipalities have high vulnerabilities depicted here, they could now have higher vulnerability scores as a result of the impacts from recent hurricanes.

3.5.11 Impacts of Recent Hurricanes

During the 2017 Atlantic hurricane season, the USVI islands suffered two major storms. On September 6, Category Five Hurricane Irma passed directly over St. John and St. Thomas. St. Croix escaped Irma relatively unscathed, however, two weeks later on September 20, the eye of Category Five Hurricane Maria passed just offshore of the southwestern tip of St. Croix before turning north and crossing Puerto Rico. The combined effects of the two storms had a significant impact on the territory's' infrastructure, including that of the fishing industries. Damage was caused to fishing-related infrastructure, ports, docks, fishing businesses, vessels, and fishing gear.

After the storms, NMFS conducted damage assessments in the territories and produced reports for Puerto Rico and the USVI[49]. The information provided here comes from those damage assessments. The USVI Division of Fish and Wildlife records currently list 104 licensed and currently registered commercial fishermen on St. Thomas/St. John with 64 of those being considered active fishermen. Of those surveyed the estimated total capital losses were $3,147,164 and lost revenue of $485,641, which produced total losses of $3,632,806 at the time of surveying, for St. Thomas and St. John. There was an average vessel damage of $11,167 and average gear damage of $15,509 reported. Loss of crew positions was minimal for St. Thomas and St. John.

For the charter fleet total capital losses of $1,151,604 and lost revenue of $533,230 were reported, which produced total losses of $1,684,834 at the time of surveying. These estimates were based upon the assumption that there were 27 active charter operations that DPNR staff were aware of on St. Thomas and St. John. The average vessel damage estimated for the for-hire fleet was $35,438 with average gear damage being $5,321. The average revenue lost was estimated to be near $19,749.

There were six tackle shops and marine related businesses surveyed which reported a total damages of $242,392. The total amount of lost revenue reported for those businesses was $1,216,232 and seven employee positions lost.

One year follow-up surveys are being conducted among these businesses to understand how recovery efforts have fared.

3.6 Administrative Environment

The administrative environment affecting the St. Thomas/St. John FMP was discussed in detail in Section 1.6 (Regional Fisheries Management). Additional information regarding fishery management in territorial or federal waters can be found in the Caribbean SFA Amendment (CFMC 2005) and in the 2010 Caribbean ACL Amendment (CFMC 2011a).

3.7 Issues of Concern to Fisheries Management

3.7.1 Introduction

Both fishermen and stakeholders have concerns about the long-term future of fishery resources and the habitats that support those fisheries. According to a 2016 census of licensed fishermen

[49] https://www.fisheries.noaa.gov/feature-story/noaa-releases-economic-impact-evaluations-hurricanes-irma-and-maria-disasters

of the USVI (Kojis et al. 2017), fishermen are generally concerned about high costs associated with replacing lost or stolen gear, constraints of a market-driven system such as lack of demand and structures (i.e., fish houses), foreign and illegal fishermen depleting local resources, and the lack of enforcement.

The next section lists specific concerns expressed by St. Thomas/St. John fishermen and stakeholders with respect to resource health and availability, socio-economic concerns, management and operational concerns, and others.

3.7.2 Fishermen and Stakeholder Concerns

Kojis et al. (2017) reported that the primary socio-economic problems reported by St. Thomas/St. John fishermen were due to regulatory and environmental impacts. While some fishermen said they understood the reason for regulations such as closed seasons, others said that area closures create competition for space among fishermen and that oftentimes regulatory discards (i.e., fish that are thrown back because they were caught during their seasonal closure) do not survive, which they consider to be wasteful. Environmental concerns ranged from general (bad weather limits fishing days) to specific (damage to mangroves and pollution from detergents and cleaning supplies used by live-aboard boaters).

Fishermen in St. Thomas/St. John reported several concerns related to fish traps. Of particular concern was the presence of too many traps in the fishery, resulting in increased damage to the benthos as well as the potential for ghost traps (i.e., lost traps that result in dead fish). However, they also expressed concern regarding the DPNR trap reduction program, which was implemented in July 2018 with the goal of reducing the number of fish traps by 20 percent. The respondents suggested this trap reduction program has actually resulted in increased incidents of trap theft and increased effort by trap fishermen as a means of maintaining supply to the market.

Other comments provided by fishermen during the recent census centered on competition for resources. First, dishonest reporting of commercial catch has unknown but likely negative impacts on fish stocks. Second, foreign fishermen harvesting fish from local waters are depleting pelagic fish and bait stocks. Finally, because there is no recreational data collection program, it is uncertain how many fish the recreational fishermen (dubbed “weekend warriors”) are catching. At the August 2018 Council meeting, the USVI DPNR Director of the Division of Fish and Wildlife gave a presentation outlining efforts that are underway to establish a recreational fishery data collection program, which would include data recording and reporting. An ancillary component of this effort would be a trap numbering system that would assist with the identification of stolen traps. To alleviate some of these issues, fishermen recommended enhanced enforcement.

For many fishermen in St. Thomas/St. John, problems often occur after the fish are landed, most notably with respect to market instability and the fact that people often do not have money to purchase fresh fish. Additionally, unlicensed/illegal fishermen catch and sell fish in direct competition with licensed fishermen. Adding to these issues, while the price per fish is the same as it was 10 years ago, operating expenses such as fuel and gear have increased. In order to attract buyers, and discourage the selling of illegal catch, the islands need more fish markets with ample parking and running water that can easily be accessed by law enforcement and samplers. Many of these issues make it hard to attract a younger generation of fishermen interested in sustainably fishing local resources.

Chapter 4. Environmental Consequences

4.1 Action 1: Transition Fisheries Management in the St. Thomas/St. John Exclusive Economic Zone (EEZ) from a U.S. Caribbean-wide Approach to an Island-based Approach

Summary of Management Alternatives

Alternative 1. No Action. Do not transition management from a U.S. Caribbean-wide approach to an island-based approach. The four Council fishery management plans (FMPs) (i.e., Reef Fish, Spiny Lobster, Queen Conch, and Coral) would continue to guide federal fishery management in the St. Thomas/St. John EEZ.

Alternative 2 (Preferred). Establish a new St. Thomas/St. John FMP to manage fishery resources in the St. Thomas/St. John EEZ and repeal the four Council FMPs as they apply to the St. Thomas/St. John EEZ and replace them with the new St. Thomas/St. John FMP. The St. Thomas/St. John FMP would include previous fishery management measures applicable to the St. Thomas/St. John EEZ.

4.1.1 Direct and Indirect Effects on the Physical Environment

Alternative 1 (No Action) is an administrative action that would leave in place the existing U.S. Caribbean-wide approach to federal fishery management in the U.S. Caribbean EEZ, and would not establish a St. Thomas/St. John approach. Because it would not change the status quo, it would not have any direct effects on the physical environment. The National Marine Fisheries Service (NMFS) and the Caribbean Fishery Management Council (Council) already prohibit the use of destructive fishing gear types and methods such as explosives, chemicals, power assisted tools, powerheads, gill nets, and trammel nets among others (50 CFR part 622). By prohibiting destructive fishing methods and ensuring that activities do not adversely affect essential fish habitat (EFH) and habitat areas of particular concern, the Council and NMFS would ensure that negative impacts on the physical environment from authorized fishing activities are negligible.

Establishing an island-based FMP for the St. Thomas/St. John EEZ in **Preferred Alternative 2** does not directly affect the physical environment. Under **Preferred Alternative 2**, regulations would be reorganized from a U.S. Caribbean EEZ domain to a St. Thomas/St. John EEZ domain and these would be placed in the St. Thomas/St. John FMP, but the regulations would remain the same in most respects. As mentioned above, there are management measures already in place that prohibit the use of destructive fishing gears and methods and ensure that activities do not adversely affect EFH and other habitat areas. These measures would be migrated to the new plan under **Preferred Alternative 2** (see Chapter 5). In addition, as discussed in the 2014 EA: *Development of Island-Based FMPs in the U.S. Caribbean: Transition from Species-Based*

FMPs to Island-Based FMPs (NMFS 2014) tailoring management measures to St. Thomas/St. John could in the long-term make fisheries management more effective therefore eventually minimizing adverse direct or indirect effects from fishing activities to the physical environment.

4.1.2 Direct and Indirect Effects on the Biological/Ecological Environment

Alternative 1 would continue the U.S. Caribbean-wide approach to federal management; thus little change would be expected in the biological/ecological environment.

Under **Preferred Alternative 2** regulations would be reorganized from a U.S. Caribbean EEZ domain to a St. Thomas/St. John EEZ domain, and this would be placed in the St. Thomas/St. John FMP, but the regulations would remain the same in most respects. Short-term effects to the biological/ecological environment would be the same as for **Alternative 1** because, based solely on the outcome from Action 1, the applied regulatory environment would not change. In the long-term, the island-based approach proposed by **Preferred Alternative 2** could potentially minimize impacts to the biological/ecological environment from fishing activities by enhancing fisheries management, allowing for an island-based approach. However, the ultimate outcome from implementing **Preferred Alternative 2**, coupled with implementation of any combination of proposed management actions (except the No Action alternatives) presented and discussed in Actions 2-7, likely would be positive. Long-term effects to the biological/ecological environment would be expected to be positive as discussed in Section 1.4 of the 2014 EA (NMFS 2014).

No direct or indirect effects to Endangered Species Act (ESA)-listed species are expected from this action, as it would not change how the fisheries within each management area operate (i.e. gear types used or effort expended).

4.1.3 Direct and Indirect Effects on the Economic Environment

To ascertain whether the net benefits associated with **Preferred Alternative 2** exceed those under **Alternative 1** (No Action), one would ideally look at the change in economic surplus (i.e., producer and consumer surplus) which would be forthcoming in moving to the preferred alternative. If positive, the alternative state (i.e., moving from the status quo to the preferred alternative) would be justifiable from the perspective of economic efficiency. Estimating the change in surplus, however, requires a significant amount of information/analyses including: (a) costs associated with the commercial harvest of seafood and change in producer surplus associated with movement from the status quo; (b) consumer surplus derived from the consumption of commercially harvested product and its change associated with movement from the No Action alternative; (c) benefits derived from recreational activities and the change in these benefits in conjunction with movement to the preferred alternative; and (d) benefits derived from non-consumptive activities and related changes in the transition from a U.S. Caribbean-wide approach to an island-based management approach. None of this information/analyses exists, however, which makes evaluating the change in surplus infeasible.

While the change in surplus associated with moving from the no-action alternative (**Alternative 1**) to **Preferred Alternative 2** cannot be estimated, there are a number of aspects associated with the economic environment that can help establish the expected direction (if any) of the change. First, because transition from an U.S. Caribbean-wide to an island-based management approach is not expected to influence current harvest and resource use, one can surmise that changes in direct economic benefits would be minimal. However, there are likely to be indirect benefits associated with transitioning to an island-based management approach and the prospect of not 'capturing' these indirect benefits would hamper the realization of long-term maximum benefits derived from the fishery. Possibly the largest effect is the loss in indirect benefits that may be forthcoming from enhanced compliance. It is the fishermen who have requested an island-based approach to management in lieu of the current U.S. Caribbean-wide approach. More involvement by the fishermen in the development and implementation of the management process could potentially culminate in enhanced compliance. This enhanced compliance may range from the provision of higher quality fishery-dependent data to a voluntary reduction in fishing activities that are in violation of regulations. Such increased compliance may, over time, culminate in more efficient management practices that more adequately protect stocks and stock complexes; thereby, increasing indirect benefits.

Finally, transitioning from U.S. Caribbean-wide management approach (**Alternative 1**) to an island-based management approach in the St. Thomas/St. John EEZ (**Preferred Alternative 2**) would, over time, allow for the tailoring of management measures more in line with the specific needs of the island, including economic nuances, social nuances, and fishing practices specific to the island. There are likely to be indirect economic benefits in doing so.

4.1.4 Direct and Indirect Effects on the Social Environment

Alternative 1 would not result in changes or direct effects to the social environment, however there may be indirect effects if the No Action alternative is chosen as the preferred. There has been considerable discussion at the Council level with regard to island specific management with public input strongly in favor of this style of management. In some cases, displeasure has been expressed toward the lack of understanding of local needs and concerns. Island level management may accommodate some of these concerns and moving toward island management may afford a more streamlined and successful management of Caribbean fisheries. Under **Alternative 1**, fishermen may become dissatisfied and perceptions of the efficacy of management may erode. Such an erosion of perception can lead to lesser compliance and affect participation in management. Cooperation and participation in management have been shown to improve compliance with fishery regulations and can contribute to the overall well-being of fishermen and other stakeholders including the well-being of the resource. Developing a new St.

Thomas/St. John FMP under **Preferred Alternative 2** would consider the unique attributes of the island group taking into account the specific cultural, social, economic, physical, geological, and biological environments of St. Thomas/St. John. **Preferred Alternative 2** would create an individual plan for St. Thomas/St. John and would address the concerns that have been expressed by the public regarding island management.

The different histories of the islands have had a unique effect on the development of the fishing economy on each. Based upon different governance, dissimilar colonization and development of plantations and slavery, the islands have today developed their own unique culture and social environments. These differences are evident as one examines the ethnic and cultural makeup of the stakeholders within each island fishery. While all share common experiences and historical provenance, over the decades, significant differences have evolved. Present day economies differ on each island as affected by unique histories and the new trends of tourism and global economies have helped transform the older more traditional coastal way of life. Fishing is one of those historical activities that has remained an important part of island culture, yet each of the social and economic environments differ and have dictated unique trajectories for the development of all three sectors of fishing. By allowing for more island centric management, each locale may be able to take advantage of the historical trends that have created each unique social and cultural environment that may offer more streamlined and effective management. This may bring about more participation as stakeholders see management more responsive to their local needs. The increased cooperation may lead to more compliance which should benefit the biological, economic and social environments.

4.1.5 Direct and Indirect Effects on the Administrative Environment

Choosing to take no action in **Alternative 1** would not require additional rulemaking and would therefore have no additional effects on the administrative environment. Thus, when compared to **Preferred Alternative 2** (establishing a new St. Thomas/St. John FMP), **Alternative 1** might prove beneficial to the administrative environment in the short-term because maintaining the status quo would not require administrative adjustments when compared to the extensive rulemaking that would be needed to implement a new St. Thomas/St. John FMP.

Under **Preferred Alternative 2** regulations would be reorganized from a U.S. Caribbean-wide EEZ domain to a St. Thomas/St. John EEZ domain, but the regulations would remain the same in most respects. Short-term effects on the administrative environment would be negative but minor as the new (reorganized) regulations are established. However, long-term effects could be positive, though the expected benefits are unknown as future impacts to the human environment depend on the nature of the specific management actions. Even if the Council does not choose **Preferred Alternative 2**, it could amend management measures under the U.S. Caribbean-wide FMPs, with benefits to the administrative environment.

4.2 Action 2: Identify Stocks in Need of Federal Conservation and Management

Summary of Management Alternatives

Alternative 1. No Action. The St. Thomas/St. John FMP would include all species presently managed under the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs.

Alternative 2 (Preferred). For those species for which landings data are available, follow a stepwise application of criteria to determine the species included for management in the St. Thomas/St. John FMP. The criteria under consideration include, in order:

Criterion A. Include overfished species in U.S. Caribbean federal waters, species with harvest prohibitions due to their ecological importance, or species with seasonal closures or size limits.

Criterion B. From the remaining species, <u>exclude</u> species that infrequently occur in federal waters based on expert analysis guided by available data.

Criterion C. From the remaining species, <u>include</u> species that are biologically vulnerable, constrained to a specific habitat that renders them particularly vulnerable, or have an essential ecological value, as determined by expert analysis.

Criterion D. From the remaining species, <u>include</u> economically important species (to national or regional economy) based on a threshold of landings or value and those that are an important component of bycatch, as established by expert analysis.

Criterion E. From the remaining species, <u>include</u> any other species that the Council determines are in need of conservation and management.

4.2.1 Direct and Indirect Effects on the Physical Environment

Action 2 (species selection) is primarily an administrative action because adding or removing species for management does not directly affect how the fisheries operate (i.e., gear types used) and is not expected to have direct effects on the physical environment. Indirect effects may apply depending on the species selected for management.

Alternative 1 (No Action) would bring all species previously managed in the Reef Fish, Queen Conch, Spiny Lobster, and Coral FMPs into the new St. Thomas/St. John FMP. Under **Alternative 1**, 81 species of reef fish, 58 species of aquarium trade fish, spiny lobster, queen conch, 94 species or species groups of corals, and 63 species or genera of aquarium trade invertebrates would continue to be managed under the St. Thomas/St. John FMP. **Alternative 1** is not be expected to have direct effects on the physical environment, nor any indirect effects on the physical environment that were not previously considered in the 2010 and 2011 Caribbean ACL Amendments as current fishing practices are not expected to change.

Applying the stepwise process under **Preferred Alternative 2** would result in 47 species of finfish, queen conch, spiny lobster, and all species of coral, sea cucumbers, and sea urchins included for management in the St. Thomas/St. John FMP. Species for which the majority of catch occurs in territorial waters would be removed. As noted in Section 2.2.2, removing species from federal management does not directly affect how the fisheries operate. Fishermen would be expected to continue to fish in territorial waters for those species removed from federal management via **Preferred Alternative 2**, where the majority of fishing effort for these species occurs. If fishing effort and harvest methods remain the same without federal management, then indirect effects to the physical environment from fishing for these species would not be expected to change. The effects to the physical environment could increase, however, if fishing effort, and associated effects from gear interactions, increased without federal oversight, but this is not expected to occur. Most of these species are already managed by the territory. Due to the small amount of fishing effort applied to catching these non-targeted species in federal waters, plus given that the methods used to fish for these species minimally affects the physical environment (e.g., hook and line), impacts to the physical environment are not expected.

Adding species previously not managed would potentially have indirect effects on the physical environment if it changed fishing behavior, for example, if it resulted in new gear types, fishing areas, or fishing effort not previously in use, but these routes are not expected for any of the species added in **Preferred Alternative 2**. This alternative would result in the Council establishing measureable management measures (although not in this action) for the newly added species, and any indirect effects that may occur from interactions between the physical environment and fisheries catching these new species would be limited. For example, including all sea urchins and sea cucumber species in the St. Thomas/St. John FMP could have indirect physical effects. Under the U.S. Caribbean-wide FMPs, only select sea urchins and sea cucumbers are managed. Managing all species allows the Council to ensure that harvest levels and methods are commensurate with the important role that all of the species in these two groups play as ecosystem engineers within the coral reef ecosystem. For example, the Council could prohibit harvest of these species under the St. Thomas/St. John FMP. Healthy populations of sea cucumbers and sea urchins help to ensure their contributions to sediment bioturbation and biofouling reduction are maintained at appropriate levels. However, considering that harvest from the St. Thomas/St. John EEZ is unknown but likely near zero, the physical effects of choosing to manage all of these species and potentially taking action to prohibit all harvest would be expected to be minimal when compared to outcomes expected from **Alternative 1**. Regarding pelagic species to be managed under **Preferred Alternative 2**, such as dolphin and wahoo, these species are already legally harvested from the St. Thomas/St. John EEZ by both commercial and recreational fishermen, generally using common hook-and-line methods.

Adding these pelagic species to management would therefore be expected to have no direct or indirect physical effects on the environment beyond those already being experienced. However, future Council actions could affect the physical environment. For example, the Council could take action to reduce harvest of these species or change allowable harvest methods in a manner than changes effects to the physical environment.

4.2.2 Direct and Indirect Effects on the Biological/Ecological Environment

Action 2 (species selection) is primarily an administrative action because adding or removing species for management does not directly affect how the fisheries operate (i.e., amount of fish caught) and is not expected to have direct effects on the biological/ecological environment. Indirect effects may apply depending on the species selected or removed from management, and management measures established or removed.

Alternative 1 would retain the same indirect effects to the biological/ecological environment as those previously analyzed and described in the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b), but it would not allow for the inclusion of new species for management. Since those amendments were published, other species have been identified as playing an important role in St. Thomas/St. John's fisheries and/or the coral reef ecosystem supporting those fisheries and may be in need of conservation and management. **Alternative 1** would not add new species to the St. Thomas/St. John FMP. On its own, adding species to the plan will not change how the fisheries operate. However, adding these species and managing them could have indirect biological/ecological effects. Without adding these species to the plans, the Council would not set management reference points or other conservation measures for those species, or otherwise ensure those species are managed in a manner that prevents overfishing while achieving, on a continuing basis, the OY from the fishery. In addition, **Alternative 1** would retain species that might not be as applicable for the St. Thomas/St. John FMP due to the geography and location of management zones.

Finally, in response to changing environmental (e.g., habitat availability or health) or anthropogenic (e.g., fishing practices) factors, the species to be managed need to be reevaluated periodically to maximize biological as well as socio-economic benefits. Under **Alternative 1**, the Council would take no action to reevaluate and revise (as appropriate) the species to be included for federal management and the associated benefits to the biological and ecological environment are lost. The Council, could however, take this action in a future amendment.

Forty-seven species of finfish, queen conch, spiny lobster, and all species of coral, sea cucumbers, and sea urchins would be managed in the St. Thomas/St. John FMP under **Preferred Alternative 2**. Like **Alternative 1**, **Preferred Alternative 2** would continue to manage species considered to be classified as overfished in U.S. Caribbean federal waters (queen conch, Nassau grouper and goliath grouper), or for which harvest is prohibited due to their ecological importance (rainbow, blue and midnight parrotfish), or for species that have seasonal closures or size limits (queen conch, spiny lobster and select snappers and groupers). These species are susceptible to excess fishing pressure and/or vulnerable to environmental conditions. Unlike **Alternative 1**, **Preferred Alternative 2** includes species that that were not included in the previous FMPs, but are currently considered to be biologically vulnerable or ecologically important, such as sea urchins and sea cucumbers. **Preferred Alternative 2** would also benefit the biological/ecological environment indirectly because, once these species are included in the FMP, the Council must establish catch limits, including limits for the highly targeted stocks that are currently without federal management measures, like dolphin and wahoo. Establishing harvest limits for these pelagic stocks would provide a more comprehensive management of the St. Thomas/St. John coral reef ecosystem.

Not every fishery needs federal regulation. Not all species that are landed in St. Thomas/St. John or that were included in the Reef Fish FMP list of managed species are appropriate for management in federal waters off St. Thomas/St. John. During the stepwise process of **Preferred Alternative 2**, expert analysis guided by available data identified species that were either infrequently caught in federal waters or primarily caught in territorial waters, which were then excluded from federal management.

With respect to ESA-listed species, **Alternative 1** and **Preferred Alternative 2** would both include for management the seven threatened corals (see Table 3.2.1) and Nassau grouper, thus indirect effects to the biological/ecological environment resulting from management of these species would be expected to be similar for the two alternatives. Similarly, both alternatives would include for management fish species (e.g., parrotfish and surgeonfish) that are ecologically important inhabitants of coral reefs. However, unlike **Alternative 1** which only includes for management a finite number or corals, sea urchins, and sea cucumbers, **Preferred Alternative 2** would include for management all species of corals, sea cucumbers, and sea urchins within the St. Thomas/St. John EEZ. That comprehensive management approach could indirectly affect the amount of habitat available for recruitment of ESA-listed corals. For example, sea urchins graze algae covered substrate completely, leaving clean surfaces for coral recruits to attach. To the extent that management protects these species and allows them to continue to complete this function, then management would have beneficial effects. However, as noted above, considering that harvest from the St. Thomas/St. John EEZ is unknown but likely near zero, the effects to the biological/ecological effects of choosing to manage all species of sea cucumbers and sea urchins and potentially taking action to prohibit all harvest would be expected to be minimal when compared to outcomes expected from **Alternative 1**. Additionally, species new to management proposed under **Preferred Alternative 2** would not be expected to increase impacts to ESA-listed species, as the gear types used in the harvest of these species is the same as is used in the managed fisheries.

In summary, compared to **Alternative 1**, **Preferred Alternative 2** would be more beneficial to the biological/ecological environment because it would include species that have not been previously subject to conservation and management. As a result, the Council must establish ACLs and could establish other measures that would provide a more comprehensive management of the coral reef ecosystem. In addition, the Council could set measures to protect biologically vulnerable species or ecologically important as discussed above. That rearrangement of species to be managed would increase the likelihood of sustainable harvest, as a means both to enhance food security for the island of St. Thomas/St. John and to rebuild and sustain the natural ecological balance of the coral reef ecosystem within the context of sustainable harvest.

4.2.3 Direct and Indirect Effects on the Economic Environment

Management alternatives considered under this action are largely administrative in nature and therefore would have no direct economic effects. **Alternative 1** (No Action) maintains the status quo with species subject to management remaining unchanged. Since current fishing practices under **Alternative 1** would remain unchanged, no direct economic effects would be forthcoming. While largely administrative in nature, there may be some indirect economic effects associated with maintaining the status quo. First, there may be species not included under the No Action alternative that are in need of management for the realization of long-term maximum benefits derived therefrom. Specifically, some species commonly found in federal waters but not included in the No Action alternative may be vulnerable to overfishing. Exclusion of these species from the St. Thomas/St. John FMP translates to an inability to properly manage these species to prevent overfishing while achieving, on a continuing basis, the optimum yield from the fishery[50].

Like **Alternative 1**, **Preferred Alternative 2** would continue to manage species considered to be classified as overfished in U.S. Caribbean federal waters (queen conch, Nassau grouper and goliath grouper), or for which harvest is prohibited due to their ecological importance (rainbow, blue and midnight parrotfish), or for species that have seasonal closures or size limits (queen conch, spiny lobster and select snappers and groupers). These species are susceptible to excess fishing pressure and/or vulnerable to environmental conditions. Unlike **Alternative 1**, **Preferred Alternative 2** includes species that that were not included in the previous FMPs, but are currently considered to be biologically vulnerable or ecologically important, such as all sea urchins and sea cucumbers. **Preferred Alternative 2** would also benefit the biological/ecological environment indirectly because, once these species are included in the FMP, the Council must establish catch limits, including limits for the highly targeted stocks that are currently without federal management measures, like dolphin and wahoo. Establishing

[50] A qualification needs to be given here. Commercial fisheries in the St. Thomas/St. John EEZ are not restricted in terms of access. Being largely ‘open access’, these fisheries likely generate little producer surplus. While the rebuilding of stocks and increased harvests may allow for the generation of some short-run producer surplus (profit), this would likely be dissipated over time.

harvest limits for these pelagic stocks would provide a more comprehensive management of the St. Thomas/St. John coral reef ecosystem. A more comprehensive management system would, in turn, generate a healthier ecosystem. A healthier ecosystem, in turn, implies a larger carrying capacity for other species dependent upon that ecosystem. Ultimately, this will result in larger stocks (controlling for other factors) and greater fishing opportunities. The benefits of these larger stocks, however, depends on mechanisms in place to control effort. Without effective mechanisms to control effort, producer surplus in the commercial sector resulting from the higher stocks will likely be dissipated over time.

Addition of species under **Preferred Alternative 2** would be largely administrative in nature but there could be some indirect economic impacts. Historical landings associated with the pelagic species (dolphin and wahoo) added under **Preferred Alternative 2** are relatively large. Inclusion of these species, as noted, will provide a more comprehensive management of the St. Thomas/St. John coral reef system. The relatively large landings of some of these species imply that subsequent regulations can have substantial economic impacts. Until such regulations are specified, however, one cannot determine if the economic impacts are positive, negative, or mixed (i.e., positive for one of the sectors but negative to the other sector).[51] Finally, to fully consider economic impacts that may, in the long run, be attributable to including many of the species listed under Criterion D in the St. Thomas/St. John FMP, one must consider how limited enforcement resources reacts to regulation associated with these species. This may be an important consideration given the large landings and, hence, possible large enforcement activities that would detract from other enforcement activities.

Not every fishery needs federal regulation. Not all species that are landed in St. Thomas/St. John or that were included in the Reef Fish FMP list of managed species are appropriate for management in federal waters off St. Thomas/St. John. During the stepwise process of **Preferred Alternative 2**, expert analysis guided by available data identified species that were either infrequently caught in federal waters or primarily caught in territorial waters, which were then excluded from federal management. The paucity of landings of these species in federal waters suggests that they are not targeted in federal waters. Hence, one might conclude that direct economic effects associated with exclusion of these species from the St. Thomas/St. John FMP would be minimal. Given limited enforcement resources in the region, furthermore, exclusion of these infrequently harvested species may allow for enhanced enforcement activities associated with those species of greater economic and/or ecological relevance.

[51] Given that there are no permit requirements associated with the commercial harvesting of these species, any producer surplus generated as a result of regulation would likely be transitory in nature.

4.2.4 Direct and Indirect Effects on the Social Environment

The social effects from adding species to the list of stocks to be managed are indirect benefits that help fulfill the goals of the FMP and protect stocks that are important both economically and socially to St. Thomas/St. John stakeholders. Under **Alternative 1** (No Action) those species that are currently managed under the Reef Fish, Queen Conch, Spiny Lobster, and Coral FMPs will be continued to be managed , but the Council will not add new species nor remove species from management. Not tailoring the list of stocks to be managed to those species of interest to St. Thomas/St. John would be contrary to the purpose of developing an island-based FMP.

With **Preferred Alternative 2** a stepwise process using the identified criteria allows for a more methodical approach that takes into consideration biological, ecological, and socio-economic considerations for the St. Thomas/St. John fishery that should have indirect beneficial social effects. The process under **Preferred Alternative 2** uses an expert panel and other management panels to apply the criteria that give a broad interpretation of social, economic and ecological importance which should benefit the stocks included and the fishery and more meaningfully meet the intent of creating an island-based FMP. Including specific species that are relevant to St. Thomas/St. John fishermen and stakeholders would facilitate monitoring and assessment which is critical to ensuring stock status remains above critical thresholds and avoids an overfished status. It also provides monitoring of fishing activity that can provide important information in determining whether actions may need to be undertaken to meet social and economic objectives within the St. Thomas/St. John FMP. The criteria included in **Preferred Alternative 2** serve different purposes as discussed in Section 2.2.2. All of these criteria offer an opportunity to consider social, economic, and ecological benchmarks by which to include species that are important to St. Thomas/St. John into the FMP and should have positive social effects although indirect. A new species identified as having ecological importance and added under Criterion C was the yellowmouth grouper. Others included under Criterion D were dolphin and wahoo. These species that have economic importance, and will be managed to prevent overfishing while ensuring optimum yield. These species are undoubtedly of social importance also and by including them into management, the Council can tailor management to ensure their continued positive social effects. Furthermore with the addition of all sea cucumbers and sea urchins, there would likely be positive social effects from management and conservation of these species.

4.2.5 Direct and Indirect Effects on the Administrative Environment

Alternative 1 would not result in increased administrative effects associated with selecting stocks to be included for management because **Alternative 1** continues management of the species included in the Reef Fish, Spiny Lobster, Queen Conch and Coral FMPs already have the list of species in place.

Preferred Alternative 2 would in the future resoult in increased administrative impacts associated with establishing ACLs and AMs for stocks new to management, but would also have decreased costs associated with the stocks that were removed from the previous FMPs. Under Criterion B, 36 previously managed finfish species of and all reef fish and invertebrates included as aquarium trade species in the Reef Fish and Coral FMPs, would be excluded from the St. Thomas/St. John FMP. The decreased administrative costs for those removed stocks would be expected to outweigh the costs associated with adding the three new fish stocks and new invertebrate stock complexes included for management under this alternative. Even though all species of corals, sea urchins, and sea cucumbers would be included in the St. Thomas/St. John FMP, which would potentially include hundreds of species, they would be managed at either the Class or Order level, requiring management measures for only three stock complexes.

4.3 Action 3: Compose Stock Complexes and Identify Indicator Stocks

Summary of Management Alternatives

Alternative 1. No Action. Retain the stock complex organization from the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs for stocks that would continue to be managed under the St. Thomas/St. John FMP. For stocks not previously included in the four U.S. Caribbean-wide FMPs, but which would be managed under the St. Thomas/St. John FMP via Action 2, no stock complexes would be established.

Alternative 2. Do not organize the species in the St. Thomas/St. John FMP into stock complexes.

Alternative 3 (**Preferred**). Manage species included for management in the St. Thomas/St. John FMP as individual stocks or as stock complexes based on scientific analysis including one or more of the following: cluster analysis based on landings patterns; outcomes from the Southeast Data, Assessment, and Review Caribbean Data Evaluation Workshop (2009) (only for species previously managed that would remain in the FMP); biological/life history similarities and vulnerability (for all species); and, expert opinion from the scientific and fishing communities (for all species).

Alternative 4. Where there are stock complexes, determine whether to assign one or more indicator stocks as follows:
Sub-alternative 4a (**Preferred**). Indicator stocks would be used. One or more indicator stocks would be assigned within a stock complex based on specific criteria. For stock complexes for which harvest is allowed and for which one or more indicator stocks is assigned, stocks in the stock complex would be subject to AM as a group based on the ACL established for the indicator stock(s).

Sub-alternative 4b (**Preferred**). No indicator stock(s) would be assigned. For stock complexes for which harvest is allowed, stocks in the complex would be subject to AMs as a group based on the aggregate ACL derived from information on all of the stocks in the complex.

4.3.1 Direct and Indirect Effects on the Physical Environment

Action 3 (stock organization) is primarily an administrative action because grouping species into stock complexes and selecting indicators stocks does not directly affect how the fisheries operate (i.e., gear types used) and is not expected to have direct effects on the physical environment as is it not expected to change fishing behavior. Indirect effects on the physical environment would depend on how the stocks, stock complexes, or indicator stocks are managed and how fishing activities as fishing effort and gear choice change as a result of that management.

Alternative 1 (No Action) would retain the same organization of stocks and stock complexes from the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs with two exceptions. Species that would no longer be managed as a result of Action 2 would be removed from the complexes, and stocks that are new to management would not be organized into stock complexes, but would be managed individually. Indirect effects to the physical environment for those unchanged complexes would continue to occur based on interactions of the fisheries with the sea floor, but the effects would not be expected to be greater than those previously discussed in the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b), if the harvest levels stay the same (see Action 4, Section 4.4 for a discussion of how changing harvest levels could affect the physical environment). For stocks new to management that would be managed individually, indirect effects on the physical environment would be the same as **Alternative 2**, described below.

Alternative 2 would not establish stock complexes, but rather would manage all species as individual stocks, resulting in one spiny lobster, one queen conch, 47 individual finfish stocks and an unknown number of coral, sea urchin and sea cucumber stocks. Even though the species would be managed as individual stocks under this alternative, fishing practices would not be expected to change, though the amount of fishing effort, and associated effects to the environment, could change. Indirect effects of fishing activities on the physical environment (i.e., the habitat, particularly that constituting the coral reef) would depend on whether and how individual management (e.g., establishment of ACLs and AMs) affects fishing effort. To the extent that it reduces fishing effort, it could reduce physical effects from interactions with fishing gear. ACLs would be set for the individual stock, and AMs would be applied at an individual level, and this could reduce fishing effort on a stock by stock basis. However, in a multi-species fishery where different stocks co-occur, as in St. Thomas/St. John, individual application of AMs might not reduce overall effort in a particular area. For a discussion on how ACLs affect fishing effort see Action 4, section 4.4.

Following Action 2, the composition of some stocks/stock complexes under **Preferred Alternative 3** would be the same as the composition under **Alternative 1** (see Section 2.3.2). For those stocks/stock complexes, the indirect effects to the physical environment would be expected to be the same under the two alternatives. For those stocks/stock complexes where the compostion of stocks under **Alternative 1** differed under **Preferred Alternative 3**, any differences on the expected physical effects would be subtle because of the generalized approach to fishing. Indirect effects of fishing activities on the physical environment would depend on whether and how management (e.g., establishment of ACLs and AMs) affects fishing effort. However, again, to the extent that fishing effort is reduced, there could be benefits to the physical environment by reducing interactions with fishing gear.

Alternative 4 determines whether to assign an indicator stock (**Preferred Sub-alternative 4a**) or to not assign an indicator stock (**Preferred Sub-alternative 4b**) to a stock complex. **Preferred Sub-alternative 4a** could have indirect effects on the physical environment. For complexes in which an indicator stock was selected, those effects would be expected to be beneficial if, for example, AMs that reduce the length of the fishing season based on landings of the indicator stock were triggered more frequently than AMs that were based on landings of the aggregate stock complex. More frequent AMs could reduce fishing effort and potential gear interactions; however on multi-species fisheries, like in St. Thomas/St. John, an AM based fishing season reduction for one species that co-occurs with others in the fishery might not reduce overall pressure. Not all stock complexes have the necessary data or information available to establish an indicator stock, or in other ways are inappropriate or not in need of indicator assignment which is the premise of **Sub-alternative 4b** as discussed in Section 2.3.2. All physical effects would be expected to be identical between **Preferred Alternative 3** and **Preferred Sub-alternative 4b**, because not choosing an indicator for all stock complexes results in the same list as **Preferred Alternative 3**.

4.3.2 Direct and Indirect Effects on the Biological/Ecological Environment

Action 3 is primarily an administrative action because grouping species into stock complexes and selecting indicators stocks does not directly affect how the fisheries operate *(*i.e., amount of fish caught) and is not expected to have direct effects on the biological/ecological environment. Indirect effects would depend on how the stocks, stock complexes, or indicator stocks are managed, including whether there is sufficient information to inform that management, and how fishing activities change as a result of that management.

For those stocks/stock complexes that are not changed in **Alternative 1** compared to the U.S. Caribbean wide FMPs, the indirect effects to the biological/ecological environment would continue to occur based as previously discussed in the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b), unless management measures controlling harvest are changed (see Action 4). Only a few stock complexes would be unchanged compared to the U.S. Caribbean wide complexes (e.g., Snapper 1, see Table 2.3.1), thus indirect effects to the biological/ecological environment could occur depending on how the changes to the complex composition alter management of these stocks. For stocks new to management that would be managed individually, indirect effects on the biological/ecological environment would be the same as **Alternative 2**, described below.

Alternative 2 would not group stocks into stock complexes and would result in management measures being established for each individual. For stocks that are caught in conjunction with other species or as part of a multi-species fishery, which is characteristic of the St. Thomas/St. John reef fish fishery, if an AM that reduces harvest is applied to a stock but not others, managing at the individual stock level could be less biologically beneficial than stock complex management, in that it could increase the amount of discard mortality of the stock subject to the AM.

For stocks that have insufficient data to establish reliable SDC or evaluate stock status relative to the SDC (e.g., variable landings, infrequently caught, species misidentification), managing at the individual stock level could be less beneficial than stock complex management (as proposed in **Alternative 1** and **Preferred Alternative 3**), as managing these data limited stocks together with stocks with more data could better prevent overfishing of these stocks and ensure OY.

Following Action 2, the composition of some stocks/stock complexes under **Preferred Alternative 3** would be the same as the composition under **Alternative 1**. For those stocks/stock complexes, the indirect effects to the biological/ecological environment would be expected to be the same under the two alternatives. For those stocks/stock complexes where the composition of stocks differs, **Preferred Alternative 3** would be beneficial to the biological/ecological environment. When determining appropriate stock complexes under **Preferred Alternative 3**, the Council and its SSC considered the availability of information about each stock to establish SDC and monitor stock status as well as other factors, such as how the stock is targeted and where stocks co-occurred. **Preferred Alternative 3** represents the best balance of individual versus stock complex management. This alternative would be expected to result in more careful and responsive management of the fisheries, and provide increased benefits, albeit indirect ones, to the biological/ecological environment, when compared to **Alternative 2** and **Alternative 1**. For example, the Council can tailor management in a way that might avoid AM-based fishing season reductions, which reduces the potential for regulatory discards and discard mortality. In addition, the Council would be better positioned to set ACLs that would provide better protection of the stocks and stock complexes.

Alternative 4 could be applied to each stock complex as necessary, depending on the desire to select (**Preferred Sub-alternative 4a**) or not select (**Preferred Sub-alternative 4b**) indicator stocks for the stock complex. **Preferred Sub-alternative 4a** increases the potential indirect benefits to the biological/ecological environment as the selected indicator stock can be used to help manage and evaluate more poorly known stocks within a stock complex. If an indicator stock is selected, it would represent the typical vulnerability of the stocks within the complex, or be more vulnerable, with special regard to interactions with the fishery. In data-limited situations, indicator stocks minimize the risk of overfishing, as all species in the stock complex are managed under the measures created for the indicator stock. Conversely, having the option to not select an indicator stock, as in **Preferred Sub-alternative 4b,** would provide flexibility in creating management measures for stock complexes for which an appropriate indicator cannot be identified. Where an appropriate indicator cannot be selected, the management measures would be based on the complex as a whole, thus providing increased biological/ecological benefits to the species within the complex. For each stock complex established in **Preferred Alternative 3**, the Council's SSC determined whether or not an indicator stock would provide additional biological benefits.

With respect to ESA listed-species, no direct effects are expected from this action, as it re-organizes how stocks are grouped, or not grouped, which would not be expected to alter fishing practices in the St. Thomas/St. John EEZ. Indirect effects to ESA-listed species may occur if individual stock versus stock complex management affects harvest and resource use and the potential for fishing-related interactions. It is not possible to know how individual stock or stock complex management would affect those interactions, as the factors that influence ESA-listed species are numerous and complex (e.g., co-location of the fisheries with the ESA species, seasonal migrations), or how the overall amount of pressure related to those factors would be affected.

4.3.3 Direct and Indirect Effects on the Economic Environment

The arrangement (or change in arrangement) of stocks into stocks/stock complexes, as proposed under Action 3, would not result in direct economic effects. This is because it would not be expected to influence harvest or use of the resource. Indirect effects are manifested via management actions that follow from the stock complex organization and influence harvest and resource use.

Alternative 2 does not organize stocks into stock complexes. As noted in section 2.3, however, all stocks may not necessarily benefit from being managed as individual stocks due to issues associated with the mis-identification of some individual species and unreliability of landings associated with the less frequently caught species. Given these factors, it could be difficult to establish reference points that are protective of stock status while allowing access to the resource. Annual catch limits associated with each individual species within the St. Thomas/St. John FMP would most likely result in a significant increase in administrative burden as AMs would need to be imposed when the ACLs are reached. These frequent AMs can be disruptive to the fishing communities, and may not be necessary to protect the stock if based on insufficient information. Reference points that do not protect a stock from overfishing could have long-term negative economic consequences. Individual management of the less frequently landed stocks is not likely to be effective, and could impose economic costs. These stocks are not targeted by fishermen but are instead caught in conjunction with other species (i.e., they are a part of a multi-species fishery). Thus, efforts to protect these infrequently caught species via individual stock management, such as stock specific ACLs and AMs, are likely to be relatively ineffective (assuming a high discard mortality which would likely be the case for, at least the reef fish species, given the depth of federal waters) unless catch of the other targeted stocks are also simultaneously curtailed. However, given the low landings of these infrequently caught stocks, short-term producer surplus would likely not be reduced significantly even with numerous AMs specific to the infrequently caught stocks. Thus, where insufficient information exists to manage a stock individually, or where stocks are caught together, managing the stocks in a complex, with a single ACL and AM for the complex, could avoid regulatory discards and protect economically important species. **Alternative 2** would prevent these benefits.

Like **Alternative 2**, **Alternative 1** would not be expected to influence harvest or use of the resource and thus has no direct economic effects. Given that many of the fisheries in St. Thomas/St. John are multi-species in nature, however, management of stock complexes as in **Alternative 1**, could result in different economic outcomes than managing at the individual stock level (**Alternative 2**). Specifically, managing at the individual stock level is likely to result in more regulatory discards than that which would occur under **Alternative 1**. **Alternative 1** does rely on indivual stock management for species that are new to management, however, it also relies on stock complex management. Hence, benefits associated with **Alternative 2** are less than those of **Alternative 1**.[52]

Preferred Alternative 3, like **Alternative 1**, would use the concept of stocks and stock complexes to manage species that were selected for management in Action 2. However, the organization of stocks and stock complexes differs from those designated in **Alternative 1** (Table 2.3.3). A comparison of **Alternative 1** with **Preferred Alternative 3** indicates some of the differences in the arrangement of stocks (stock complexes) represent inclusion of species new to management into various stocks and stock complexes in **Preferred Alternative 3**. For example, yellowmouth grouper would be managed in the Grouper 5 stock complex under **Preferred Alternative 3** rather than as an individual stock, as in **Alternatives 1** and **2**. Annual landings of this stock are relatively limited, and therefore this stock is not of significant economic importance. Other changes in stock complex organization reflect additional information about how the stocks are caught and additional consideration of life history information. For example, the Parrotfish stock complex was divided into the Parrotfish 1 and Parrotfish 2 stock complexes based on these considerations.

[52] See Section 2.3 for detail regarding types of scientific analysis which would be considered in development of the stocks and stock complexes.

Like **Alternative 1** and **Alternative 2**, **Preferred Alternative 3** is not expected to directly affect the economic environment because it does not directly change the harvest or use of the resource. Subsequent regulations, such as implementation of AMs, could trigger a change in the economic environment. While differences between **Alternative 1** and **Preferred Alternative 3** are relatively minor (in terms of changes in the economic environment that may be forthcoming with regulation), **Preferred Alternative 3** relied on additional and more recent information to organize stock complexes than is the case with **Alternative 1**. As such, there is likely a better chance of setting ACLs that would provide adequate protection of the stock with **Preferred Alternative 3** than with **Alternative 1** which, through time, would provide greater indirect economic benefits.

Preferred Alternative 4, Preferred Sub-alternative 4a or **Preferred Sub-alternative 4b** would not be expected to directly affect the economic environment because they not directly change the harvest or use of the resource. Assuming subsequent regulation, the economic outcome of assigning one or more indicator stocks for stock complexes may have important implications relative to not assigning indicator stocks. This would depend upon two factors: (a) the indicator stock selected and (b) the 'jointness in catch' among the individual stock in the complex.[53] Presumably, the indicator stock selected would reflect those stocks which provide the most informative catch data.[54] If this is the situation and if catch in the multi-species fishery is highly joint in nature, use of an indicator stock can help manage and evaluate the conditions for some of those stocks for which catch and other relevant data that can be used in the management process are less informative. Thus, use of one or more indicator stocks could better ensure that less frequently caught stocks (which have less informative data) would be better protected and not overfished, which would then detract from any long-term benefits from harvesting these stocks. If true jointness does not exist in the harvesting (production) process, however, any economic benefits that might be derived from the use of indicator stocks may also be diminished.[55]

4.3.4 Direct and Indirect Effects on the Social Environment

The organization of stocks and stock complexes, as proposed under Action 3, would not result in direct effects to the social environment because it would not influence fishing activities or use of the resource. The social effects from establishing stock complexes would be indirect as many of the impacts would come from ACLs, other reference points, and AMs that govern harvest of each stock or stock complex. Managing with stock complexes helps resolve the difficulty in

[53] Jointness in catch reflects the inability of the fishermen to change fishing practices in a manner that would change species composition in the multi-species fishery.
[54] See Section 2.3.2 for the set of criteria that may be used to select one or more indicator stocks.
[55] As noted, entry into most of the fisheries in the federal waters off of the St. Thomas/St. John coast is not limited, which would tend to suggest relatively limited producer surplus. This fact and the fact that the landings of the more infrequently harvested species are more limited suggest that economic benefits associated with the use of one or more indicator stocks would be limited.

establishing reference points for each individual stock, especially those that do not have reliable landings histories which can place unnecessary burdens on different fishing sectors according to their fishing practices for a particular species.

For the most part, **Alternative 1** (No Action) would organize stocks and stock complexes as they were organized under the U.S. Caribbean-wide FMPs. However, stocks that are newly added to management would not be included in complexes and would need to have reference points, such as ACLs, established individually, which may prove difficult if data are not available. Without reliable and consistent data, the reference points that would be established and AMs that could follow may result in fishing season reductions that disrupt fishing patterns. Managing species individually, for stocks new to management under **Alternative 1** and for all stocks under **Alternative 2**, has the potential to trigger unnecessary and onerous management actions that could have complex negative social effects. For example, if, as might be the case for some species, there is insufficient information to develop robust reference points based on available data, ACLs might be set at a precautionary level that could result in frequent closures.

The selection of stock and stock complexes under **Preferred Alternative 3** relied on analysis and extensive review by expert and experience-based panels. This process, involving experts and user groups from the island, garners both scientific and public support and is consistent with the purpose of creating an FMP tailored to St. Thomas/St. John. **Alternative 1** also relies on stock complexes and individual stock management. The stock/stock complex organization under **Alternative 1** would be largely the same as under **Preferred Alternative 3**, however, that organization was not re-reviewed with scientific and experience-based experts, and thus does not reflect a refined approach to management. For this reason, it would not be likely to provide the same benefits to the social environment as **Preferred Alternative 3**.

Alternative 4 would allow the Council to choose indicator stocks that would be used to set SDC for a particular stock complex. Under **Alternative 4, Preferred Sub-alternative 4a** the SSC evaluated variuos criteria to select indicator stocks and discussed those selections at a public meeting where members of the St. Thomas/St. Jon DAP were able to offer input. This process lends confidence regarding the suitability of the indicator stock to manage the stock complex. **Alternative 4**, **Preferred Sub-alternative 4b** was applied to those stock complexes for which there is no appropriate indicator stock. In this instance, reference points would be established for the stock complex based upon the aggregate stock information and AMs would be applied based on those reference points. It is anticipated that the preferred alternatives would have positive social benefits through practical selection or non-selection of indicator stocks, that reflect available information. However, the formation of reference points for grouped stocks and the use of indicator stocks may induce some changes in fishing behavior if unanticipated closures occur as a result of thresholds for the stock complex being exceeded. In the long-term, if these measures provide sufficient protection for stocks there should be positive social effects.

4.3.5 Direct and Indirect Effects on the Administrative Environment

Action 3 would directly and indirectly affect the administrative environment. Direct effects result as management resources are expended to update the stock/stock complex organization (e.g., update regulations, revise management plans) and indirect effects depend on the resources needed to manage the resultant stock/stock complexes going forward (e.g., monitor ACLs and apply AMs). Generally, individual stock management would require more administrative resources than stock complex management.

Alternative 1 retains the prior stock/stock complex organization, as applicable, for stocks that were managed under the Reef Fish, Spiny Lobster, Queen Conch and Coral FMPs. Stock complexes were updated to reflect that certain species are no longer being managed as a result of Action 2. Species new to management are not organized into stock complexes and would be managed individually. Updating the management plans and regulations to revise these stock complexes directly impacts the administrative environment. Indirect administrative effects would depend on the amount and frequency of future administrative actions needed to manage these stocks/stock complexes. Management measures would need to be established for the species new to management, which would include three fish stocks and many individual stocks of corals, sea cucumbers, and sea urchins.

Alternative 2 would result in the greatest administrative burden, as it would require that management measures be established for a minimum of 49 individual stocks and an unknown number of coral, sea urchin, and sea cucumber stocks. Some of these species are unidentifiable, misidentified or misreported, or have extreme fluctuations in landings through time due to rarity, or lack of targeted fishing effort. Thus, specifying individual management measures for these stocks might result in periodic overages that would require AM implementation, creating additional burdens on science and enforcement in the future.

Preferred Alternative 3 would decrease the number of stock/stock complexes compared to both **Alternative 1** and **Alternative 2**, potentially increasing the positive indirect effects to the administrative environment. **Preferred Alternative 3** would be expected to result in better management of the stocks in the St. Thomas/St. John FMP, as the stocks and stock complexes were organized using the best information available. Thus, it would be expected that the number of future administrative actions related to these stocks/stock complexes would be fewer and less frequent than under the other alternatives. As with **Alternatives 1** and **2**, indirect effects would result from establishing management measures for the species new to management.

Preferred Sub-alternative 4a (selecting an indicator stock) would have minimal direct effect on the administrative environment and **Preferred Sub-alternative 4b** (not selecting an indicator stock) would have no direct effect on the administrative environment. The direct effect of

Preferred Sub-alternative 4a follows from expending management resources to update the management plan and regulations to reflect the selection of an indicator stock. The indirect effects depend on updating the management measures applicable to the stock/stock complex and managing those stock/stock complexes. Depending on the determination on an indicator stock for the complex, the process for establishing management measures would be slightly different and could have differing indirect administrative effects. For those stock complexes where an indicator stock was selected (**Preferred Sub-alternative 4a**), the process for establishing management measures would be similar to single species stocks, which is a simpler process. For those stock complexes where an indicator stock was not selected (**Preferred Sub-alternative 4b**), establishing management measures would require an extra step to combine the data for the stocks within that stock complex. Similarly, monitoring the multi-species stock complexes without an indicator stock would require that additional step before determining if the ACL was exceeded. Overall, the expected effects of selecting or not selecting an indicator stock would be expected to be minimal, as those determinations were based on the best scientific information available at the time and would provide managers with increased flexibility in the monitoring and management of stock complexes.

4.4 Action 4: Establish Status Determination Criteria and Management Reference Points

Summary of Management Alternatives

Alternative 1. No Action. Retain the management reference point values and SDC specified in the 2010 and 2011 Caribbean ACL Amendments; and the Caribbean SFA Amendment defintions for MSST.

Alternative 2 (**Preferred**). Apply a three-step process to define MSY (or its proxy), SDC, ABC, and ACL for each stock or stock complex in the St. Thomas/St. John FMP.
Step 1. Adopt and apply the ABC Control Rule described in Table 2.4.1.
Step 2. Establish the proxy that would be used when F_{MSY} cannot be determined:
- **Sub-alternative 2a.** The proxy for $F_{MSY} = F_{MAX}$
- **Sub-alternative 2b**. The proxy for $F_{MSY} = F_{40\%SPR}$
- **Sub-alternative 2c** (**Preferred**). The proxy for $F_{MSY} = F_{30\%SPR}$

Step 3. Determine the OY and the ACL based on the sub-alternatives below and the ABC from **Step** 1 above.
- **Sub-alternative 2d.** OY = ACL = ABC
- **Sub-alternative 2e** (**Preferred for all stocks except angelfish, parrotfish, surgeonfish**). OY = ACL = ABC x 0.95
- **Sub-alternative 2f**. OY = ACL = ABC x 0.90
- **Sub-alternative 2g** (**Preferred for angelfish, parrotfish, surgeonfish**). OY = ACL = ABC x 0.85
- **Sub-alternative 2h**. OY = ACL = ABC x 0.75
- **Sub-alternative 2i**. OY = ACL = 0

Alternative 3. Apply the four-step process used in the 2010 and/or 2011 Caribbean ACL Amendments, as applicable, to set management reference points and/or SDC.
Step 1. Time Series:
- **Sub-alternative 3a**. Use the longest year sequence of reliable landings data available
- **Sub-alternative 3b**. Use the longest time series of pre-Caribbean SFA Amendment landings data considered to be consistently reliable
- **Sub-alternative 3c**. Use 2012-2016 as the most recent five years of available landings data.
- **Sub-alternative 3d**. Use another year sequence, as recommended by the Council's SSC

Step 2. Determine the MSY proxy (the MSY proxy = OFL):
- **Sub-alternative 3e**. Median annual landings from year sequence selected in Step 1.
- **Sub-alternative 3f**. Mean annual landings from the year sequence selected in Step 1.

Step 3. Determine the ABC:
- **Sub-alternative 3g**. Do not specify an ABC Control Rule. Adopt the ABC recommended by the Council's SSC.
- **Sub-alternative 3h**. Adopt an ABC Control Rule where ABC = OFL
- **Sub-alternative 3i**. Adopt an ABC Control Rule where ABC = OFL x 0.90
- **Sub-alternative 3j**. Adopt an ABC Control Rule where ABC = OFL x 0.85
- **Sub-alternative 3k**. Adopt an ABC Control Rule where ABC = OFL x 0.75

Step 4. Determine the ACL and OY (OY = ACL):
- **Sub-alternative 3l**. OY = ACL = ABC; **Sub-alternative 3m**. OY = ACL = ABC x 0.95
- **Sub-alternative 3n**. OY = ACL = ABC x 0.90; **Sub-alternative 3o**. OY = ACL = ABC x 0.85
- **Sub-alternative 3p**. OY = ACL = ABC x 0.75 **Sub-alternative 3q**. OY = ACL = 0

4.4.1 Direct and Indirect Effects on the Physical Environment

Alternative 1 (No Action), would result in the continuation of SDC and management reference points established in the 2010 and 2011 Caribbean ACL Amendments and the Caribbean SFA Amendment, as applicable to stock/stock complex composition (resulting from Action 2) and organization (resulting from Action 3). **Alternative 1** simply carries over the existing management reference points and SDC as discussed in Section 2.4.2. This alternative would largely maintain the status quo, which would not have effects to the physical environment beyond those existing effects from fishing for managed stocks and stock complexes. However, **Alternative 1** does not respond to and incorporate additional data, and does not adapt to a changing suite of managed stocks. Failing to revise management would preclude realization of any benefits or negative consequences of updated reference points, discussed in **Alternative 3** and **Alternative 4**. Stocks newly added to the St. Thomas/St. John FMP would not be accounted for in **Alternative 1**, a result that does not meet the requirements of the Magnuson-Stevens Act. Not specifying and monitoring harvest levels for newly added stocks, however, is not expected to change fishing behavior relative to the status quo, and thus is not expected to alter effects to the physical environment. These stocks were not managed and the continued absence of harvest levels is not expected to change behavior, though selecting this alternative would prevent realizing any benefits to the physical environment from management.

Preferred Alternative 2 would define a *three-step process* to specify new reference points and SDC for all stocks and stock complexes (as appropriate) proposed for management in the St. Thomas/St. John FMP. Applying the best scientific information available to ensure federally managed stocks are harvested sustainably over the long-term ensures those finfish and invertebrate populations supporting harvest are exploited to the greatest practicable extent while protecting reproductive capacity and maintaining effective ecological contributions. Establishing appropriate harvest reference points, taking into account both the biological needs and the ecological contributions of the stock as would be prescribed by **Preferred Alternative 2**, provides positive short- and long-term benefits to the physical environment depending on how fishing effort is adjusted. Reducing catch limits would generally reduce fishing effort and the potential for negative effects to the physical environment from gear and vessel interactions. Increasing catch limits would be expected to have the opposite result. However, in a multi-species fishery, where many fish are caught together, reducing harvest of one stock or stock complex but allowing harvest of others may not reduce overall effort and associated effects to the physical environment.

Step 1 applies a tiered control rule to develop reference points and SDC, depending on available information. Step 2 provides that when information is not available to determine the fishing mortality rate when fishing at maximum sustainable yield quantitatively, the Council can select a qualitative proxy. When applied over the long-term, this fishing mortality rate would allow a stock to achieve the maximum sustainable yield. **Sub-alternative 2b** of Step 2 is more conservative and thus, when data exists for this proxy to inform practical management measures, it could provide freater protections to the physical environment form reducing the potential for interactions thatn **Sub-alternatives 2a** and **2c** (**Preferred**). Step 3 derives OY and ACL from the ABC established via the tiered control rule in Step 1. With the series of sub-alternatives included in **Preferred Alternative 2,** Step 3, progressing from **Sub-alternative 2d** to **Sub-alternative 2i**, each sub-alternative progressively identified a more restrictive OY and ACL, with **Sub-alternative 2i** the most restrictive (no catch). As the sub-alternatives progress to a larger buffer between the ABC and ACL and lower ACL and OY, the effects to the physical environment would become increasingly positive as interactions between gear and habitat are reduced due to catch limits becoming increasingly lower.

Alternative 3 would follow the SDC and reference point setting methodologies developed in the 2010 and 2011 Caribbean ACL Amendments. The effects to the physical environment resulting from **Alternative 3** would depend on the combination of sub-alternatives selected and the catch levels resulting from application of this control rule, with interactions between gear and habitat reduced with lower catch levels. Step 1 **(Sub-alternatives 3a-3d**) would depend on the catch history (i.e., landings) of the stock and would could vary greatly depending on the length and timing of the year sequence selected. For some stocks, historical landings (**Sub-alternatives 3a** and **3b**) were not reported at the stock level, but rather at the family level (e.g. groupers). For those stocks, landings may be more reliable under **Sub-alternative 3c**, which uses a more recent year sequence, and may reflect updated landings reporting to the stock level. Step 2 (**Sub-alternatives 3e-3f**) would depend on the catch data available during the year sequence selected in Step 1. For stocks, the result would depend on the variability in the annual catch, which again would vary greatly by stock. With the exception of **Sub-alternative 3g**, in which the SSC would select and apply an alternative control rule, Step 3 (**Sub-alternatives 3h-3k**) would result in an increasingly lower ABC with the progression of each sub-alternative following from **Alternative 3**, Steps 1 and 2. Thus greater benefits to the physical environment would be expected with **Sub-alternative 3k** (ABC = OFL*0.75), as it applies the greatest reduction factor from OFL. Similarly, the final step in **Alternative 3** sets the ACL by applying a reduction buffer to the ABC resulting from Step 3 in order to account for uncertainty in the management process (**Sub-alternatives 3l-3q**). The range of reduction buffers is identical to the range of buffers included in **Preferred Alternative 2**, Step 3 (**Sub-alternatives 3d-3i**). The physical effects of lower catch levels would be expected to be the same as for **Preferred Alternative 3** discussed above.

4.4.2 Direct and Indirect Effects on the Biological/Ecological Environment

Direct and indirect effects would result from the revision (stocks presently managed in U.S. Caribbean EEZ waters) or establishment (stocks newly added to the St. Thomas/St. John FMP) of management reference points. Reference points directly affect how the fisheries operate (i.e., amount of fish caught) and are therefore expected to have direct effects on the biological/ecological environment. In addition, indirect effects such as effects on other species (e.g., trophic interactions) may be experienced. Those direct and indirect effects would differ depending upon the alternative chosen by the Council for establishing management reference points, and are discussed below.

Under **Alternative 1** (No Action), management reference points and in particular ACLs would be carried over from the presently established Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs, as applicable to the stocks and stock complexes to be managed under the St. Thomas/St. John FMP (See Section 2.4.2). Those reference points resulted from a lengthy process of data evaluation and analysis led by the Council's SSC, as described in the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b), and remain valid within the context of that process. However, that context is founded upon landings data obtained during those years for which the data were available and were considered valid at the time. While the validity of the reference year data has changed little, the years during which landings are available has changed. For those stocks (snapper, grouper, parrotfish, queen conch) addressed in the 2010 Caribbean ACL Amendment, the most recent reference year was 2005, whereas for the remaining stocks under federal management, the most recent reference year was 2009. As reference points are reevaluated for application in the St. Thomas/St. John FMP, additional years of data are available extending through 2016.

Under **Alternative 1** is chosen as the reference setting approach, those more recent years of landings data would not be considered. Much has changed in the St. Thomas/St. John EEZ fishery since 2009, and even more so since 2005. In particular, implementation of the Caribbean SFA Amendment along with the 2010 and 2011 Caribbean ACL Amendments altered many facets of the regulatory environment in St. Thomas/St. John EEZ waters, for example by establishing area and season closures, altering the composition of the managed fisheries, and implementing ACLs and AMs. In some instances it may be appropriate to use only reference years preceding some or all of those events, as landings during those years may best represent a sustainable harvest level. But for other components of the St. Thomas/St. John EEZ fishery, accounting for those changes best represents modern fishing practices as well as fishing activity into the future. These recent events would not be considered by the Council under **Alternative 1**. This could result in potentially direct negative effects by not ensuring each stock in the St. Thomas/St. John FMP is managed at OY. **Alternative 1** also may result in negative indirect effects by not ensuring that the Council to properly address ecological functionality such as those associated with trophic interactions (including grazing capacity) to the extent those interactions can be influenced by fishery management.

Of equal or greater effect, reference points for those species newly added to management would not be specified under **Alternative 1**, including for such economically important species as the dolphin and such ecologically important stocks as sea urchins. That outcome could result in direct negative biological effects because, without management reference points, these stocks may not achieve OY and indirect negative ecological effects by failing to ensure the provision of essential ecosystem services such as grazing capacity.

Preferred Alternative 2 would be expected to have positive short- and long-term effects on the biological/ecological environment associated with the St. Thomas/St. John EEZ. Applying the best scientific information available would ensure federally managed stocks are harvested sustainably while protecting reproductive capacity and maintaining effective ecological contributions. **Preferred Alternative 2** sets forth a three step process to derive MSY or its proxy, SDC, ABC, ACLs, and OY. In step 1, the Council applies a tiered ABC CR to determine MSY and SDC, or their proxies. Higher tiers in the ABC CR reflect more information about the stock. With less information, more conservative approaches are warranted. The Council and their SSC applied considerable expertise and effort to the process of developing the ABC CR in Step 1 of **Preferred Alternative 2**, establishing the process and protocols for implementing that ABC CR. Relying on a tiered control rule provides positive short- and long-term benefits to the biological/ecological environment by ensuring the best information is used throughout time to develop reference points indicative of potential negative trends in reproductive capacity and ecological function. Under National Standard 2 of the Magnuson-Stevens Act, the Council must always use the best scientific information available. The tiered ABC CR sets up a system that anticipates evolving and better information. If the Council selects another ABC CR that does not contemplate better information, for example information from stock assessments that would be used in Tier 1, it would have to develop and apply another ABC CR that is able incorporate that information when it becomes available. Under **Preferred Alternative 2**, the Council would be able to update management measures, SDC, reference points, and catch limits by simply re-applying the tiered ABC CR. Reflecting potential data limitations, Step 2 of the control rule provides that the Council can select a proxy for the fishing mortality rate when fishing at the maximum sustainable yield when that fishing mortality rate cannot be derived from the ABC CR. When data allow, management measures implemented to achieve the harvest objectives set by the F_{MSY} proxy would directly impact the biological environment in the form of controlling fishing effort. The choice of the F_{MSY} proxy depends on the life history of a species and how much risk the Council is willing to take. **Sub-alternative 2b**, which uses $F_{40\%SPR}$ as a proxy for F_{MSY} is more conservative and would provide greater assurance overfishing would not occur than the F_{MSY} proxies specified under **Sub-alternatives 2a** and **2c** (**Preferred**). Therefore, the biological benefits of **Sub-alternative 2b** would be greater than **Sub-alternatives 2a** and **2c** (**Preferred**).

For each of **Preferred Alternative 2** and **Alternative 3**, the final step in the process of establishing reference points is to set the ACL/OY. The Council selected **Preferred Alternative 2** as preferred based on the benefits of the tiered approach, discussed above, and directed the SSC to apply the control rule to develop reference points and SDC from the ABC CR. The SSC accounted to some degree for uncertainty when establishing SYL (Tier 4) to ABC (i.e., scientific uncertainty) reductions in their control rule. The SSC noted how factors that lead to management uncertainty, such as reporting issues, could lead to scientific uncertainty about what the data can demonstrate. Thus, the Council determined it was appropriate to apply a relatively minimal additional reduction to account for management uncertainty (**Sub-alternatives 2d-2i**). Those reductions are slightly less than the reductions in the reference points that would be carried over from the U.S. Caribbean-wide FMPs in **Alternative 1**. However, in both the 2010 and 2011 Caribbean ACL Amendments, no reduction from the OFL to the ABC was applied to account for scientific uncertainty. Thus, the full uncertainty reduction that would be applied under **Preferred Alternative 2**, Step 3, for all managed stocks, is more conservative when compared to the uncertainty reduction inherent in **Alternative 1**.

The series of sub-alternatives included in **Preferred Alternative 2** Step 3, progressively identifies a more restrictive OY and ACL, from no buffer in **Sub-alternative 2d** (no buffer)**,** 5% buffer in **2e** (preferred for all stocks but parrotfish, angelfish, and surgeonfish), 10% buffer in **2f,** 15% buffer in **2g** (preferred for parrotfish, angelfish, and surgeonfish to account for the ecological services these stocks provide to the coral reef ecosystem), 25% buffer in **2h**, to no catch in **2i** (most restrictive). As the sub-alternatives progress to a larger buffer between the ABC and ACL and lower ACL and OY, the biological/ecological effects would become increasingly positive due to catch limits becoming increasingly lower.

Effects to the biological/ecological environment resulting from **Alternative 3,** Step 1 **(Sub-alternatives 3a-3d),** Step 2 **(Sub-alternatives 3e-3f)**, and Step 3 **(Sub-alternatives 3g-3k)** would be expected to be more beneficial than those that would be realized from implementation of **Alternative 1** but less beneficial than those that would be realized from implementation of **Preferred Alternative 2**. Providing a mechanism for developing reference points for all managed species, as called for in **Alternative 3**, would result in positive biological/ecological effects, but the extent of those positive effects would be limited over time as this control rule does not provide a mechanism to consider and apply the best scientific information available and to update management as those data expand and improve. The range of reduction buffers to set the ACL in Step 4 of **Alternative 3** is identical to the range of buffers included in **Preferred Alternative 2**, Step 3 (**Sub-alternatives 2d-2i**). The biological/ecological effects would be expected to be the same as for **Preferred Alternative 2** discussed above.

With respect to ESA listed species, direct effects could be expected from this action, even though gear types and fishing effort are not expected to substantially differ from those previously analyzed, as it updates ACLs for several stocks previously managed and establishes ACLs for stocks new to management. However, it is uncertain how fishing under the new ACLs established under **Preferred Alternative 2** would impact ESA-listed species compared to **Alternative 1**, since some stock/stock complex-specific ACLs increased while others decreased.

Overall we expect decreases in ACLs to reduce the amount of fishing and the potential for fishing related interactions (interactions with gear, vessels, anchors). However, in a multi-species fishery, where many fish are caught together, reducing harvest of one stock or stock complex but allowing harvest of others may not reduce overall effort and associated effects to the biological environment.

4.4.3 Direct and Indirect Effects on the Economic Environment

Alternatives under Action 4 outline different approaches for specifying management reference points and SDC, in order to protect stocks (or complexes) from being overfished, while achieving, on a continual basis, OY. Ideally, these alternatives would be analyzed by examining the changes in producer and consumer surplus under each of the alternatives. The lack of information on costs in the commercial sector, from which information on consumer surplus is derived, the lack of information on the benefits derived from recreational fishing activities, and the lack of information on the benefits from non-consumptive activities prohibits any in-depth analysis of the changes in producer surplus. Hence, a more general analysis will be presented here relying more on expected changes in catch.

Alternative 1 maintains the status quo. As such, reference points specified in the 2010 and 2011 Caribbean ACL Amendments would remain in effect, where applicable (see Section 2.4.2). There are no direct economic impacts associated with maintaining the status quo but there may be indirect effects if the reference points as specified in the 2010 and 2011 Caribbean ACL Amendments are not based on the best available data or, for other reasons, do not reflect more recent analyses (e.g., changes in stock complex composition or organization).[56] If the status quo ACLs are specified in such a manner that they do not adequately protect stocks/stock complexes, there would be indirect economic effects from taking no action to change the ACLs (i.e., assuming sufficient effort, stocks may become overfished). On the other hand, if the no action management reference points are overly restrictive, AMs may be triggered in instances where such action is not warranted (i.e., overfishing on the stocks is not occurring and they are not in an overfished status). These AMs triggered based on incorrect management reference points would result in indirect economic losses.

Preferred Alternative 2 would use a three step process to specify the MSY or proxy, OFL or proxy, ABC, OY, and ACL for each stock/stock complex. The first step would be the adoption of an ABC CR (Table 2.4.1). Adoption of the ABC CR is entirely administrative in nature and is expected to have no direct effects on the economic environment.

[56] As indicated in Section 2.4, the timeframe used in calculating management reference points ended in 2005 and recreational data used in the calculations covered only the 2000-2005 timeframe.

Upon adoption of this control rule, an optional second step allows the Council to determine the proxy for the fishing mortality rate associated with fishing at MSY, when data is not available to derive this information from the ABC CR. This will inform qualitative approximations of MSY and MFMT when F_{MSY} cannot otherwise be determined, based on three sub-alternatives. The third step is to determine OY and ACL based on six sub-alternatives. In all six of these sub-alternatives, OY is set equal to ACL with ACL being some fraction of ABC (ranging from 0 to 1).

The third step would determine OY and ACL based on six sub-alternatives. As noted, there are no cost data by which to estimate the differences in producer surplus that might be forthcoming (at least in the short run[57]) under the different sub-alternatives. One could look at change in dockside revenues in conjunction with the ex-vessel price data but there is little to be gained from this exercise because the fractions associated with each of the sub-alternatives would provide the proportionate change in ex-vessel value that would be forthcoming under each sub-alternative if it is binding.[58]

Given the lack of information, discussion of each of the sub-alternatives is also limited. Certainly as one moves from **Sub-alternative 2d** to **Sub-alternative 2i** harvests that would be allowed before AMs are triggered would be reduced. This would provide enhanced protection of the stocks/stock complexes but this protection may be unwarranted (such as under **Sub-Alternative 2i** which sets OY and ACL equal to zero). The reduction in catches as one moves from **Sub-alternative 2d** to **Sub-alternative 2i** would, at least in the short run, reduce producer surplus to the commercial sector (assuming the response in price is relatively limited) and benefits to the recreational sector. If warranted, however, it will provide the necessary biological protection to the stock/stock complex. If reduction is not warranted (i.e., selection of a sub-alternative which dictates a lower harvest than that which is necessary to adequately protect the stock/stock complex), then selection of that sub-alternative would unnecessarily result in a reduction in surplus with no long-run benefits. Thus, there is an obvious tradeoff. Moving from **Sub-alternative 2d** to **Sub-alternative 2i** reduces surplus that society gains from fishing activities but provides greater stock protection. There is no way of determining though what level of protection yields the highest net benefits.[59]

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[57] It is important to specify short-run at this point because the purpose of setting an ACL to protect a stock/stock complex from being overfished, while achieving OY in a continuing basis. There would be no need to specify alternative ACLs for a given stock/stock complex if there were no uncertainty as to the scientific 'appropriate' ACL. Unfortunately, this is not the case and selection of a fraction that is too high, say 0.95, may result in insufficient protection of the stock/stock complex. Conversely, selection of a fraction that is too low may result the triggering of AMs that are not warranted for protection of the stock/stock complex.

[58] The assumption is being made that dockside price does not change in response to changes in binding ACLs.

[59] From a technical point of view, the question comes down to how much risk society is willing to take that a stock/stock complex will not be overfished versus the costs associated with a reduction in the ACLs.

Alternative 3 is comparable to **Preferred Alternative 2** in that its purpose is to provide a procedure for calculating an ACL and OY for each stock/stock complex. Possible changes in the economic environment that might be forthcoming from the selection of any sub-alternative in Step 3 of **Preferred Alternative 2** would be similar to any of the sub-alternatives selected in Step 4 of **Alternative 3**. Specifically, it cannot be stated with any certainty which sub-alternative would yield the greatest net benefits.

4.4.4 Direct and Indirect Effects on the Social Environment

Setting management reference points can impose indirect social effects. Impacts are recognized after the catch limits are implemented and subsequent actions, such as AMs, follow to ensure compliance with those limits. The social effects of retaining reference points for stocks or stock complexes under **Alternative 1** may be negative because those reference points may not mirror the St. Thomas/St. John fishery as it is being managed through this FMP. **Preferred Alternative 2** has social benefits as the stepped process allows for more and specific information to be considered in establishing reference points and SDC for those stocks or complexes that have assessments or those with more data (Tiers 1-3) and helps assess the risk of overfishing. It also provides a process recommended by scientific experts for specifying SDC for those species that do not have assessments (Tiers 4a and 4b). **Preferred Alternative 2** has an optional second step for establishing the proxy for the fishing mortality rate associated with fishing at MSY, when data is not available to derive this information from the step 1. The three sub-alternatives depend on the life history of a species and how much risk the Council is willing to take. **Sub-alternative 2b**, which uses $F_{40\%SPR}$ as a proxy for F_{MSY}, is more conservative and, to the extent it is able to inform catch levels, would provide greater assurance overfishing would not occur than the F_{MSY} proxies specified under **Sub-alternatives 2a** and **2c** (**Preferred**). Therefore, the social benefits of **Sub-alternative 2b** would be greater than **Sub-alternatives 2a** and **2c** (**Preferred**). With the series of sub-alternatives included in **Preferred Alternative 2** Step 3, progressing from **Sub-alternative 2d** to **Sub-alternative 2i**, each sub-alternative progressively identified a more restrictive OY and ACL. The most restrictive is **Sub-alternative 2i**, which allows for no catch. As the sub-alternatives progress to a larger buffer and lower ACL and OY, the social effects would become increasingly negative in the short-term as catch limits would be increasingly lower. The long-term effects would likely be positive if the OY and ACLs provide protection for the stocks and ensure the sustainability of stocks and stock complexes.

As in Tier 4 of the control rule in **Preferred Alternative 2**, **Alternative 3** would also use a series of steps to choose various reference points. For many sub-alternatives, it may be difficult to know the social effects as they would depend upon each sequential step to understand the effect of the combined steps. The social effects of setting time series reference points for stocks or stock complexes under **Alternative 3** (Step 1) may be different as different time series can encompass an entirely different set of actors and fishing behaviors depending upon the bounds of the time series. Shorter time series that are closer to the present would reflect recent changes and fishing behavior and current participation, whereas longer time series provide a more historical perspective on the particular fishery for a stock or stock complex and include past fishermen as well as fishermen who have been involved in the long-term. In either case, there can be both negative and positive indirect social effects. With **Sub-alternative 3a** by using the longest time series available the historic fishery and participation should be accounted for, however, it may reflect a much different fishery that existed previously and may not resemble the type of fishery that exist today in participation or behaviorally. Using the time series under **Sub-alternative 3b** would be consistent with what had been used in previous amendments by may not reflect the best time series for St. Thomas/St. John. Using the most recent data in **Sub-alternative 3c** would be more indicative of the current fishery but does not offer the long-term perspective. The time series under **Sub-alternative 3d** could have more positive social effects if the Council's SSC were able to take into consideration more current factors that may be missed with other sub-alternatives, such as recent weather events that may have altered the fisheries and their makeup.

Alternative 3 (Step 2) would set MSY proxies through a series of sub-alternatives. The social effects from any of these sub-alternatives are dependent upon selection from the previous step and subsequent choices of the succeeding steps. Overall, the effects are likely to be more positive with increased information, but again, it would depend upon the time series chosen for a particular sub-alternative as to whether the choice was reflective more of the historic fishery or the current one.

Alternative 3 (Step 3) would identify an ABC through the choice of a series of sub-alternatives. Those choices range from an ad hoc approach recommended by the SSC for each stock/stock complex in **Sub-alternative 3g** through a series of progressively lower ABCs from **Sub-alternative 3h** where it is equal to OFL to **Sub-alternative 3k** (75% of OFL). With each subsequent sub-alternative as before, from **Sub-alternatives 3g** to **Sub-alternative 3k**, the ABC is lower with each sequential sub-alternative, as would be the measures that are based on the ABC, such as the ACL. As discussed earlier, the lower ACLs that would result from each sub-alternative would have negative short-term social impacts, but could also have long-term benefits if it were to help maintain stocks at sustainable levels.

Alternative 3 (Step 4) specifies an OY, which is equal to the ACL, through the choice of a series of sub-alternatives. Under Step 4, OY is either equal to or reduced from ABC (**Sub-alternative 3l** to **Sub-alternative 3p**), or set at zero (**Sub-alternative 3q)**. Optimum yield is a reference point that takes into consideration social, economic and ecosystem factors to provide net benefits to the nation, and ACLs represent allowable catch levels. Setting a buffer from the ABC to establish OY and ACLs provides insurance that the stock would be healthier and thus positive social benefits should accrue as there should be continuous fish to harvest. However, buffers may not be necessary to protect the stock. Optimum yield is a management target and setting it too low may have negative short-term social impacts, although, lower levels of OY and ACLs could also have long-term benefits if it were to help maintain stocks over a long period of time and allow businesses to continue to operate within communities. The Council would select the sub-alternative that reflects its risk tolerance in view of available information.

Establishing reference points would not be expected to have direct social effects and any effects could be difficult to determine until reference point have been implemented and other processes such as stock assessments have been completed. Because the references points here are being selected with St. Thomas/St. John and its stocks and stock complexes that are important for island fishermen in mind, then it is assumed that the social effects would be beneficial. Therefore, **Preferred Alternative 2** should have the most social benefits because it is more responsive to the actual fishery in St. Thomas/St. John and uses more timely information. **Alternative 3** is somewhat outdated because of the timeframes that were used in previous amendments and was based on species that were more U.S. Caribbean-wide and not specific to the St. Thomas/St. John fishery. However, it is difficult to determine precise social effects and the scope of their nature as mentioned because they are indirect effects that depend on many other factors. If the fishery remains healthy as a result and fishermen are not unnecessarily constrained in their ability to make a living or recreate, there should be positive benefits.

4.4.5 Direct and Indirect Effects on the Administrative Environment

Administrative effects from **Alternative 1** are expected to be neutral because no additional action needs to be taken.

Preferred Alternative 2 would be expected to result in minor negative short-term administrative effects as effort is expended to modernize landings tracking protocols to account for establishment of new reference points and inclusion of new species. With respect to setting an F_{MSY} proxy, enhanced long-term positive effects on the administrative environment could be expected from **Preferred Sub-alternative 2c** of Step 2 because, when data are available to rely on this proxy to derive reference points, it would constrain harvest to the least extent relative to **Sub-alternatives 2a** or **2b**, and therefore could require less frequent management responses if ACLs are met compared to greater harvest constraints. **Sub-alternatives 2d** to **2i** of Step 3 provide options for determining OY and ACLs from the ABC derived from Step 1. These alternatives result in progressively greater reductions from the ABC, and progressively lower catch levels. The lower the catch levels, the more likely administrative action will be taken to ensure accountability with those levels.

Under **Alternative 3**, administrative short-term effects would be negative but minor, due to the additional administrative effort to update regulations and public awareness documents. Long-term administrative effects depend on the resulting catch levels and the administrative effort necessary to monitor and ensure compliance with those levels. Those effects would be essentially the same as those identified for **Preferred Alternative 2** above.

4.5 Action 5: Accountability Measures for Stocks and Stock Complexes

Summary of Management Alternatives

Alternative 1. No Action. Retain the methods for triggering and applying AMs included in the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs and brought into the St. Thomas/St. John FMP under Action 1. Do not establsh AMs for new stocks.

Alternative 2 (**Preferred for reef fish and spiny lobster**). Trigger an AM if landings exceed the applicable ACL, based on one of the sub-alternatives. The AM would reduce the length of the fishing seasaon in the year following the overage determination and be applied from September 30 backward. The Regional Administrator in consultation with the Council may deviate from the specific time sequences based on data availability.

Sub-alternative 2a. Beginning with the most recent year available, use a single year of landings data;

Sub-alternative 2b. Beginning with the most recent year available, use a single year of landings data, then a progressive running 2-year average of landings data;

Sub-alternative 2c. Beginning with the most recent year available, use a single year of landings data, followed by a 2-year average of landings data, then a progressive running 3-year average of landings data;

Sub-alternative 2d (**Preferred**). Use a single year of landings data from 2018, followed by a second single year of landings data from 2019, followed by a 2-year average of 2019-2020 landings data, then a progressive running 3-year average of landings data beginning with 2019-2021. The Regional Administrator in consultation with the Council may deviate from the specific time sequences based on data availability.

Alternative 3 (**Preferred for pelagics**). Establish an ACT (**Step 1**) for the pelagic stocks/complexes only, and use the ACT as the AM. Upon exceeding the ACT (**Step2**), the Council with the SEFSC would assess whether corrective action is needed.

Step 1: Specify the ACT for each stock:

Sub-alternative 3a (**Preferred**)**:** ACT = ACL x 0.90; **Sub-alternative 3b:** ACT = ACL x 0.80**;**

Sub-alternative 3c: ACT = ACL x 0.70;

Step 2: Determine the sequence of years to be used to determine if an overage has occurred. The Regional Administrator in consultation with the Council may deviate from the specific time sequences based on data availability.

Sub-alternative 3d. Beginning with the most recent year available, use a single year of landings data;

Sub-alternative 3e. Beginning with the most recent year available, use a single year of landings data, then a progressive running 2-year average of landings data;

Sub-alternative 3f. Beginning with the most recent year available, use a single year of landings data, followed by a 2-year average of landings data, then a progressive running 3-year average of landings data;

Sub-alternative 3g (**Preferred**). Use a single year of landings data from 2018, followed by a second single year of landings data from 2019, followed by a 2-year average of 2019-2020 landings data, then a progressive running 3-year average of landings data beginning with 2019-2021. The Regional Administrator in consultation with the Council may deviate from the specific time sequences based on data availability.

Alternative 4. Establish an in-season AM for stocks or stock complexes in the FMP. Harvest would be prohibited for the remainder of the fishing season if the ACL is reached or projected to be reached.

Alternative 5 (**Preferred for corals, sea cucumbers, sea urchins, Nassau and goliath grouper, queen conch, and midnight, blue, and rainbow parrotfish**). For a stock with a harvest prohibition, the prohibition would serve as the AM.

4.5.1 Direct and Indirect Effects on the Physical Environment

Effects to the physical environment resulting from establishment of AMs for stocks/stock complexes included in the St. Thomas/St. John FMP are expected to be indirect, minimal and generally neutral, or positive. Physical effects to the environment from fishing activities primarily result from gear interactions with physical structures such as seagrass beds or coral reefs. Those physical impacts may result from interactions with fishing gear or from vessel and especially anchor impacts. With regard to gear impacts, the extent of those impacts would reflect fishing effort. Reducing fishing effort reduces the opportunity for negative physical impacts from fishing gear with the sea bottom, including structural habitat such as coral. Overall physical effects would also depend on the extent to which other fishing opportunities, including effort shifts to stocks that remain available for harvest, alter overall fishing effort. For example, if an AM was applied to the spiny lobster stock harvested by hand, and fishermen responded by shifting effort to hook-and line harvest of a finfish stock, the overall effect could be detrimental if gear-bottom interactions increased. But, this would be tempered by the limit imposed by the ACL and potential application of an AM to the finfish stock, such that the overall effect may be neutral.

In general, benefits to the physical environment would be expected from the application of either **Alternatives 1**, **2 (Preferred)**, **4**, or **5 (Preferred)**, and this is the case regardless of the sub-alternative(s) chosen in **Alternative 2**. Positive indirect physical effects from the application of AMs reflect the reduction in fishing effort for the stock affected by the AM and/or a reduction in the number of anchoring events when fishing for the stock affected by the AM when the length of the fishing season is reduced (**Alternatives 1**, **2 (Preferred)**, and **4**) or harvest is prohibited (**Preferred Alternative 5**). However, these benefits would only be realized if fishing effort is not shifted to species not subject to the AM that are caught in the same areas with the same gear and methods. Within **Preferred Alternative 2**, the choice of **Sub-alternatives 2a-2d** could influence the frequency with which an AM-based fishing season reduction is implemented and the length of that fishing season reduction, however, the specific effects associated with each sub-alternative depend on the stock in question and the variability in landings associated with that stock. Without that information, it is difficult to assess the relative physical effects of each sub-alternative.

Indirect positive effects from the application of AMs would not be expected in the short-term from **Preferred Alternative 3** because triggering an AM under this alterntive does not necessarily result in a fishery closure as in the other alternatives. The Council can, however, take corrective action if needed that could reduce fishing activities and the potential for gear and vessel interactions, which could benefit the physical environment. **Sub-alternatives 3a** (**Preferred**), **3b**, and **3c** simply set reduction factors from ACL to ACT and would likely have similar, if any, indirect effects to the physical environment. **Sub-alternatives 3d – 3g**

(**Preferred**) use the same year sequences as **Sub-alternatives 2a** – **2d** (**Preferred**). Again, it would be difficult to assess the relative physical effect of each sub-alternative.

An AM could result in an increase in fishing effort within the shortened season for stocks affected by an AM, though this would only be the case with a post-season AM (**Alternative 1**, **Preferred Alternative 2** (regardless of the sub-alternative chosen), **Preferred Alternative 3** (if the Council choses to reduce the fishing season for pelagic stocks, and regardless of the sub-alternative chosen), when fishers know the season will be shortened and may adjust their behavior. This increased fishing effort would not necessarily result in an increase in the number of anchoring events because more effort can be expended within a single such event. Within the constraints of ACLs, more intensive deployment of gear may result in greater physical impacts, but would also likely result in increased harvest rates that would achieve the ACL sooner within the year. As a result, the intensity of gear interactions would increase but the duration of those effects would be shorter. That trade-off between intensity of the effect and duration of the effect would likely result in a neutral overall physical effect.

4.5.2 Direct and Indirect Effects on the Biological/Ecological Environment

Biological/ecological effects resulting from AM application would be indirect and positive, and in some cases could be substantial and these are expected from all alternatives proposed.

Under **Preferred Alternative 2** (post season AMs), positive benefits to the biological/ecological environment would be expected because the length of the fishing season would be reduced to ensure that the landings do not exceed the ACL in the year following an ACL exceedance, thereby ensuring fishing effort is managed as necessary to prevent a subsequent exceedance of the ACL. As discussed in Section 2.5.2, **Sub-alternatives 2a-2d (Preferred)** under **Preferred Alternative 2** propose a different choice of years in a stepwise temporal approach to calculate average landings for comparison against the applicable ACL. Although the choice of sub-alternative within **Preferred Alternative 2** could influence the frequency with which an AM-based fishing season reduction is implemented, and the length of that fishing season reduction, the specific effects associated with each of **Sub-alternatives 2a-d** (**Preferred**) depend on the stock in question and the variability in landings associated with that stock. Without that information, it is difficult to assess the relative effects of each sub-alternative. However, in general, the fewer years of landings used for comparison against the ACL (i.e., **Sub-alternative 2a** [single year of landings] or **Sub-alternative 2b** [one single year, then average of two-years]), the more variable the resultant year-to-year comparison will be against the established ACL. Because some or all of the variability results from natural biological fluctuations, little biological/ecological advantage is obtained from using a single year of landings for comparison against the ACL. Overall, OY would be achieved less frequently when using a single year of landings for identifying an ACL overage. To a point, the longer the time-series like that proposed in **Preferred Sub-alternative 2d**, the more closely management will achieve OY.

Alternative 4 (in season AMs) achieves the same goals as **Preferred Alternative 2** (post-season AMs) but more responsively by applying effort control in a pro-active rather than reactive manner. **Alternative 4** therefore provides enhanced benefits relative to **Preferred Alternative 2**, and much greater benefits relative to **Alternative 1** because of its broader applicability to all managed stocks or stock complexes, and because it provides a mechanism to prevent ACL overages within the fishing year rather than responding in a subsequent year to an already realized ACL overage. As previously discussed, the Council, its federal and state partners, and its constituents embrace, and are working toward, fishery data collection and reporting mechanisms that would support in-season management. When those mechanisms are achieved for one or more stocks/stock complexes, application of **Alternative 4** will be feasible. Because such timely data reporting may be imminent for one or more stocks/stock complexes included in the St. Thomas/St. John FMP, inclusion of **Alternative 4** is valid despite its present lack of applicability. In any case, both **Preferred Alternative 2** and **Alternative 4** provide the framework for managing fishing effort on all stocks/stock complexes proposed for inclusion in the St. Thomas/St. John FMP. **Alternative 1** does not. Successful management of fishing effort on all managed stocks, to ensure a sustainable harvest, is the essence of fishery management, and brings to fruition the entirety of conceptual and analytical processes resulting from Actions 1-7 of this document.

Additional positive biological/ecological effects would occur from re-establishing AMs for previously managed stocks and by establishing AMs for newly managed stocks, as proposed in **Preferred Alternative 2 and Alternative 4**. Again, **Alternative 4** is advantageous relative to **Preferred Alternative 2** because **Alternative 4** provides an anticipatory rather than a reactive response as would be the case with **Preferred Alternative 2**.

For those stocks available for harvest, **Alternative 4** provides the greatest biological/ecological benefit because that approach ensures that harvest is constrained to a pre-determined, biologically sustainable level during the fishing season. The post-season AMs contemplated in **Alternatives 1** and **Preferred Alternative 2** result in a lag in application of the AM to constrain harvest. However, application of **Alternative 4** depends on the timely availability of landings data, and at present those in-season data are not available. As in-season landings data become available for one or more stocks, **Alternative 4** would be available to provide the most biological and ecologically beneficial option. In the meantime, **Preferred Alternative 2** would result in the most biologically/ecologically beneficial effects to the environment. **Preferred Alternative 2** continues and extends (to those stocks newly added to management) the beneficial effects realized from the original implementation of the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b) and summarized as follows. The more natural population size distribution resulting from sustainable harvest would provide a biological benefit, ensuring reproductive interactions are maintained especially for the plethora of sequentially hermaphroditic reef fish occupying the U.S. Caribbean coral reef ecosystem. Similarly, enhancing the size distribution of managed stocks contributes to the ecological function of the coral reef complex, for example by maintaining essential (and size-dependent) grazing services provided by herbivores such as parrotfish and surgeonfish. Conversely a negative effect to both the biological/ecological (and socio-economic) environments may result from the potential increase in regulatory discards of species caught during an AM fishing season reduction while fishermen continue harvest of species not subject to the AM. Although it is the desire of fishermen and managers to ensure species caught as bycatch are returned to the water with minimal harm, the normal routine of those fish would be disturbed and their fate upon re-submergence is unknown.

Alternative 1 would provide biological and ecological benefits similar to those presented for **Preferred Alternative 2**, but fails to provide such benefits to those stocks newly added to management because it would not establish AMs for those stocks. This would likely negatively affect the biological/ecological environment by potentially failing to achieve OY or to minimize the risk of stock depletion due to a failure to properly manage harvest.

Preferred Alternative 3 addresses a special case of pelagic stocks newly added to management. Those stocks have not been previously managed in St. Thomas/St. John EEZ waters, are broadly migratory, are relatively short-lived, and as a result tend to experience substantial year-class variability. Because of that, reducing the length of a future fishing season in response to an ACL overage (**Preferred Alternative 2**) may provide little positive biological/ecological benefit. The approach proposed in **Preferred Alternative 3** (establishing an ACT as a percentage of the ACL that would serve as the AM trigger) would require convening the Council to determine, based on advice from the SEFSC, whether corrective action is needed following an ACT exceedance. From the three sub-alternatives proposed under **Preferred Alternative 3** for setting the ACT relative to the ACL, **Sub-alternative 3c** provides the most conservative response because the ACT trigger represents the smallest percentage of the ACL and therefore provides the greatest likelihood that the Council and the SEFSC would convene and potentially take corrective action. That likelihood decreases with **Sub-alternative 3b** and is lowest with **Preferred Sub-alternative 3a**. The choice of years to calculate average landings for comparison against the applicable ACT as the determinant to trigger an AM proposed in **Sub-alternatives 3d-3g (Preferred)** could influence the frequency with which an AM is triggered, but the specific effects associated with each of **Sub-alternatives 3d-g** (**Preferred**) depend on the pelagic stock in question and the variability in landings associated with that stock. Without that information, it is difficult to assess the relative biological/ecological effects of each sub-alternative. In general, the biological/ecological effects from **Preferred Alternative 3** would likely be less beneficial relative to the other alternatives proposed because the AM would not require action in season or post season to limit harvest for the stock when triggered, risking potential depletion of the resource. However, long-term beneficial biological/ecological effects would be anticipated. Consulting with the SEFSC to take appropriate action to respond to ACT exceedances based on the most up-to-date biological and fishery information would provide an opportunity to better understand stock function relative to fishing pressure while providing guidance as to additional data and management needs. Any management revisions resulting from this would benefit stock productivity in the long-term with resultant benefits to the biological/ecological (and socio-economic environments discussed in Sections 4.5.3 and 4.5.4 below).

Preferred Alternative 5 provides the greatest overall benefit to the biological/ecological environment, but only for those stocks to which it applies (i.e., stocks for which harvest is prohibited for which the Council assigned an ACL of zero based on the Council's preferred alternative in Action 4). It is possible that beneficial long-term biological/ecological (and socio-economic effects discussed in Sections 4.5.3 and 4.5.4) may be realized from a prohibition on harvest and equivalent AM, as that prohibition would allow rebuilding of depleted stocks to a level at which harvest is sustainable and ecological function revived. While these considerations apply to all stocks for which a prohibition on harvest would be in place, they are particularly pertinent to midnight, blue, and rainbow parrotfish. Historically, stocks of those three species have been harvested from the St. Thomas/St. John EEZ by both commercial and recreational fishermen. Rebuilding those stocks to levels sufficient to again support harvest would therefore provide socio-economic benefits to the fishing community and, to the extent those stocks are then sustainably managed at OY, also would provide enhanced biological/ecological benefits to the coral reef community via their unique contributions to grazing capacity.

No direct effects to ESA-listed species are expected from this action, as an administrative action that establishes how and when an AM would be applied. With the exception of **Preferred Alternative 3**, AMs under this Action would generally reduce the length of the fishing season for a stock or stock complex, potentially resulting in a decrease of interactions with ESA-listed turtle and fish (interactions with hook-and-line gear) or corals (interactions with trap gear or anchors). **Alternative 3** requires allows the Council to consider whether additional corrective action, which could include fishing season reductions or could result in changes to the ACLs, is needed. Although indirect effects to ESA-listed species may occur if and when those AMs are applied, it is difficult to ascertain at this time the timing and duration of those closures or the stocks/stock complexes to which they would apply, and thus how ESA-listed species could be impacted. Following from Action 4, several stocks/stock complexes would experience increases in their applicable ACLs, and so it would be expected that fewer AMs would be triggered and applied. Again, it is difficult to predict which fisheries would experience fishing season reductions.

4.5.3 Direct and Indirect Effects on the Economic Environment

If stocks/stock complexes newly added to the St. Thomas/St. John FMP could potentially be overfished, or be subjected to overfishing in the future, **Alternative 1** would not provide the mechanism needed to adequately protect these stocks/stock complexes. This could result in long-term economic losses to the users of the resource via reduction in stock/stock complex levels that due to excessive harvest that fails to achieve OY. In addition, as noted in Section 2.5.2, **Alternative 1** would fail to comply with the requirements of the Magnuson-Stevens Act, which requires that mechanisms to ensure accountability with measures designed to prevent overfishing (namely, ACLs) be established for all federally managed stocks.

In determining the economic consequences associated with the implementation of any of the sub-alternatives associated with **Preferred Alternative 2**, it is important to realize that landings data for St. Thomas/St. John are merely estimates (based on an extrapolation from reported landings) and that estimated landings in any given year may be highly imprecise (with estimated landings being overestimated in some years and underestimated in other years). In addition, there is likely to be significant natural annual variation in the abundance of the stock/stock complex; particularly for stocks/stock complexes composed of short-lived species. Large annual variation in stock/stock complex abundance can result in significant annual variation in 'true' landings as well as estimated landings. These two factors would suggest that a longer sequence of years (up to some point) may be preferable to a shorter sequence in a comparison against the ACL. Given this to be the case, **Sub-alternative 2a** (a single year of landings) would likely lead to the triggering of an AM in many instances where such a triggering could be based on imprecise landings data for any given year. This situation, which is caused by 'artificial' annual perturbations in the landings data, can result in significant disruption to fishing communities and a loss of economic benefits derived from fishing activities. No real benefits associated with protection of the stock/stock complex may be realized because the high estimated landings are merely an artifact of error in the extrapolation process. Regulatory discards resulting from bycatch of species caught during an AM closure represent another potential economic cost in terms of lost benefits to the harvesting sector; particularly if the AM closure is the result of estimated landings over a short period (say, one or two years) exceeding 'true' landings.

While **Sub-alternative 2b** uses an average of the two most recent years of complete landings to be compared against the applicable ACL (after the first year), the use of only two years of landings data may not be sufficient to 'smooth out' errors in the landings data. Thus, from an economic perspective, **Sub-alternative 2c**, which would rely on three years of landings, would appear to adequately protect the stocks/stock complexes while imposing the least economic costs on the fishing communities when compared to either **Sub-alternative 2a** or **Sub-alternative 2b**.

Finally, the economic costs associated with **Preferred Sub-alternative 2d** would be of a similar magnitude of those under **Sub-alternative 2c** with the difference being those which are entailed during the first few years of FMP operation. **Preferred Sub-alternative 2d** also allows the Regional Administrator to deviate from the specific years based on data quality and availability. Deviation from the specified years based on data quality and availability is beneficial from an economic perspective since use of years with 'better' quality data will provide more accurate estimates while the availability of data necessitates deviation from the specified years. However, **Sub-alternative 2c** is likely to have marginally lower economic costs because a longer sequence of years is used after the first year of FMP operation, not after the second as with **Preferred Sub-alternative 2d**. Finally, since **Preferred Alternative 2** provides protection for those species newly added to the St. Thomas/St. John FMP whereas **Alternative 1** does not, economic benefits from protection of the stocks/stock complexes under the sub-alternatives listed in **Preferred Alternative 2** likely exceed the benefits associated with **Alternative 1**. The difference in benefits is likely to be particularly pronounced in a comparison of **Sub-alternative 2c** with **Alternative 1**.

Preferred Alternative 3, as noted, applies only to pelagic stocks new to management in the St. Thomas/St. John EEZ. Based on the largely migratory nature of these pelagic stocks/stock complexes and the relatively wide geographical area over which these stocks/stock complexes are harvested, limited economic effects would be expected to result from **Preferred Alternative 3** in the long run. Among the proposed sub-alternatives, **Preferred Sub-alternative 3a** (i.e., ACT would be 90% of ACL) in conjunction with **Preferred Sub-alternative 3g** (which grants additional flexibility by allowing the Regional Administrator, in consultation with the Council, to modify the specific time sequences based on data availability) would impose the least costs on fishing communities and would also entail the least amount of administrative burden.[60] The rationale for **Preferred Sub-alternative 3a** is that it gives the highest ACT relative to ACL. When this ACT is met, the Council convenes to determine, in consultation with the SEFSC, whether corrective action is needed. The rationale for **Sub-alternative 3g**, which provides the years for which landings will be compared to the ACT, follows the line of reasoning used in the selection of **Sub-alternative 2d** in the economic analysis of **Preferred Alternative 2**. Conversely, the greatest costs to fishing communities (and high administrative burden) would be the combination of **Sub-alternative 3c** (ACT is 70% of the ACL) in conjunction with **Sub-alternative 3d** (single year of landings). Costs associated with all other combinations would fall somewhere in between these two extremes.[61]

In-season landings data for stocks proposed for inclusion in the St. Thomas/St. John FMP are unavailable which implies that in-season management (i.e., **Alternative 4**) is currently infeasible. Therefore, the benefits and costs expected from **Alternative 4** could only be thoroughly evaluated once the contours of in-season management are detailed and the data to support such a management approach are available. In general, in-season management provides

[60] It is worth noting that triggering of the AM would not automatically necessitate any mitigation of overages. Instead, it would call for the Council to consult with the SEFSC to review available data and evaluate what factors led to the exceedance and whether corrective action is warranted (such as revision of the ACL, or a post-season fishing reduction). Comparison of the combination of sub-alternatives presented herein is premised on corrective action being taken (i.e., a restriction on future harvests due to exceeding the current limit). The costs of not taking action to curtail future harvests are the costs of convening with the SEFSC.
[61] Benefits in all cases would likely be very low for reasons already cited.

a more timely response to ACL exceedances, and thus could more quickly impose economic costs than post-season management.

Potential benefits relative to costs associated with **Preferred Alternative 5** are expected to be relatively large. This is based on the consideration that ACL for these species is set to zero due to the overfished nature of some stocks (i.e., queen conch, Nassau grouper, goliath grouper) and the ecological importance of other stocks (blue, midnight, and rainbow parrotfish, sea cucumbers, sea urchins, and corals). Hence, enhanced protection of these stocks is warranted.

4.5.4 Direct and Indirect Effects on the Social Environment

Accountability measures assist managers in maintaining an ACL within its bounds and can prevent overages from occurring or would account for overages in some manner. In **Alternative 1**, there would be no revision for determining the trigger for an AM or specifying an AM for the new stocks/stock complexes in the St. Thomas/St. John FMP. The AMs applicable to the stocks/stock complexes managed under the U.S. Caribbean region wide FMPs would continue to apply to the stock/stock complexes previously managed, which could have negative social effects, as management would not reflect the new island-based management.

In **Preferred Alternative 2**, an AM is triggered if total landings exceeds the ACL for a stock/indicator stock/stock complex in the St. Thomas/St. John FMP, and may be more aligned with stakeholder desires, benefitting the social environment. Under several sub-alternatives, the AM may be implemented in a variety of ways. Under **Sub-alternative 2a**, a single year of the most recent year of landings is used as the determinant. This alternative is more reactive to immediate circumstances but may not be the best predictor of future fishing practices. It assumes that fishing effort is constant and unchanged by other factors. Using the most recent year of landings then a progressive two-year average starting with the initial year and subsequent year, **Sub-alternative 2b** may account for trends that may be better predictors of future fishing behavior. **Sub-alternative 2c** is similar to **2b** but, in the third year, uses a progressive three-year average. **Preferred Sub-alternative 2d** uses a similar stepwise approach as in **Sub-alternative 2c**, but it includes an additional single year of landings at the onset (single year, subsequent single year, two year average, three year average). It also prescribes the landings years to use, but allows the Regional Administrator to deviate from the specific years based on data availability. Which of these sub-alternatives would have the least negative social effects is difficult to determine. The alternative that best reflects fishing trends and prevents overages from occurring is the more desirable. Those that incorporate running averages, and allow flexibility based on data availability, may be more in tune with fishing practices at the time considered and what may occur in the future.

Under **Preferred Alternative 3,** a two-step process is considered to establish an ACT as an AM trigger and then apply the AM (assess any necessary corrective action) through several sub-alternatives for pelagic stocks/indicator stock/stock complex. An ACT of 90% of the ACL would be established under **Preferred Sub-alternative 3a** with an ACT of 80% of ACL under **Sub-alternative 3b** and an ACT of 70% of ACL under **Sub-alternative 3c**. Moving from **Sub-alternative 3a (Preferred)** to **3c**, the social effects are likely less negative to more negative, respectively, because the more conservative approach resulting from **Sub-alternative 3c** likely would result in the ACT being met more frequently. This may have positive social effects in the long-term, however, if catches stabilize, although it may require more frequent reevaluation of how stock/stock complex are managed to best reflect fishing practices, prevent overfishing, and ensure OY. **Sub-alternatives 3d-3g (Preferred)** would evaluate whether the AM trigger had been met (the ACT had been exceeded) based on landings from the same potential year sequences as the sub-alternatives from **Preferred Alternative 2**. Again, it is difficult to determine which sub-alternative would have the least negative social effects, but those that best reflect fishing trends into the future and prevent overages are more desirable.

By establishing an in-season AM in **Alternative 4** fishing would be prohibited for the remainder of the year once the applicable ACL is reached or projected to be reached. This alternative would pertain to those stocks for which data are available to make such a determination, therefore would be limited in its scope as for most stocks included in the stock or stock complexes in-season data are not available. Therefore, the inability to implement an in-season AM would have negative social effects.

For those stocks with an ACL of zero, **Preferred Alternative 5** would establish the harvest prohibition as the required AM. There would be few if any immediate social effects from choosing this alternative, however, over time as these stocks recover and harvest is again allowed there could be positive social effects in the long-term.

4.5.5 Direct and Indirect Effects on the Administrative Environment

Alternative 1 would not produce administrative effects in the short-term as it would not change the status quo, but by not complying with Magnuson-Stevens Act requirements by not establishing AMs for stocks/stock complexes new to management, it may trigger a legal response. **Preferred Alternatives 2** and **3** (all sub-alternatives), **Alternative 4**, and **Preferred Alternative 5** would all have direct minor administrative effects because they all require rulemaking to establish AMs for managed stocks. In **Preferred Alternative 2**, sub-alternatives that could result in more frequent AM closures would increase the administrative burden. That result would be expected from those sub-alternatives that use a few years of landings (i.e., **Sub-alternative 2a, 2b**) instead of longer time series of landings (i.e., **Sub-alternative 2c, Preferred Sub-alternative 2d**). The fewer years of landings used, the more variable the resultant year-to-year comparison will be against the established ACL with more frequent exceedances of the ACL. This outcome would not be expected from **Sub-alternatives 3d -3g** (Preferred) of **Preferred Alternative 3** (i.e., choice of years for comparison against ACT) because exceeding the ACT does not trigger a fishing season reduction, unless a closure is selected by the Council in consultation with the SEFSC as a corrective measure. However, exceeding the ACT requires the Council to take action to determine whether corrective action is needed, which imposes administrative costs. The additional condition included in **Preferred Sub-alternative 2d** and **Preferred Sub-alternative 3g** that allows the Regional Administrator in consultation with the Council to deviate from specific time sequences would add an inconsequential administrative burden. Lastly, **Alternative 4** effects would be larger because of additional administrative cost and time burdens associated with tracking landings in-season, however at this time, in-season tracking of landings is not feasible.

4.6 Action 6: Describe and Identify EFH for Species Not Previously Managed in the St. Thomas/St. John EEZ

Summary of Management Alternatives

Alternative 1. No Action. EFH designations would not be described and identified for species new to management under the St. Thomas/St. John FMP. EFH designations for species previously managed under the U.S. Caribbean-wide FMPs (i.e., Reef Fish, Spiny Lobster, Queen Conch, and Coral) would be retained.

Alternative 2 (**Preferred**). EFH designations would be described and identified for species new to management according to functional relationships between life history stages and marine and estuarine habitats, based on best scientific information available from the literature, landings data, fishery-independent surveys, and expert opinion.

Alternative 3. Use the highest level of detailed information below to describe and identify EFH for species new to management.

1) Designate EFH based on distribution data (distribution of habitat types, fish species and fishing effort) (Level 1 data – surveys of presence/absence; simple habitat/species associations);
2) Designate EFH based on habitat-related densities of the species (Level 2 – Survey/fishery related catch per unit effort as proxy for density; or spatial modeling of probability of occurrence, or other forms of habitat suitability models);
3) Designate EFH based on data on growth, reproduction, or survival rates within habitats (Level 3 – obtained from tagging data (growth), fecundity data by area);
4) Designate EFH based on production rates by habitat (Level 4); and
5) Designate EFH based on habitat suitability models (uses models prepared by National Ocean Service to infer information about species distribution, and possibly relative density).

4.6.1 Direct and Indirect Effects on the Physical Environment

Action 6 would identify and describe EFH for species new to management under Action 2. Designation of EFH has no direct effects on the physical environment, but may have indirect effects due to two other provisions of the Magnuson-Stevens Act. First, every FMP must minimize to the extent practicable adverse effects of fishing on EFH (MSA Section 303(a)(7)). Second, federal agency actions that may adversely affect EFH trigger consultation and/or recommendations (MSA Section 305(b)(2)-(4)). As an example, positive indirect effects could occur if EFH designation leads to future regulatory action that increase area protections or lead to EFH consultations, and negative indirect effects could occur if EFH is not designated and if fishing activities (i.e., gear/anchor interactions with bottom) adversely impact bottom structure or function.

Fishing gear could have impacts on the biogenic structure and biota living on the bottom. However, the fishing gears used in harvesting the new finfish species for which EFH must be designated are similar to fishing gears used for species already managed. The Council previously considered the effect these gears have on the physical environment in the Final Environmental Impact Statement (FEIS) for the Generic EFH Amendment (2004 FEIS) (CFMC 2004) and the Reef Fish FMP, and took action to protect areas that it had identified as EFH. If the Council identifies additional habitat areas as EFH for the species new to management, it would similarly need to take action to minimize the adverse effects to these areas of EFH from fishing, which could benefit the physical environment (assuming fishing practices harm these areas and the effects can be addressed). If no new habitat areas are identified as EFH, no further action may be needed, and no additional benefits would be achieved.

Alternative 1 would not comply with the Magnuson-Stevens Act, which requires that EFH be identified for all managed species, and therefore would not be viable. The indirect effects stemming from the decision not to identify EFH for the proposed species is that the Council would not identify new habitat areas as EFH, and thus would not be required to take action to protect these areas from fishing or to consult on effects to these areas. Thus, if EFH is not identified, potential benefits from consultation and actions to protect EFH might not be realized, but of course those potential benefits depend on new areas of EFH being identified and there being effects to these areas that can be offset, or there being something different about how the species use the EFH that results in additional protections from any EFH consultations.

Under **Preferred Alternative 2,** the Council would describe and identify EFH for species new to management following the same approach used in the 2004 FEIS (CFMC 2004) for those species already under management. **Preferred Alternative 2** identified EFH by specifying functional relationships for life stages and habitat types that might be regarded as meriting special attention for their importance to managed species based on information available through literature review, fishery-dependent and independent data and expert opinion (Section 2.6, Appendix I). **Preferred Alternative 2** identified new habitat areas as EFH for corals, sea urchins, and sea cucumbers, namely substrates in waters from mean low water to the outer boundary of the EEZ. This designation includes substrates in waters of all depths, not just subtrates in waters from mean low water to 100 fathoms as was previously identified as EFH for managed corals, sea urchins, and sea cucumbers. The substrates identified as EFH for dolphin and wahoo also included substrates from mean high water out to the outer boundary of EFH. Substrates in these deeper waters were not identified as EFH for species previously under management. Thus, there could be indirect effects of identifying these additional habitat areas, for example, if the Council takes action to limit fishing impacts to these areas, or if EFH consultations result in measures that protect the physical environment. However, for the newly added species, **Preferred Alternative 2** would not be expected to lead to additional protective measures as interactions resulting from the use of hook-and-line gear to pursue deep-water species, such as queen and silk snapper, would have minimal impact on the underlying substrates. In addition, the Council prohibited harvest of managed coral reef resources through Action 4, positively benefitting EFH. Finally, projects affecting substrates located beyond 100 fathoms are generally infrequent (e.g., submarine cables and transmission lines) and the landward extent of those project from 100 fathoms already trigger EFH consultations.

Alternative 3 proposes other approaches to describe and identify EFH for species new to federal management that were explored in the 2004 FEIS (CFMC 2004) that could be used depending on data availability. The limiting factors for these approaches is the lack of species-specific data (density, abundance, etc.) and the lack of geographical boundaries for the marine habitats used by the species new to management. At this time, indirect effects of **Alternative 3** would be the same as **Alternative 1** for the species new to management. When the data required for any of the approaches listed under **Alternative 3** become available, then the effects of this alternative would be expected to be similar to the effects of **Preferred Alternative 2,** as EFH would be designated for the new species. If the information allowed for additional or more precise descriptions of EFH, the effects might be more beneficial.

4.6.2 Direct and Indirect Effects on the Biological/Ecological Environment

Identifying EFH would not have direct effects on the biological/ecological environment, but indirect effects could occur depending on future regulatory actions taken to minimize effects to EFH (MSA Section 303(a)(7)) and EFH consultations on the effects to EFH (MSA Section 305(b)(2)-(4))).

Describing and identifying EFH would not by itself restore degraded habitat, but any resulting Council action to minimize effects to EFH and EFH consultations may help to arrest the current degradation and prevent future adverse impacts due to fishing and non-fishing activities. Measures that improve habitat conditions would have regional and local benefits to the biological environment. Local habitat improvements resulting from protective measures and/or recommendations arising out of EFH consultations would offer an opportunity for increased productivity that would likely have spillover effects to surrounding areas as fish move on and off with daily and seasonal movements.

Preferred Alternative 2 identifies EFH for newly proposed species for federal management and includes substrates in deeper waters than was identified as EFH for the previously managed species. **Alternative 3** would allow the Council to more finely identify EFH, if information was available to use **Alternative 3**. As a result, **Alternative 3** could inform more specific protections for the more finely identified EFH. However, at this time, we do not know what designations would result from **Alternative 3**, and thus do not know which additional protections might be needed or available.

Alternative 1 would not comply with the requirements of the Magnuson-Stevens Act, as it would not identify EFH for new species included in the St. Thomas/St. John FMP. Negative indirect effects could occur under this alternative if habitats important to particular life stages for the species new to management were impacted from fishing or non-fishing activities. Not identifying EFH for the newly proposed species (**Alternative 1**), assuming the EFH identified differed from the already identified EFH, would not allow the Council to realize the benefits to the biological and ecological environments from consultations or other actions to protect the habitat.

The indirect effects of **Preferred Alternative 2** and **Alternative 3** would depend on the EFH areas identified and future management actions associated to protect those areas. The Council may not need to take future action if the areas identified as EFH for the species new to management are the same as the areas previously identified as EFH in the U.S. Caribbean-wide FMPs. Likewise, if gear types and/or fishing practices do not impact the habitat, one would expect no indirect benefits from specifying EFH for the added species.

Preferred Alternative 2 identifies and describes EFH for the species new to federal management, including substrates in deeper waters than was previously identified as EFH. Thus, **Preferred Alternative 2** could lead to additional protective measures from fishing gear regulations or additional protections resulting from consultations on federal actions that may adversely affect EFH. Although the EFH descriptions for the Sea urchins, Sea cucumbers, and Corals stock complexes included in the St. Thomas/St. John FMP were updated to account for sea urchin, sea cucumber, and coral species new to management in the St. Thomas/St. John EEZ, the Council prohibited harvest for each of these stock complexes under Action 4; thus, no additional measures to manage fishing for these species are necessary and no associated effects in the area designated as EFH on these species would be expected. Biological/ecological effects from identifying EFH pelagic species, which also include deeper substrates, are not expected. Due to the pelagic nature of this fishery, which takes place in the upper water column only, and other deepwater fisheries (e.g., the silk and queen snapper fisheries), no measures to protect deeper substrates are expected. Finally, projects affecting substrates located beyond 100 fathoms are generally infrequent (e.g., submarine cables and transmission lines) and the landward extent of those project from 100 fathoms already trigger EFH consultations.

Alternative 3 would not describe or identify EFH at the present time, but in the future it might provide better information to inform management or consultations.

No direct effects to ESA-listed species would be expected from this action, as it just describes and identifies EFH for species new to management. Indirect effects could occur if, through future action, the Council puts protective measures in place to protect EFH (e.g., limiting fishing within an area) that also benefits ESA-listed species occurring within those areas.

4.6.3 Direct and Indirect Effects on the Economic Environment

Although identifying or not identifying EFH is merely an administrative action that would have no direct economic effects, not identifying EFH for species new to management as would result from **Alternative 1** may have economic effects if the gears and/or fishing practices used by fishermen to harvest these new species impact the surrounding physical environment and regulations to protect the environment are needed and are not an outcome of specifying EFH for these species. This, through time, may result in a loss of carrying capacity of the environment and, hence, long-run yield of species to be added to the St. Thomas/St. John FMP as well as species currently managed in federal waters. The reduction in long-run yields may translate into a loss of revenues for commercial fishermen and catch rates for recreational fishermen.[62]

In addition, degradation of EFH may impact the enjoyment associated with non-consumptive activities (e.g. scuba diving) which, in turn, could reduce consumer surplus to this component. Benefits associated with protection of habitat through regulation of gears/practices that impact the habitat must, of course, be weighed in conjunction with the costs imposed on the various sectors from the regulations. Specifically, regulations implemented to protect EFH impose a direct cost on those sectors upon whom regulation is imposed. Until such regulations are outlined, however, one cannot determine whether direct and indirect economic effects would be positive or negative. If gear types and/or fishing practices do not impact the habitat, one would expect no indirect benefits from specifying EFH for the added species. Likewise, if the same areas that are currently designated as EFH, and currently subject to protections and consultations, are designated as EFH for additional species, there would be no indirect benefits of stating that these areas also are EFH for additional species.

[62] Whether revenues decline in reaction to any reduction in catch depends on the price response to the change in landings. Given that there are few entry restrictions associated with fishing in federal waters, however, reduction producer surplus associated with a reduction in harvest may be limited

Preferred Alternative 2 and **Alternative 3** both call for describing and identifying EFH for species not previously managed in federal waters of St. Thomas/St. John but use different information, based on availability, for doing so. As with **Alternative 1**, these alternatives are merely administrative in nature and would result in no direct economic impacts. Whether any indirect economic benefits (or costs) would be forthcoming from either of these two alternatives depends upon a number of factors. The first, of course, is whether the gear and/or fishing activities impact EFH. If there is no impact, there would be no indirect benefits or costs associated with describing and identifying EFH for species not managed in federal waters of St. Thomas/St. John under either **Preferred Alternative 2** or **Alternative 3**. In general, if there are impacts to EFH from gear and/or activities and regulations are implemented to protect EFH, there would be beneficial impacts to the habitat and species, thereby resulting in associated economic benefits (as previously discussed). However, these benefits must be compared to costs (e.g., gear restrictions that are costly financially or result in a reduction in catch) to determine whether the net benefits that society receives from regulations imposed to protect EFH would be positive or negative. Both **Preferred Alternative 2** and **Alternative 3** are warranted from an economic perspective (that of efficiency) if protection of EFH via regulation generates positive net benefits. The net economic effects expected to result from **Preferred Alternative 2** cannot be determined at this time. The relative magnitude of any potential economic costs and benefits that could be expected to result from **Preferred Alternative 2** may only be estimated if (and once) specific regulations to protect EFH are outlined and enacted. However, as noted above, the Council is not expected to take additional action to manage fishing activities to protect these deeper EFH substrates, given the current harvest prohibitions and the pelagic nature of the deep-water fisheries. In addition, projects affecting substrates located beyond 100 fathoms are generally infrequent (e.g., submarine cables and transmission lines) and the landward extent of those project from 100 fathoms already trigger EFH consultations. **Alternative 3** would not yet result in EFH designations, and any potential economic benefits would only materialize once they serve as a basis for improving management in the future.

4.6.4 Direct and Indirect Effects on the Social Environment

Identifying EFH has limited direct social impacts, although by identifying and possibly protecting habitat by implementing measures to minimize effects from fishing or through taking actions in EFH consultations, it can have positive indirect social effects. Social impacts include, for example, the knowledge that marine habitats are being protected; the expectation that, by protecting these habitats, fishery resources could be positively impacted (e.g., fish population growth); and the expectations that these habitats would be available for non-consumptive uses (e.g., snorkeling).

In **Alternative 1,** EFH would not be identified for new species included in the FMP and could therefore have negative indirect social effects. However, the Magnuson-Stevens Act requires that EFH be established for species under management, so **Preferred Alternative 2** and

Alternative 3 would meet that mandate although by using different information to identify EFH. **Preferred Alternative 2** would use available information to describe and identify EFH, whereas **Alternative 3** would allow the Council to select among different approaches to determine EFH. The social effects of either alternative would be hard to determine, if they were both currently applicable, given the indirect links to other management alternatives that may or may not have some impacts. However, **Preferred Alternative 2** is more beneficial since **Alternative 3** is dependent upon information that is not available, although in the future if more information is available, **Alternative 3** may be a better choice. Of course, any protection to fishery habitat that is afforded by any alternative should have beneficial social impacts if it provides protection for stocks throughout their life history which in turn ensures healthy stocks that can be harvested at levels that provide OY. As mentioned in the economic effects section, positive social effects could be expected for those species for which **Preferred Alternative 2** described new areas as EFH (e.g., deeper waters for coral reef resources) within the U.S. Caribbean EEZ, as the coral reef ecosystem is vital to the well-being of the fishermen and fishing communities of St. Thomas/St. John. However, the Council is not expected to take additional action to manage fishing activities to protect these deeper EFH substrates, given the current harvest prohibitions and the pelagic nature of the deep-water fisheries, and additional social effects are not expected. In addition, for the reasons noted above, additional EFH consultations are unlikely to yield additional social benefits.

4.6.5 Direct and Indirect Effects on the Administrative Environment

Alternative 1 (No Action) would have a negative impact on the administrative environment since the description and identification of EFH is a required provision for FMPs, as stated in the Magnuson-Stevens Act. This could potentially result in lawsuits for non-compliance, which would require resources to address.

Preferred Alternative 2 uses the same approach that the Council previously used to identify EFH for the species under management in the U.S. Caribbean-wide FMPs. **Preferred Alternative 2** complies with the requirements under the Magnuson-Stevens Act as it identifies and describes EFH for newly proposed species for federal management, including newly defined substrates located beyond 100 fathoms for some managed species. Indirect effects from EFH identification on the administrative environment (e.g., triggering future regulatory actions or consultations) could be expected but projects affecting substrates located beyond 100 fathoms are generally infrequent (e.g., submarine cables and transmission lines) and the landward extent of those project from 100 fathoms already trigger EFH consultations. In addition, the Council is not expected to take additional action to manage fishing activities to protect these deeper EFH substrates, given the current harvest prohibitions and the pelagic nature of the deep-water fisheries.

Alternative 3 would allow the Council to select among a variety of methods to determine EFH. Although **Alternative 3** includes options that would provide the most refined description of EFH for all species under management, these data are not currently available to describe EFH for any of the species new to management, and therefore, this is not a viable alternative. Selecting **Alternative 3** would not result in EFH being identified, and would have the same effects as **Alternative 1**. If the information were to become available, the costs (in terms of administrative resources expended) of using one or more of the approaches under **Alternative 3** could be greater than the costs under **Preferred Alternative 2**. If more information were to become available, **Alternative 3** could result in EFH designations that could potentially result in additional or new management measures. Those new designations would have an indirect impact on the administrative environment depending on the effort required to update maps and information on EFH, as well as to promulgate any additional/new management measures necessary to protect the areas.

4.7 Action 7: Framework Procedures for the St. Thomas/St. John FMP

Summary of Management Alternatives

Alternative 1. No Action. Retain the framework procedures included in the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs listed in Table 2.7.1. No new or modified framework procedures would be added to the St. Thomas/St. John FMP.

Alternative 2 (**Preferred**). Adopt the framework procedures listed in Table 2.7.2 that include both closed and open framework procedures and, within the open framework, the additional option of using an abbreviated framework.

Alternative 3. Adopt the broader framework procedures listed in Table 2.7.3 that include both closed and open framework procedures.

Alternative 4. Adopt the narrower framework procedures listed in Table 2.7.4 that include both closed and open framework procedures.

4.7.1 Direct and Indirect Effects on the Physical Environment

Modifying the framework procedure is not expected to have direct effects on the physical environment. However, if the level of fishing effort or the use of certain gear types is affected by the management strategies modified by the framework, this could affect the physical environment by changing the interactions between gear types and the habitat.

Alternative 1 would not modify the framework procedures established in the Council's Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs and brought into the St. Thomas/St. John FMP under Action 1. Thus, **Alternative 1** would have no additional effects to the physical environment from the baseline. Indirect positive effects to the physical environment would be expected from those measures included in the framework that result in a faster protection to the habitat from gear/habitat interactions than if the measures were approved through a regular amendment, which may take more time to develop and implement. Examples of these measures include the specification or modification of gear restrictions including those that minimize the interaction of fishing gear with protected species, such as listed habitat-forming corals (e.g., the ESA threatened species *Orbicella annularis*, *Orbicella franski*) and those actions that close/open areas to fishing, and regulate fishing effort (e.g., adjustment of trip limits, bag limits, size limits, ACLs), among others.

Preferred Alternative 2 would allow the Council to change management measures more expeditiously than via a regular amendment in response to changes in resource abundance and new scientific information. This is expected to indirectly affect the physical environment similar to that described above for **Alternative 1**. The abbreviated framework option available in **Preferred Alternative 2** but not available in the other alternatives proposed, is not expected to provide additional indirect benefits to the physical environment as changes that can be made through the abbreviated framework would be insignificant.

Alternatives 3 and **4** may result in indirect physical impacts because of the timeliness of implementing the change to the management measures. Similar to **Alternatives 1** and **2 (Preferred)**, this could indirectly benefit the physical environment, for example if a speedier application of measures protecting the biological integrity of managed resources result in quicker protection to the physical environment. With respect to measures to protect the physical environment, **Alternative 3** is more beneficial than **Preferred Alternative 2** although similar to **Alternative 1**. **Alternative 3** allows for the modification of gear restrictions, including modifications to respond to interactions with protected species, like in both **Alternatives 1** and **2** (**Preferred**), but the changes allowed are broader than those in **Preferred Alternative 2** (i.e., change could include a complete prohibition on a specific gear). **Alternative 4** would be the least beneficial to the physical environment because the range of actions that can be taken more expeditiously through framework is more limited than the other alternatives. For example, it does not provide for any framework measures to address gear interactions.

4.7.2 Direct and Indirect Effects on the Biological/Ecological Environment

Modifying the framework procedure in the St. Thomas/St. John FMP is primarily an administrative action that provides a more expeditious way for implementing management changes. The managed stocks in the St. Thomas/St. John FMP could benefit from the modification of framework procedures in Action 7 as a speedier implementation of management measures could yield biological benefits in the future by protecting the biological integrity of the managed resources and preventing overfishing.

Alternative 1 would not allow for the addition through framework of measures that may be more tailored to the specific fisheries within the St. Thomas/St. John FMP. If a measure needed to be expeditiously taken to protect the biological integrity of a resource was not included in the framework (e.g. respecification of SYL), it could have negative indirect effects on the biology of the affected resource.

Preferred Alternative 2 would allow the Council to make more expeditious regulation changes to a list of management actions in response to changes in resource abundance and new scientific information, therefore protecting the biological integrity of the managed resources and decreasing the risk of overfishing those resources. For example, under **Preferred Alternative 2**, changes to ABCs and ACLs would be implemented quicker than if such changes proceeded via a full FMP amendment, which could help to prevent overfishing of the resources. Effects on ESA-listed species and other species and the comparison with the other alternatives are similar to those discussed above under the physical environment. Changes to gear modifications could be expected to indirectly benefit the biological integrity of species, although these benefits would be minor and more insignificant than those expected from **Alternative 1. Preferred Alternative 2** only allows for minor changes to gear modifications to address to address conservation issues, including to respond to interactions with listed species, whereas **Alternative 1** allows for adjustment of gear restrictions or prohibitions.

Alternative 3 and **Alternative 4** may result in indirect biological/ecological impacts as a result of the timeliness of implementing the measure. Although all of alternatives proposed allow for a speedier adjustment of management measures than implementing measures via FMP amendments, **Alternative 3** provides the advantage that the framework actions may be implemented at any time in response to any additional information or changed circumstances. This is beneficial to the biological/ecological environment as changes would be implemented quicker, helping to prevent overfishing of the stocks. With respect to measures to protect species, **Alternative 3** is more beneficial than **Preferred Alternative 2** but similar to **Alternative 1.** Although it also allows for the modification of gear restrictions to respond to interactions with species, including protected species, like in both **Alternatives 1** and **2**, the changes allowed are broader than those in **Preferred Alternative 2** (i.e., change could include a complete prohibition on a specific gear). These changes could have positive indirect effects on the biological environment.

Alternative 4 is more restrictive than **Alternatives 1**, **2 (Preferred)**, and **3** with respect to the circumstances where a framework can be applied, thus benefits to the biological environment would be more limited than in those alternatives. In addition, the list of actions that can be done through a framework is also very narrow, including having no specific measures to address interactions with ESA-listed species, thus positive effects from a faster adjustment of measures would be limited to those measures on the list, contrasting with the benefits from the more extensive list of measures that can be rapidly adjusted in **Alternatives 1**, **2 (Preferred)**, and **3** in response to biological changes to the managed resources.

4.7.3 Direct and Indirect Effects on the Economic Environment

None of the four alternatives listed in Action 7 are expected to have any direct effects on the economic environment since they represent administrative actions. However, framework procedures can reduce the amount of time needed to change a management measure and this reduction in time could provide benefits in the nature of stock/stock complex protection or rebuilding. In addition, regulations that may be forthcoming in response to a change in framework procedures could indirectly result in a change in the economic environment via a change in effort and/or fishing techniques.

Relative to **Alternative 1**, **Preferred Alternative 2** includes additional options and therefore should allow for a wider suite of measures that can more rapidly be implemented, which would be beneficial to the stocks, thereby yielding biological benefits in the future. This will, in turn, yield future economic benefits to the fishing sectors. Anticipated indirect benefits are dependent upon the relative speed at which regulatory changes can be made.

Given that **Alternative 3** (Table 2.7.3) provides a broader suite of options that can be implemented under the framework procedure than either **Alternative 1** or **Preferred Alternative 2**, one would expect indirect economic benefits associated with implementation of **Alternative 3** to exceed those of either **Alternative 1** or **Preferred Alternative 2**.

Conversely, since **Alternative 4** provides a narrower set of options that can be implemented under framework than either **Preferred Alternative 2** or **Alternative 3**, economic benefits derived from implementation of **Alternative 4** are likely to be less than those associated with either **Preferred Alternative 2** or **Alternative 3**.

4.7.4 Direct and Indirect Effects on the Social Environment

The development of a revised framework procedure would have beneficial impacts on the social environment as management can react in a timelier manner to changes in the fishery or stock status. Yet, framework actions that are done in an expedited process may have restricted public input and comment at the time the action is undertaken for analysis that is recent. The alternatives below offer several ways to address the benefits of timely action while balancing adequate public comment. **Alternative 1** retains the framework procedures from the U.S. Caribbean-wide FMPs and does not include framework procedures that may be more tailored to specific fisheries within the St. Thomas/St. John FMP. If for example, the SYL needed to be expeditiously modified to protect the social contributions of a resource and it was not included in the framework, it could have negative indirect effects on the social contributions of the affected resource. The actions under **Alternative 1** are also outdated and do not reflect current management. **Preferred Alternative 2** incorporates an abbreviated and standard frame work that includes either open or closed framework options. This would provide the most flexibility to the Council by offering expedited processes when needed and still allow for more extended public input when appropriate. **Preferred Alternative 2** does not require convening the Council's AP or SSC, but the Council may do so if deemed appropriate. **Alternative 3** provides options for implementing a framework procedure through open or closed frameworks. It provides for limited public input with discussion required at only one council meeting and does not require the AP or SSC to review the action, but the Council may do so if deemed appropriate. **Alternative 4** is the narrowest interpretation and requires discussion during at least three Council meetings. This alternative also requires review by the SSC and AP.

As mentioned earlier, timing and public input become the parameters that are constrained or alleviated by these various alternatives. While public input and participation by advisory panels are beneficial and needed in some instances, that participation, if required, can extend the management process whereby regulations may not be implemented in a well-timed manner to address a particular issue. A more timely application of framework actions can respond to needed changes that may be applied quickly and alleviate short-term negative impacts that may impose hardships if extended by more cumbersome frameworks. On the other hand expedited action by the Council may also overlook important input by either the public or advisory panels. Therefore by combining a variety of processes to address both issues within the framework procedure, the Council can provide enough flexibility to ensure the proper input occurs and regulations are implemented in a timely manner. Frameworks often change after implementation due to the changing nature of the fisheries and other factors, the Council's **Preferred Alternative 2** is likely to have the most positive social effects as it reflects the flexible suite of options and what the Council views are the appropriate procedures given the current status and condition of the fisheries being managed.

4.7.5 Direct and Indirect Effects on the Administrative Environment

Alternative 1 retains framework procedures from the U.S. Caribbean-wide FMPs, and thus is not expected to add to the administrative burden relative to the current situation. However, because it does not allow for the addition of measures more tailored to St. Thomas/St. John (see new measures described in Table 2.7.2 for **Preferred Alternative 2**) it may have negative administrative effects (e.g., time and cost) if a measure that could be taken more expeditiously through framework, needs to be done through a regular amendment.

Different than the rest of the alternatives proposed, **Preferred Alternative 2** allows the use of both abbreviated and standard frameworks and includes a comprehensive list of actions. Of all alternatives proposed, **Preferred Alternative 2** provides the best balance between the actions allowed to be implemented under the framework and the procedure required to take these actions. Also when compared to **Alternatives 1**, **3**, and **4**, **Preferred Alternative 2** provides the opportunity for sufficient public review and involvement in the process, while still accommodating the ability for more streamlined implementation.

Alternative 3 allows for a broader range of actions to be taken through framework rather than by the regular FMP amendment process and requires less discussion at Council meetings and, similar to **Preferred Alternative 2** does not specifically require SSC input (also similar to **Alternative 1**) and AP input (different from **Alternative 1**), thus would minimize the administrative burden of implementing regulations and planning/funding public and advisory meetings.

Alternative 4 would be the least beneficial to the administrative environment because the range of actions that can be taken more expeditiously through framework is more limited than the other alternatives, making **Alternative 4** more administratively burdensome as many actions that could be rapidly taken through framework would need to be taken through the lengthier regular amendment process. In addition, **Alternative 4** requires additional public, SSC, and AP input which requires more administrative resources and efforts than the other alternatives proposed.

4.8 Cumulative Effects Analysis (CEA)

The National Environmental Policy Act (NEPA) requires federal agencies preparing an EA to consider not only the direct and indirect effects associated with regulatory actions, but also the cumulative effects resulting from those actions. The NEPA regulations established by the Council on Environmental Quality, which is tasked with ensuring NEPA compliance, define a cumulative effect as the effect on the environment which results from the incremental effect of an action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (federal or non-federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions that take place over a period of time (40 CFR 1508.7), and can be either additive or synergistic. A synergistic effect results when the combined effects are greater than the sum of the individual effects. The five-step cumulative effects analysis presented below addresses the effects of the Council's preferred alternatives for all seven actions identified in Chapter 2.

1. **The area in which the effects of the proposed action will occur**

If the St. Thomas/St. John FMP is implemented, the geographic scope of the area directly affected would include waters of the St. Thomas/St. John EEZ. Those waters extend from three nautical miles (nm) off the coast of St. Thomas and St. John to 200 nm off that coast, or to a point equidistant between the coast of St. Thomas/St. John and the coast of any neighboring island-state (including Puerto Rico and the island of St. Croix, USVI) with an abutting EEZ, or to an otherwise negotiated boundary between conjoining international EEZs. Additionally, because implementation of the St. Thomas/St. John FMP requires transitioning U.S. Caribbean-wide management included in each of the Spiny Lobster, Queen Conch, Reef Fish, and Coral FMPs to island-based management inherent in the St. Thomas/St. John FMP, the geographic scope of the action includes those EEZ waters surrounding the islands of St. Croix and Puerto Rico. Those waters extend from three (St. Croix) or nine (Puerto Rico) nautical miles off the coast of each island to 200 nm off that coast, or to a point equidistant between the St. Thomas/St. John coast and the coast of any neighboring island-state with an abutting EEZ, or to an otherwise negotiated boundary between conjoining international EEZs. In combination, these areas of the U.S. EEZ constitute the Council's area of jurisdiction. This area is described in detail in Section 3.1 of this document (also see Figure 1.5.1 in Section 1.5), and represents the entire area in which fishing activities for Council-managed stocks could be affected by the alternatives analyzed in this EA. Information about the affected area in the St. Croix EEZ and Puerto Rico EEZ can be found in Section 3.1 of each of the corresponding FMPs/EAs. The most measurable and substantial effects of the St. Thomas/St. John FMP would be limited to the area encompassed by the St. Thomas/St. John EEZ.

2. The impacts that are expected in that area from the proposed action

Transitioning from U.S. Caribbean-wide FMPs to an island-based FMP for the St. Thomas/St. John EEZ (Action 1 in this EA) only rearranges past Council actions, without affecting those actions or any other past or present actions taken by federal or non-federal entities. Modifying the stocks managed under the St. Thomas/St. John FMP would include altering the composition of the stocks (Action 2) and their organization within complexes (Action 3), and would for the first time identify indicator stocks for some of those stock complexes (Action 3). As a result of modifying the list of managed stocks and the composition of stock complexes, harvest reference points (Action 4) and associated AMs (Action 5) would be revised (for stocks or stock complexes previously managed by the Council) or established (for stocks newly added to management). The impacts of these changes would be minimal as discussed in Chapter 4. Based on application of guidance regarding the requirement in the Magnuson-Stevens Act that the Council prepare an FMP for fisheries under its authority that are in need of conservation and management, 37 reef fish, and a host of smaller fish and invertebrates harvested for the aquarium trade, were removed from federal management based on the Council determination that they no longer were in need of federal conservation and management. In most cases, the decision to remove was based on their infrequent occurrence in federal waters. Applying the same guidance, another reef fish species was identified as being in need of conservation and management (yellowmouth grouper), but inclusion of that species did not substantially alter the basic character of the reef fish stock complex arrangement previously established for St. Thomas/St.

John EEZ waters. Because of their importance to the regional or national economy, two pelagic species (dolphin and wahoo) were added to the St. Thomas/St. John FMP. Although these species are not reef dependent and therefore constitute an essentially new 'group' of (pelagic) stocks to be managed, all have been and continue to be targeted by both commercial and recreational fishers, so the impacts from inclusion in the St. Thomas/St. John FMP would be minimal, assuming landings of these stocks remain at around the same level as they had been without management. Moreover, establishment of an ACT for these pelagic species as the AM provides a mechanism for the Council in consultation with NMFS' SEFSC to evaluate the factors contributing to an exceedance of the ACT and to determine whether corrective action is needed. Identifying indicator stocks (included in Action 3) increases management efficiency but would have no impacts in the area of interest.

Identifying EFH for species new to management (Action 6) addresses a required provision from the Magnuson-Stevens Act. Newly managed species occur in the same habitats as those already managed, but in addition, some of these newly added species have a much more extensive offshore distribution. Although new EFH within the U.S. Caribbean EEZ would be specifically described for these newly managed species (e.g., deeper waters for coral reef resources and pelagic species), safeguards to EFH from fishing activities are already in place either in the form of managed areas or simply because of the nature of those fishing activities that occur in the deeper offshore areas (i.e., gear types used that have minimal interactions with the bottom). Finally modifying framework procedures (Action 7) is an administrative action with no direct impacts to the biological/ecological or socio-economic environments. Minor indirect impacts on these environments would be expected from those actions that modify fishing effort and/or fishing techniques to protect the biological integrity of the managed resources or decrease the risk of overfishing those resources.

3. **Other Past, Present and Reasonably Foreseeable Future Actions that have or are expected to have impacts in the area and the impacts or expected impacts of these actions:**

Listed are past, present, and reasonably foreseeable actions affecting the fisheries in the St. Thomas/St. John EEZ. A list of regulations applicable to stocks managed by the Council in the St. Thomas/St. John EEZ that would be migrated into the St. Thomas/St. John FMP/EA is found in Chapter 5.

Other Fishery-related actions

Past Actions

The reader is referred to Appendix C (History of Federal Fisheries Management) for past fishery management actions affecting all stocks managed under the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs. The most relevant past actions are summarized below.

2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b) and associated Enviromental Impact Statements (EIS)

The CEAs included in each of the EISs for the 2010 and 2011 Caribbean ACL Amendments (CFMC 2011a, b) analyzed cumulative effects from the Reef Fish FMP related to management of reef fish in the U.S. Caribbean EEZ on the environment. The 2010 Caribbean ACL Amendment CEA analyzed cumulative effects from certain measures related to managing reef fish and queen conch, whereas the CEA included in the 2011 Caribbean ACL Amendment analyzed cumulative effects of additional measures related to managing reef fish, spiny lobster, and coral reef resources, in the U.S. Caribbean EEZ. Both of those CEAs also described baseline economic and social conditions for fishing communities in St. Thomas/St. John. The CEAs described the effects of the implementation of ACLs, AMs, and the selection of revised management reference points for Council-managed species, and how those actions would serve to restore and stabilize natural trophic and competitive relationships, rebuild species abundances, re-establish natural sex ratios, contribute to the long-term health of the ecosystem, and reinvigorate sustainable fisheries while minimizing to the extent practicable negative socio-economic impacts. Both CEAs discussed that, although ACLs and AMs are intended to prevent or greatly reduce the risk of overfishing and are expected to have positive biological benefits, they may also impose more restrictive catch levels on fisheries resulting in negative social and economic impacts over the short-term. However, to the extent that ACLs and AMs prevent overfishing and assist in rebuilding overfished stocks, they should have positive long-term benefits to both the biological and socio-economic environments. The CEAs for both EISs listed the stresses affecting fishing communities, such as additional regulatory restrictions, competition from foreign seafood imports, coastal development, loss of infrastructure, and rising fuel prices, and discussed how all of these stresses have placed a greater burden on fishermen and fishing communities that threaten their short- and long-term sustainability. The CEAs discussed that although the intent of the actions on those amendments was to improve the targets and thresholds of reef fish, spiny lobster, queen conch, and coral resources, they may cause additional stresses (e.g., lower landings). The process of protecting Council-managed species through the specification of management targets, thresholds, and AMs, and regulations that implement those AMs was expected to have a short-term adverse impact on the social and economic environment, and to create a burden on the administrative environment. However, the process was also expected to provide larger benefits to those environments in the long-run than would be expected with the No Action alternative. The effects on the human environments were discussed in detail in those EISs.

In summary, the CEA of both of these documents revealed that in combination with past and present actions, the actions in both amendments could impose more restrictive catch levels on additional fisheries resulting in negative social and economic impacts over the short-term. However, to the extent that catch limits and AMs can prevent overfishing and assist in rebuilding overfished stocks, they should have positive long-term benefits to both the biological and socio-economic environments. No alternatives were considered that would completely avoid those negative effects because they were considered a necessary cost associated with establishing ACLs and AMs in the U.S. Caribbean. The CEAs concluded that for that reason, it was difficult to mitigate these measures and managers must balance the costs and benefits when choosing management alternatives for these fisheries. These CEAs are still considered accurate and useful at the present time and are incorporated herein by reference.

Comprehensive Amendment to the U.S. Caribbean FMPs: Application of AMs (AM Application Amendment) and EA (CFMC 2016)

This amendment modified AM-applicability language in the four Council FMPs to correct an inconsistency with the implementing regulations. Although this action directly affected AMs, the action did not result in regulatory changes and did not change the way AMs are currently implemented in the EEZ. The action in the AM Application amendment is not expected to contribute to the effects expected from the actions considered in the St. Thomas/St. John FMP, and vice-versa. The CEA included in the AM Application Amendment analyzed cumulative effects of managing the spiny lobster, queen conch, reef fish, and coral resources in the U.S. Caribbean EEZ on the wider environment in light of other past, present, and reasonably future actions, and revealed no significant, cumulative adverse effects on the human environment. The CEA in the AM Application Amendment also considered the analyses of cumulative effects of taking action in light of the effects explained in each of the 2010 and 2011 Caribbean ACL Amendments/EISs, mentioned above. These analyses are still considered accurate and useful at the present time and are incorporated herein by reference.

Amendments to the Reef Fish, Spiny Lobster, and Corals and Reef Associated Plants and Invertebrates FMPs: Timing of AM-Based Closures and EA (CFMC 2017)

The CEA included in this document discussed the implications of changing the end date for AM-based closures from December 31st to September 30th each year, with the closure period extending backward toward the beginning of the year for the number of days necessary to achieve the required reduction in landings. The CEA revealed no significant beneficial or adverse cumulative effects on the physical or biological/ecological environments but identified positive non-significant effects on the social and economic environments by minimizing adverse socio-economic effects from the application of AMs. The CEA also considered the analyses of cumulative effects of taking action in light of the effects explained in each of the 2010 and 2011 Caribbean ACL Amendments/EISs, mentioned above. The CEA of this amendment is still considered to be accurate and useful at the present time.

Present and Reasonably Foreseeable Future Actions

The overarching goal of the present action, establishing a St. Thomas/St. John FMP, is to ensure the continued health of fishery resources occurring in the EEZ surrounding St. Thomas/St. John within the context of the unique biological, ecological, economic, and cultural characteristics of those resources and the communities dependent upon them. To achieve this fundamental goal, the St. Thomas/St. John FMP establishes a place-based framework designed to provide the foundation for conserving and managing the fisheries of St. Thomas/St. John within an integrative, ecosystem-based approach. Essential to this ecosystem-based fishery management (EBFM) approach is enhanced stewardship among fishermen, residents and others who value the fishery resources and marine and coastal environment of St. Thomas/St. John and the U.S. (EBFM U.S. Caribbean Roadmap Implementation Map).

The Council, in partnership with NMFS and other regional constituencies, is in the process of moving towards full implementation of EBFM in the region. EBFM enables a more holistic approach to decision-making by considering trade-offs among fisheries, aquaculture, protected species, biodiversity, habitats, and the human community, within the context of climate, habitat, ecological, and other environmental change, describe below.

Consideration of Climate Change and Other Non-Fishery Related Issues

Stresses affecting fishery resources and protected resources as well as the human communities that depend on those resources include, but are not limited to, natural events, habitat quality, human population growth, and anthropogenic threats (e.g., habitat loss and degradation, sedimentation, pollution, water quality, overharvest, climate change). Some managed species may be more sensitive to the quality of their environment than are others. For example, any changes in benthic conditions resulting from land-based increases in sedimentation or turbidity will adversely affect the available productive habitat for queen conch (Appeldoorn et al. 2011) and corals. Consideration of these stressors, and the changing nature of stressors within the context of climate variability and change, is an important component of the EBFM approach.

Emerging information sheds light on how global climate change will affect, and is already affecting, fishery resources and the habitats upon which they depend. Climate change can affect marine ecosystems through altered patterns of thermal stratification, changes to upwelling patterns, sea level rise, increases in wave height and frequency, loss of sea ice, changes to storm frequency and intensity, and increased risk of diseases in marine biota, among other things. Potential vulnerabilities for coastal zones include increased shoreline erosion leading to alteration of the coastline, loss of coastal wetlands, and changes in the profiles of fish and other marine life populations (Lorde et al. 2013). Changes in ocean temperatures have been linked to shifting fish stock distribution and productivity in many marine ecosystems, and these impacts are expected to increase in the future (NMFS 2014). Any of these could affect the local or regional seafood output and thus the local economy (Carter et al. 2014). In the U.S. Caribbean region and throughout the southeastern U.S., the major climate induced ecosystem concerns include: 1) Threats to coral reef ecosystems - coral bleaching, disease, and ocean acidification; 2)

Threats to habitat from sea level rise – loss of essential fish habitat; and 3) Climate induced changes to species phenology and distribution (Osgood 2008).

Climate variability is also a factor that needs to be considered when addressing climate effects, and in the reasonably foreseeable future, it may be far more influential than unidirectional climate change. For example, inter-annual (e.g., El Niño/La Niña) changes in the ocean environment may result in altered patterns of fish distribution, productivity, reproduction, and recruitment (NOAA PFL Climate Variability and Marine Fisheries, accessed November 2018). Additionally, cyclical water temperature variability may result in relatively short-term (decadal) changes in water temperature that substantially exceed (cyclical temperature maximum) the evident long-term pattern of temperature increase, or that act in opposition (cyclical temperature minimum) to that long-term pattern. Such decadal-scale events may be far more influential with respect to fishery management regulations such as those included in the St. Thomas/St. John FMP than are long-term climate change events, because these decadal-scale events operate on the time frame of the fishery management action and effect the ecosystem in the short-term.

Many types of "pollution" may adversely affect the coral reef ecosystem, but increasing atmospheric carbon dioxide concentration is having substantial and clearly documented negative effects. Excess carbon dioxide (CO_2) dissolves into the ocean and is converted to corrosive carbonic acid, resulting in the phenomenon known as "ocean acidification" (Madin 2010). At the same time, the CO_2 also supplies carbon that combines with calcium already dissolved in seawater to provide the main ingredient for shells and coral skeletons, calcium carbonate ($CaCO_3$) (Madin 2010). The net responses of organisms to rising CO_2 concentration will vary depending on often opposing sensitivities to decreased seawater pH, carbonate concentration, and carbonate saturation state, and to elevated oceanic total inorganic carbon and gaseous CO_2 (Cooley and Doney 2009). Increased ocean acidity caused by elevated CO_2 could directly damage organisms by partially dissolving their skeletal structure (Madin 2010) or by decreasing skeletal growth rate. Other species with more protective coverings on their shells and skeletons, such as crustaceans, temperate urchins, mussels, and coralline red algae, may be less vulnerable to decreasing seawater pH (Madin 2010). Projections based on the Intergovernmental Panel on Climate Change (IPCC) Special Report on Emissions Scenarios (SRES) estimate a reduction in average global surface ocean pH of between 0.14 and 0.35 units during the 21st century (Climate Change 2007). Although the extent and direction of effects on species and ecosystems resulting from ocean acidification are not fully understood, deleterious impacts have been unequivocally documented and the need for effective management is clear.

Although the full range of effects resulting from climate change, climate variation, and ocean acidification cannot be quantified at this time, nor is the exact timeframe known in which these impacts will occur, the need for proactive management is evident. Both globally and throughout the Caribbean basin, coral bleaching events are occurring more frequently and with greater severity. Other coral diseases also contribute to coral reef degradation. Few of the management actions proposed in this FMP/EA are expected to increase or decrease the potential impacts of climate change and ocean acidification on fishery resources and other protected resources. However, prohibitions on and reductions in allowable catch of grazing species, including parrotfish and surgeonfish, are designed to ensure adequate grazing capacity and thereby strengthen the resilience of corals to environmental impacts resulting from climate variability and change. Unfortunately, other anthropogenic impacts to Council-managed resources in the affected area may be more pressing than climate change or even decadal-scale climate variability. Those anthropogenic impacts may include, but are not limited to, nitrification, sedimentation, and other symptoms of an ever-increasing human population. Nonetheless, continued monitoring of the effects of climate change, climate variability, and ocean acidification should be a priority of national and local programs. For more information about climate impacts in U.S. marine living resources concerning NMFS, see Osgood (2008). For additional information about climate change in the Caribbean and Southeast region, please see Chapter 17 of the Third National Climate Assessment: *Climate Change Impacts in the United States* (Carter et al. 2014).

Tropical storms constitute past, present and certainly foreseeable future events with significant effects on St. Thomas/St. John fishery resources, the habitats upon which those resources depend, and the human communities dependent upon that fishery ecosystem. Historically, such tropical events substantially impact the ecosystem. Although those impacts may be relatively short-lived, they can be severe and tragic. In 2017, Hurricanes Maria and Irma affected all of the islands constituting the U.S. Caribbean region, with resultant loss of life and property from which the region has not yet recovered. Stresses caused by the impact of those recent hurricanes on St. Thomas/St. John fisheries and to socio-economy of St. Thomas/St. John, and the resulting recovery, are discussed in detail in Sections 3.4 and 3.5.11. Within the fishery ecosystem, target and non-target resources were redistributed with both beneficial and detrimental effects. Habitat, and specifically coral reefs, were severely damaged although rapidly developing restoration and recovery strategies are reducing the extent and duration of these impacts. Socially and economically, impacts to gear and infrastructure were substantial and prevented fishing in the short-term and to this day continue to constrain fishing, although the magnitude of that constraint varies as fishers have modified their fishing techniques, gears, or target species to adapt to new environmental conditions after the hurricanes' impact. Those fishing constraints result not just from the fishermen's loss of their trade tools, but also from loss of markets due to residents leaving the island and tourists staying away. Tropical storm events are a future certainty, and the prediction is for climate change to increase the frequency and severity of tropical storm events.

Other issues directly affecting human communities include high fuel costs, increased seafood imports, restricted access to traditional fishing grounds, and regional economies. Additional information on these topics as they pertain to the St. Thomas/St. John FMP can be found in Sections 3.4, 3.5, and 3.7.

4. **The overall impact that can be expected if the individual impacts are allowed to accumulate:**

Cumulative effects resulting from creation of a St. Thomas/St. John FMP in combination with other past, present, and reasonably foreseeable future actions would be expected to be minimal. Some minor short-term negative effects would result from revision of regulatory text and other descriptive documents, and some positive socio-economic effects may result from increased compliance and cooperation from affected constituents, which are in favor of an island-based approach and may, as a result, be more willing to cooperate.

No significant overall impacts to the biological/ecological environment, to protected species occurring within that environment, to the habitats constituting and supporting that environment, or to the dependent socio-economic environment are expected to result from the cumulative past, present, or reasonably foreseeable future impacts of other actions in the area and this action to develop fishery management in federal waters off St. Thomas/St. John. As discussed earlier, the impacts from recent hurricanes on the fishery ecosystem were both positive (e.g., increase in abundance of some species in some areas) and negative (e.g., physical damage to coral reefs). But restoration activities, either current or planned for the immediate future, are expected to reduce the extent and duration of these impacts. Similarly, no significant cumulative effects would be expected to result from reasonably foreseeable future actions that may be taken, by other federal or non-federal agencies in combination with this action.

5. **Summary:**

The transition to a St. Thomas/St. John FMP from the U.S. Caribbean-wide FMPs is not expected to have individually significant effects to the biological/ecological, physical, or socio-economic environments or to combine with the effects of other past, present, or reasonably foreseeable future actions in such a way that could have a potentially significant, cumulative effect.

Chapter 5. Conservation and Management Measures - Action Plan

In order to conserve, maintain, and sustain the fisheries and related environment and habitats in the U.S. Caribbean, the goal of the Caribbean Fishery Management Council (Council) is to develop and establish effective conservation and management measures that maintain a healthy fishery that meets the needs of fishermen and the general public. These conservation and management measures are based on (1) determining the status of the fisheries stocks and overall biological productivity and capacity to maintain vital fishery resources for the near- and long-term, (2) considering the economic, social and cultural aspects of the fisheries, and (3) determining effective fishing practices, rules, and regulations to ensure sustainable harvest of fishery resources within the context of optimum yield (OY). The federal guidelines regarding these conservation and management measures are fully described in National Standards (NS) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

Chapter 5 describes the Council's conservation and management measures included in the St. Thomas/St. John Fishery Management Plan (FMP) to achieve the Council's management objectives in the Thomas/St. John exclusive economic zone (EEZ). Chapter 5 also discusses the criteria used to assess the status of Council-managed stocks and the management measures that the Council has developed as a means to prevent overfishing and avoid an overfished resource. As discussed in Chapter 2 (Action 1: Transition Fisheries Management in the Thomas/St. John EEZ from a U.S. Caribbean-wide Approach to an Island-based Approach), although the Thomas/St. John FMP would replace the Council's Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs[63], the new FMP carries forward most of the management measures from those four U.S. Caribbean-wide FMPs as they apply to the St. Thomas/St. John EEZ. Importantly, the Thomas/St. John FMP introduces some new management measures as well as new reference points and status determination criteria (SDC) evaluated and ultimately selected by the Council in the environmental assessment included in this document. For additional information on the management measures migrated from the Council's previous FMPs (Reef Fish, Spiny Lobster, Queen Conch, and Coral), please see the Council's FMPs and amendments as those documents contain comprehensive discussions of the need and analysis of each of the measures transitioned into this plan at the time they were created. All management measures in the Thomas/St. John FMP have been developed and analyzed in accordance with Magnuson-Stevens Act requirements and guidance, National Environmental Policy Act, and other applicable law. The Council continues to believe that the measures that the Council is retaining from the U.S. Caribbean-wide FMPs are necessary and appropriate to manage the fishery under the Thomas/St.

[63] Action 1 repealed the existing U.S. Caribbean-wide FMPs as they applied to the St. Thomas/St. John management area and replaced them with the island-based FMP for St. Thomas/St. John EEZ waters. Similar actions to repeal and replace the U.S. Caribbean-wide FMPs were taken in the St. Croix FMP and the Puerto Rico FMP.

John FMP, as they remain important to ensure that the Council is managing the resources in a manner that is consistent with the Magnuson-Stevens Act, including National Standard 1, that is, preventing overfishing while achieving OY on a continuing basis, and other applicable law.

Management measures listed in this chapter include harvest guidelines, minimum size limits, gear restrictions and identification, seasonal and areal closures, and harvest limits (among others) for all stocks managed by the Council in the Thomas/St. John EEZ. The following sections list all provisions applicable to the fishery resources managed in the Thomas/St. John EEZ by fishery group: fish (reef fish, pelagic fish), spiny lobster, queen conch, and coral reef resources. If this FMP is approved by the Secretary of Commerce, regulations will be promulgated or updated to implement the management measures described. If there are any differences between the text of this document and the codified regulatory text implementing this FMP, the codified regulatory text controls.

5.1 Definitions

1. St. Thomas/St. John EEZ - Those waters that extend from three nautical miles (nm) off the coast of St. Thomas/St. John to 200 nm off that coast, or to a point equidistant between the coast of St. Thomas/St. John and the coast of any neighboring island-state (including Puerto Rico and the island of St. Croix in the U.S. Virgin Islands [USVI]) with an abutting EEZ, or to an otherwise negotiated boundary between conjoining international EEZs. Fishery resources within the St. Thomas/St. John EEZ included in this FMP are managed by the Council.

2. Fish - In the St. Thomas/St. John FMP, fish stocks are divided in two categories based on functional groups: Reef Fish (1) and Pelagics (2), as defined below.

1) **St. Thomas/St. John Reef Fish –** One or more of the species, or a part thereof, listed in Table 5.1.1 below.

Table 5.1.1. Species in the St. Thomas/St. John Reef Fish group and their stock/stock complex organization. Indicator stocks are marked with an asterisk. New species (1) included in the reef fish group are in bold.

Family or Class	Stock/Stock Complexes	#	Species Name	Common Name
Lutjanidae -- Snappers	Snapper 1	1	*Apsilus dentatus*	Black snapper
		2	*Lutjanus buccanella**	Blackfin snapper*
		3	*Lutjanus vivanus*	Silk snapper
		4	*Rhomboplites aurorubens*	Vermilion snapper
	Snapper 2	5	*Etelis oculatus*	Queen snapper
	Snapper 3	6	*Lutjanus synagris*	Lane snapper
		7	*Lutjanus analis**	Mutton snapper*
	Snapper 4	8	*Ocyurus chrysurus*	Yellowtail snapper

Family or Class	Stock/Stock Complexes	#	Species Name	Common Name
Serranidae -- Groupers	Grouper 1	9	*Epinephelus striatus*	Nassau Grouper
	Grouper 2	10	*Epinephelus itajara*	Goliath grouper
	Grouper 3	11	*Cephalopholis fulva*	Coney
		12	*Epinephelus guttatus**	Red hind grouper*
	Grouper 4	13	*Mycteroperca bonaci*	Black grouper
		14	*Epinephelus morio*	Red grouper
		15	*Mycteroperca tigris*	Tiger grouper
		16	*Mycteroperca venenosa*	Yellowfin grouper
	Grouper 5	17	***Mycteroperca interstitialis***	**Yellowmouth grouper**
		18	*Hyporthodus flavolimbatus*	Yellowedge grouper
		19	*Hyporthodus mystacinus*	Misty grouper
Scaridae -- Parrotfish	Parrotfish 1	20	*Scarus coeruleus*	Blue parrotfish
		21	*Scarus coelestinus*	Midnight parrotfish
		22	*Scarus guacamaia*	Rainbow parrotfish
	Parrotfish 2	23	*Scarus vetula*	Queen parrotfish
		24	*Scarus taeniopterus*	Princess parrotfish
		25	*Sparisoma chrysopterum**	Redtail parrotfish*
		26	*Sparisoma viride**	Stoplight parrotfish*
		27	*Sparisoma aurofrenatum*	Redband parrotfish
		28	*Scarus iseri*	Striped parrotfish
		29	*Sparisoma rubripinne*	Redfin parrotfish
Haemulidae -- Grunts	Grunts 1	30	*Haemulon plumierii**	White grunt*
		31	*Haemulon sciurus*	Bluestriped grunt
	Grunts 2	32	*Haemulon album*	Margate
Sparidae -- Porgies	Porgies	33	*Calamus bajonado*	Jolthead porgy
		34	*Calamus calamus**	Saucereye porgy*
		35	*Calamus penna*	Sheepshead porgy
		36	*Archosargus rhomboidalis*	Sea bream
Carangidae -- Jacks	Jacks	37	*Caranx crysos*	Blue runner
Acanthuridae -- Surgeonfish	Surgeonfish	38	*Acanthurus coeruleus*	Blue tang
		39	*Acanthurus bahianus*	Ocean surgeonfish
		40	*Acanthurus chirurgus**	Doctorfish*
Labridae -- Wrasses	Wrasses	41	*Lachnolaimus maximus*	Hogfish
Pomacanthidae -- Angelfish	Angelfish	42	*Holacanthus ciliaris*	Queen angelfish
		43	*Pomacanthus arcuatus**	Gray angelfish*
		44	*Pomacanthus paru*	French angelfish
Balistidae -- Triggerfish	Triggerfish	45	*Balistes vetula*	Queen triggerfish

2) St. Thomas/St. John Pelagics – One or more of the species, or a part thereof, listed in Table 5.1.2 below.

Table 5.1.2. Species in the St. Thomas/St. John Pelagics group. Both pelagic stocks are new to management under the St. Thomas/St. John FMP.

Family or Class	Stock	#	Species Name	Common Name
Coryphaenidae -- Dolphinfish	Dolphin	1	*Coryphaena hippurus*	Dolphin
Scombridae – Mackerels and Tunas	Wahoo	2	*Acanthocybium solandri*	Wahoo

3. Caribbean Spiny Lobster - the species, *Panulirus argus*, or a part thereof. This species is managed as a single stock (i.e., Spiny lobster).

4. Queen Conch - the species, *Lobatus gigas* (formerly *Strombus gigas*), or a part thereof. This species is managed as a single stock (i.e., Queen conch).

5. St. Thomas/St. John Coral Reef Resources - The Coral Reef Resources would be divided into three groups: (1) Sea cucumbers; (2) Sea urchins; and (3) Corals. There are species within each of the groups that would be new to management under the St. Thomas/St. John FMP (See Appendix E).

6. Fish trap - In the St. Thomas/St. John EEZ, a trap and its component parts (including the lines and buoys), regardless of the construction material, used for or capable of taking finfish, except a trap used in the directed fishery for Caribbean spiny lobster.

5.2 Prohibited Species and Harvest Restrictions

Harvest prohibitions/restrictions for species described below apply to all harvest (commercial and recreational sectors) of those fishing within the St. Thomas/St. John EEZ.

5.2.1 Fish (Reef Fish and Pelagics)

This provision applies to the following stocks/stock complexes:
<u>Groupers</u>: Grouper 1 - Nassau grouper (*Epinephelus striatus*) and Grouper 2 - goliath grouper (*E. itajara*)
<u>Parrotfish:</u> Parrotfish 1 stock complex - blue parrotfish (*Scarus coeruleus*); midnight parrotfish (*Scarus coelestinus*); rainbow parrotfish (*Scarus guacamaia*)

No person may fish for or possess goliath grouper, Nassau grouper, blue parrotfish, midnight parrotfish, or rainbow parrotfish in or from the St. Thomas/St. John EEZ. Such fish caught in the St. Thomas/St. John EEZ must be released immediately with a minimum of harm.

This provision applies to all finfish, whether managed under the St. Thomas/St. John FMP or not.

Landing fish intact.

- Finfish in or from the St. Thomas/St. John EEZ must be maintained with head and fins intact, with the following exceptions:
    - Bait is exempt from the requirement to be maintained with head and fins intact.
        - "Bait" means: (A) Packaged, headless fish fillets that have the skin attached and are frozen or refrigerated; (B) Headless fish fillets that have the skin attached and are held in brine; or (C) Small pieces no larger than 3 in^3 (7.6 cm^3) or strips no larger than 3 inches by 9 inches (7.6 cm by 22.9 cm) that have the skin attached and are frozen, refrigerated, or held in brine.
        - Note a finfish or part thereof possessed in or landed from the St. Thomas/St. John EEZ that is subsequently sold or purchased as a finfish species, rather than as bait, is not bait.
    - Legal-sized finfish possessed for consumption at sea on the harvesting vessel are exempt from the requirement to have head and fins intact, provided: (i) Such finfish do not exceed any applicable bag limit; (ii) Such finfish do not exceed 1.5 lbs. (680 g) of finfish parts per person aboard; and (iii) The vessel is equipped to cook such finfish on board.
- The operator of a vessel that fishes in the St. Thomas/St. John EEZ is responsible for ensuring that fish possessed on the vessel while in the St. Thomas/St. John EEZ are maintained intact and, if taken from the EEZ, are maintained intact through offloading ashore.

Gear restrictions and minimum size limits apply. See Sections 5.3 and 5.4 below.

5.2.2 Spiny Lobster

No species harvest prohibition. No harvest of egg bearing females (Figure 5.2.1). Egg-bearing spiny lobster in the St. Thomas/St. John EEZ must be returned to the water unharmed. An egg-bearing spiny lobster may be retained in a trap, provided the trap is returned immediately to the water. An egg-bearing spiny lobster may not be stripped, scraped, shaved, clipped, or in any other manner molested, in order to remove eggs.

Landing spiny lobster intact. A Caribbean spiny lobster in or from the St. Thomas/St. John EEZ must be maintained with head and carapace intact. The operator of a vessel that fishes in the EEZ is responsible for ensuring that spiny lobster on that vessel in the EEZ are maintained intact and, if taken from the EEZ, are maintained intact through offloading ashore.

Gear restrictions and minimum size limit apply. See Sections 5.3 and 5.4 below.

Figure 5.2.1. Spiny lobster with eggs (berried).

5.2.3 Queen Conch

No person may fish for or possess queen conch in or from the St. Thomas/St. John EEZ.

5.2.4 Coral Reef Resources

5.2.4.1 Corals

No person may fish for or possess any species of coral (e.g., stony corals, octocorals, black corals) in or from the St. Thomas/St. John EEZ. The taking of a managed coral in the St. Thomas/St. John EEZ is not considered unlawful possession provided it is returned immediately to the sea in the general area of fishing.

5.2.4.2 Sea Urchins and Sea Cucumbers

No person may fish for or possess any species of sea urchins or sea cucumbers in or from the St. Thomas/St. John EEZ. The taking of managed sea urchins and sea cucumbers in the St. Thomas/St. John EEZ is not considered unlawful possession provided it is returned immediately to the sea in the general area of fishing.

5.3 Gear and Methods

5.3.1 Prohibited Gear and Methods Applicable to all Stocks

Explosives. An explosive (except an explosive in a powerhead where a powerhead is an allowable gear) may not be used to fish in the St. Thomas/St. John EEZ. A vessel fishing in the

St. Thomas/St. John EEZ for a species managed under the St. Thomas/St. John FMP, may not have on board any dynamite or similar explosive substance.

5.3.2 Gear and Methods for the Harvest of Fish (Reef Fish and Pelagics)

5.3.2.1 Prohibited Gear and Methods for the Harvest of St. Thomas/St. John Reef Fish

A. Applicable to both the Commercial and Recreational Sectors of those Fishing for St. Thomas/St. John Reef Fish

Poisons
A poison, drug, or other chemical may not be used to fish for St. Thomas/St. John reef fish in the St. Thomas/St. John EEZ.

Powerheads
A powerhead may not be used in the St. Thomas/St. John EEZ to harvest St. Thomas/St. John reef fish. The possession of a mutilated St. Thomas/St. John reef fish in or from the St. Thomas/St. John EEZ and a powerhead is prima facie evidence that such fish was harvested by a powerhead.

Gillnets and trammel nets
A gillnet or trammel net may not be used in the St. Thomas/St. John EEZ to fish for St. Thomas/St. John reef fish. Possession of a gillnet or trammel net and any St. Thomas/St. John reef fish in or from the St. Thomas/St. John EEZ is prima facie evidence of violation of this paragraph. A gillnet or trammel net used in the St. Thomas/St. John EEZ to fish for any other species must be tended at all times.

5.3.2.2 Allowed Gear and Methods for the Harvest of St. Thomas/St. John Reef Fish

A. Applicable to the Commercial Sector (See Table 5.3.1 below)

Table 5.3.1. Gear type allowed in the commercial sector of the St. Thomas/St. John Reef Fish fishery.

St. Thomas/St. John Reef Fish Fishery:	Gear Type
Commercial Longline/hook and line fishery	Longline, hook and line
Commercial Trap/pot fishery	Trap, pot
Other commercial fishery	Spear

B. Applicable to the Recreational Sector (See Table 5.3.2 below)

Table 5.3.2. Gear type allowed in the recreational sector of the St. Thomas/St. John Reef Fish fishery.

St. Thomas/St. John Reef Fish Fishery	Gear Type
Recreational fishery	Dip net, handline, rod and reel, slurp gun, spear, trap, pot

C. Applicable to the Commercial and Recreational Sectors

Specifications are provided only for the trap/pot gear, as allowed in both the commercial and recreational sectors (see Tables 5.3.1 and 5.3.2, above), as follows:

I. *Fish Trap Identification*

- Fish Traps and Associated buoys

  A fish trap used or possessed in the St. Thomas/St. John EEZ must display the official number specified for the vessel by USVI or Puerto Rico so as to be easily identified. Fish traps used in the St. Thomas/St. John EEZ that are fished individually, rather than tied together in a trap line, must have at least one buoy attached that floats on the surface. Fish traps used in the St. Thomas/St. John EEZ that are tied together in a trap line must have at least one buoy that floats at the surface attached at each end of the trap line. Each buoy must display the official number and color code assigned to the vessel by the USVI or Puerto Rico, whichever is applicable, so as to be easily distinguished, located, and identified.

- Presumption of ownership of fish traps

  A fish trap in the St. Thomas/St. John EEZ will be presumed to be the property of the most recently documented owner. This presumption will not apply with respect to such traps that are lost or sold if the owner reports the loss or sale within 15 days to the Regional Administrator (RA).

- Disposition of unmarked fish traps or buoys

  An unmarked fish trap or a buoy deployed in the St. Thomas/St. John EEZ where such trap or buoy is required to be marked is illegal and may be disposed of in any appropriate manner by the Assistant Administrator or an authorized officer.

II. *Fish Trap Construction Specifications and Tending Restrictions*

- Minimum Mesh Size

- A bare wire fish trap used or possessed in the St. Thomas/St. John EEZ that has hexagonal mesh openings must have a minimum mesh size of 1.5 inches (3.8 cm) in the smallest dimension measured between centers of opposite strands.
- A bare wire fish trap used or possessed in the St. Thomas/St. John EEZ that has other than hexagonal mesh openings or a fish trap of other than bare wire, such as coated wire or plastic, used or possessed in the St. Thomas/St. John EEZ, must have a minimum mesh size of 2.0 inches (5.1 cm) in the smallest dimension measured between centers of opposite strands.

- Escape Mechanisms
  A fish trap used or possessed in the St. Thomas/St. John EEZ must have a panel located on one side of the trap, excluding the top, bottom, and side containing the trap entrance. The opening covered by the panel must measure not less than 8 by 8 inches (20.3 by 20.3 cm). The mesh size of the panel may not be smaller than the mesh size of the trap. The panel must be attached to the trap with untreated jute twine with a diameter not exceeding 1/8 inches (3.2 mm). An access door may serve as the panel, provided it is on an appropriate side, it is hinged only at its bottom, its only other fastening is untreated jute twine with a diameter not exceeding 1/8 inches (3.2 mm), and such fastening is at the top of the door so that the door will fall open when such twine degrades. Jute twine used to secure a panel may not be wrapped or overlapped.

- Tending Restrictions
  A fish trap in the St. Thomas/St. John EEZ may be pulled or tended only by a person (other than an authorized officer) aboard the fish trap owner's vessel, or aboard another vessel if such vessel has on board written consent of the trap owner, or if the trap owner is aboard and has documentation verifying his identification number and color code. An owner's written consent must specify the time period such consent is effective and the trap owner's gear identification number and color code.

5.3.3 Gear and Methods for the Harvest of Caribbean Spiny Lobster

5.3.3.1 Prohibited Gear and Methods for the Harvest of Spiny Lobster

A. Applicable to both the Commercial and Recreational Sectors

<u>Spears and hooks</u>
A spear, hook, or similar device may not be used in the St. Thomas/St. John EEZ to harvest a Caribbean spiny lobster. The possession of a speared, pierced, or punctured Caribbean spiny lobster in or from the St. Thomas/St. John EEZ is prima facie evidence of violation of this section.

Gillnets and trammel nets

A gillnet or trammel net may not be used in the St. Thomas/St. John EEZ to fish for Caribbean spiny lobster. Possession of a gillnet or trammel net and any Caribbean spiny lobster in or from the St. Thomas/St. John EEZ is prima facie evidence of violation of this paragraph. A gillnet or trammel net used in the St. Thomas/St. John EEZ to fish for any other species must be tended at all times.

5.3.3.2 Allowed Gear and Methods for the Harvest of Caribbean Spiny Lobster

A. Applicable to the Commercial Sector (see Table 5.3.3 below)

Table 5.3.3. Gear type allowed in the commercial sector of the St. Thomas/St. John Spiny Lobster fishery.

St. Thomas/St. John Spiny Lobster Fishery	Gear Type
Trap/pot fishery	Trap/pot
Dip net fishery	Dip net
Hand harvest fishery	Hand harvest, snare

B. Applicable to the Recreational Sector (see Table 5.3.4 below)

Table 5.3.4. Gear type allowed in the recreational sector of the St. Thomas/St. John Spiny Lobster fishery.

St. Thomas/St. John Spiny Lobster Fishery	Gear Type
Recreational fishery	Dip net, hand harvest, snare, trap, pots

C. Applicable to the Commercial and Recreational Sectors

Specifications are provided only for the trap/pot gear, as allowed in both the commercial and recreational sectors (see Tables 5.3.3 and 5.3.4, above), as follows:

I. *Caribbean Spiny Lobster Trap Identification*

- Caribbean Spiny Lobster traps and associated buoys
  A Caribbean spiny lobster trap used or possessed in the St. Thomas/St. John EEZ must display the official number specified for the vessel by the USVI or Puerto Rico so as to be easily identified. Caribbean spiny lobster traps used in the St. Thomas/St. John EEZ that are fished individually, rather than tied together in a trap line, must have at least one buoy attached that floats on the surface. Caribbean spiny lobster traps used in the St. Thomas/St. John EEZ that are tied together in a trap line must have at least one buoy that

floats at the surface attached at each end of the trap line. Each buoy must display the official number and color code assigned to the vessel by the USVI or Puerto Rico or, whichever is applicable, so as to be easily distinguished, located, and identified.

- Presumption of ownership of Caribbean spiny lobster traps
  A Caribbean spiny lobster trap in the St. Thomas/St. John EEZ will be presumed to be the property of the most recently documented owner. This presumption will not apply with respect to such traps that are lost or sold if the owner reports the loss or sale within 15 days to the RA.

- Disposition of unmarked Caribbean spiny lobster
  An unmarked Caribbean spiny lobster trap or a buoy deployed in the St. Thomas/St. John EEZ where such trap or buoy is required to be marked is illegal and may be disposed of in any appropriate manner by the Assistant Administrator or an authorized officer.

II. *Caribbean Spiny Lobster Trap Construction Specifications and Tending Restrictions*

- Escape mechanisms
  A spiny lobster trap used or possessed in the St. Thomas/St. John EEZ must contain on any vertical side or on the top a panel no smaller in diameter than the throat or entrance of the trap. The panel must be made of or attached to the trap by one of the following degradable materials:
  - Untreated fiber of biological origin with a diameter not exceeding 1/8 inches (3.2 mm). This includes, but is not limited to tyre palm, hemp, jute, cotton, wool, or silk.
  - Ungalvanized or uncoated iron wire with a diameter not exceeding 1/16 inches (1.6 mm), that is, 16 gauge wire.

- Tending restrictions
  A Caribbean spiny lobster trap in the St. Thomas/St. John EEZ may be pulled or tended only by a person (other than an authorized officer) aboard the fish trap owner's vessel, or aboard another vessel if such vessel has on board written consent of the trap owner, or if the trap owner is aboard and has documentation verifying his identification number and color code. An owner's written consent must specify the time period such consent is effective and the trap owner's gear identification number and color code.

5.4 Size Limits

Species that are not in compliance with the size limits, in or from the St. Thomas/St. John EEZ, may not be possessed, sold, or purchased and must be released immediately with a minimum amount of harm. The operator of a vessel that fishes in the St. Thomas/St. John EEZ is responsible for ensuring that the species on board the vessel are in compliance with the size limits specified below.

5.4.1 Applicable to Reef Fish

<u>Yellowtail Snapper (*Ocyurus chrysurus*)</u>
Minimum size limit of 12 inches (in) (30.5 cm) total length (TL). This size limit applies year-round.

5.4.2 Caribbean Spiny Lobster

The minimum size limit is 3.5 in or 8.9 cm carapace length (Figure 5.4.1). See Section 5.2.2. above for harvest restrictions applicable to the harvest of Caribbean spiny lobster, including the requirement that Caribbean spiny lobster must be maintained with head and carapace intact.

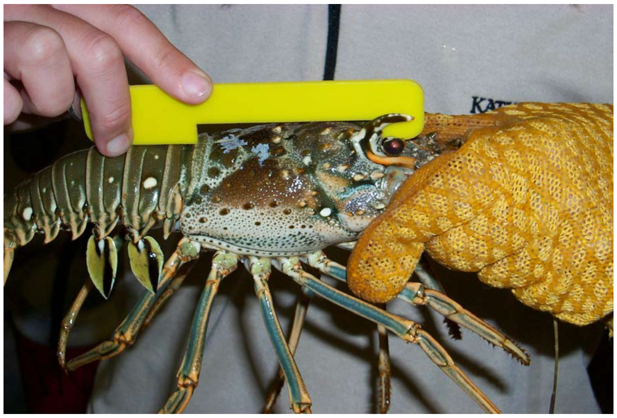

Figure 5.4.1. Measurement of a spiny lobster carapace.

5.5 Commercial Trip Limits

There are no commercial trip limits established for stocks or stock complexes managed under the St. Thomas/St. John FMP.

5.6 Recreational Bag Limits

5.6.1 General Applicability of Bag and Possession limits for Certain Reef Fish Species and Spiny Lobster

The bag and possession limits apply to certain stocks or stock complexes in or from the St. Thomas/St. John EEZ, as specified below. Unless specified otherwise, bag limits apply to a person on a daily basis, regardless of the number of trips in a day. Unless specified otherwise, a person is limited to a single bag limit for a trip lasting longer than one calendar day. Unless specified otherwise, possession limits apply to a person on a trip after the first 24 hours of that trip. The bag and possession limits apply to a person who fishes in the St. Thomas/St. John EEZ in any manner, except a person ho has a valid commercial fishing license issued by Puerto Rico or the U.S. Virgin Islands. A person who fishes in the St. Thomas/St. John EEZ may not combine a bag limit specified for the St. Thomas/St. John EEZ with a bag or possession limit applicable to territorial waters. A stock/stock complex subject to a bag limit specified below and taken in the St. Thomas/St. John EEZ by a person subject to the bag limits may not be transferred at sea, regardless of where such transfer takes place, and such fish may not be transferred in the St. Thomas/St. John EEZ. The operator of a vessel that fishes in the St. Thomas/St. John EEZ is responsible for ensuring that the specified bag and possession limits are not exceeded.

5.6.2 Bag and Possession Limits for Reef Fish[64]

Bag and possession limits apply to the harvest of the St. Thomas/St. John reef fish stocks listed in Table 5.6.1 below.

Table 5.6.1. Bag and possession limits for the recreational harvest of St. Thomas/St. John Reef Fish.

Aggregate bag limit for:	Allowed quantity:
Snapper, grouper, parrotfish, combined	5 fish per person/day, of which no more than 2 may be parrotfish, or if 3 or more persons are aboard, 15 fish total per vessel/day; of which no more than 6 may be parrotfish.
Angelfish, grunts, wrasses, jacks, porgies, triggerfish, surgeonfish, combined	5 fish per person/day, of which no more than 1 may be surgeonfish, or, if 3 or more persons are aboard, 15 fish total per vessel/day, of which no more than 4 may be surgeonfish.

5.6.3 Bag and Possession Limits for Caribbean Spiny Lobster

Bag and possession limits applicable to the harvest of the Caribbean spiny lobster in the St. Thomas/St. John EEZ are listed in Table 5.6.2.

Table 5.6.2. Bag and possession limits for the recreational harvest of spiny lobster.

Bag limit for:	Allowed quantity:
Spiny lobster	3 spiny lobsters per person/day, not to exceed 10 spiny lobsters per vessel/day, whichever is less.

[64] The recreational bag limit only applies to St. Thomas/St. John reef fish. It does not apply to pelagic stocks (dolphin and wahoo), which are new to management in the St. Thomas/St. John FMP.

5.7 Restrictions on Sale/Purchase

5.7.1 General

The Magnuson-Stevens Act defines recreational fishing as fishing for sport and pleasure.

5.7.2 Reef Fish

A live red hind or live mutton snapper in or from the St. Thomas/St. John EEZ may not be sold or purchased and used in the marine aquarium trade.

5.7.3 Caribbean Spiny Lobster

No person may import a Caribbean spiny lobster with less than a 6-ounce (170-gram) tail weight **into St. Thomas/St. John**. A 6-ounce (170-gram) tail weight is defined as a tail that weighs 5.9-6.4 ounces (167-181 grams). If the documentation accompanying an imported Caribbean spiny lobster (including but not limited to product packaging, customs entry forms, bills of lading, brokerage forms, or commercial invoices) indicates that the product does not satisfy the minimum tail weight, the person importing such Caribbean spiny lobster has the burden to prove that such Caribbean spiny lobster actually does satisfy the minimum tail-weight requirement or that such Caribbean spiny lobster has a tail length of 6.2 inches (15.75 cm) or greater or that such Caribbean spiny lobster has or had a carapace length of 3.5 inches (8.89 cm) or greater. If the imported product itself does not satisfy the minimum tail-weight requirement, the person importing such Caribbean spiny lobster has the burden to prove that such Caribbean spiny lobster has a 302 tail length of 6.2 inches (15.75 cm) or greater or that such Caribbean spiny lobster has or had a carapace length of 3.5 inches (8.89 cm) or greater. If the burden is satisfied such Caribbean spiny lobster will be considered to be in compliance with the minimum 6-ounce (170-gram) tail-weight requirement.

No person may import a spiny lobster with less than a 5-ounce (142-gram) tail weight **into any place subject to the jurisdiction of the United States excluding the U.S. Virgin Islands and Puerto Rico**. A 5-ounce (142-gram) tail weight is defined as a tail that weighs 4.2-5.4 ounces (119-153 grams). If the documentation accompanying an imported spiny lobster (including but not limited to product packaging, customs entry forms, bills of lading, brokerage forms, or commercial invoices) indicates that the product does not satisfy the minimum tail-weight requirement, the person importing such spiny lobster has the burden to prove that such spiny lobster actually does satisfy the minimum tail-weight requirement or that such spiny lobster has a tail length of 5.5 inches (13.97 cm) or greater or that such spiny lobster has or had a carapace length of greater than 3.0 inches (7.62 cm). If the imported product itself does not satisfy the minimum tail-weight requirement, the person importing such spiny lobster has the burden to prove that such spiny lobster has a tail length of 5.5 inches (13.97 cm) or greater or that such spiny lobster has or had a carapace length of greater than 3.0 inches (7.62 cm). If the burden is satisfied, such spiny lobster will be considered to be in compliance with the minimum 5-ounce (142-gram) tail-weight requirement.

No person may import, into any place subject to the jurisdiction of the United States, Caribbean spiny lobster tail meat that is not in whole tail form with the exoskeleton attached.

No person may import, into any place subject to the jurisdiction of the United States, Caribbean spiny lobster with eggs attached or Caribbean spiny lobster from which eggs or pleopods (swimmerets) have been removed or stripped. Pleopods (swimmerets) are the first five pairs of abdominal appendages.

5.8 Anchoring Restrictions

5.8.1 General

Specific area in the St. Thomas/St. John EEZ with anchoring restrictions
Anchoring by fishing vessels is prohibited year-round in the Hind Bank Marine Conservation District (MCD), south of St. Thomas/St. John (See Section 5.10 and Figure 5.10 below for information on the Hind Bank MCD).

5.8.2 Reef Fish

The owner or operator of any fishing vessel, recreational or commercial that fishes for or possesses St. Thomas/St. John reef fish in or from the St. Thomas/St. John EEZ must ensure that the vessel uses only an anchor retrieval system that recovers the anchor by its crown, thereby preventing the anchor from dragging along the bottom during recovery. For a grapnel hook, this could include an incorporated anchor rode reversal bar that runs parallel along the shank, which allows the rode to reverse and slip back toward the crown. For a fluke or plow type anchor, a trip line consisting of a line from the crown of the anchor to a surface buoy would be required.

5.9 Seasonal Closures Applicable to Fishing for Certain Reef Fish Species

The seasonal closures applicable to fishing for the species listed below (Table 5.9.1) apply to all fishing activities. No person may fish for or possess the following species in or from the St. Thomas/St. John EEZ (unless another area is specified) during the closed time period. The prohibition on possession does not apply to the species harvested and landed ashore prior to the closure.

Table 5.9.1. Species in the St. Thomas/St. John EEZ with seasonal closures and dates when season is closed and open for fishing for these species.

Species	Open Season	Closed Season
Silk snapper Black snapper Blackfin snapper Vermillion snapper	January 1 – September 30	October 1 – December 31
Mutton snapper Lane snapper	July 1 – March 31	April 1 – June 30
Yellowfin grouper Red grouper Tiger grouper Black grouper Yellowedge grouper	May 1 – January 31	February 1 - April 30

5.10 Seasonal Area Closures Applicable to Specific Fishing Activities and to Certain Species

The seasonal area closures in the St. Thomas/St. John EEZ listed below (Table 5.10.1) do not apply to fish harvested and landed ashore prior to the closure.

Table 5.10.1. Areas in the St. Thomas/St. John EEZ with seasonal area closures and dates when the area is closed and open for specific fishing activities.

Area	Open	Closed
Grammanik Bank		
No fishing for or possession of any species of fish[2] during the closure. The prohibition does not apply to highly migratory species[3].	May 1 – January 31	February 1 – April 30
Fishing with pots, traps, bottom longlines, gill or trammel nets is prohibited year-round.	Year-round prohibition	
Hind Bank Marine Conservation District	**Open**	**Closed**
All fishing is prohibited	Year-round Prohibition	

[2]Fish means finfish, mollusks, crustaceans, and all other forms of marine animal and plant life other than marine mammals and birds.
[3] Highly migratory species means bluefin, bigeye, yellowfin, albacore, and skipjack tunas; swordfish; sharks (listed in Appendix A to part 635 of this title); and white marlin, blue marlin, sailfish, and longbill spearfish.

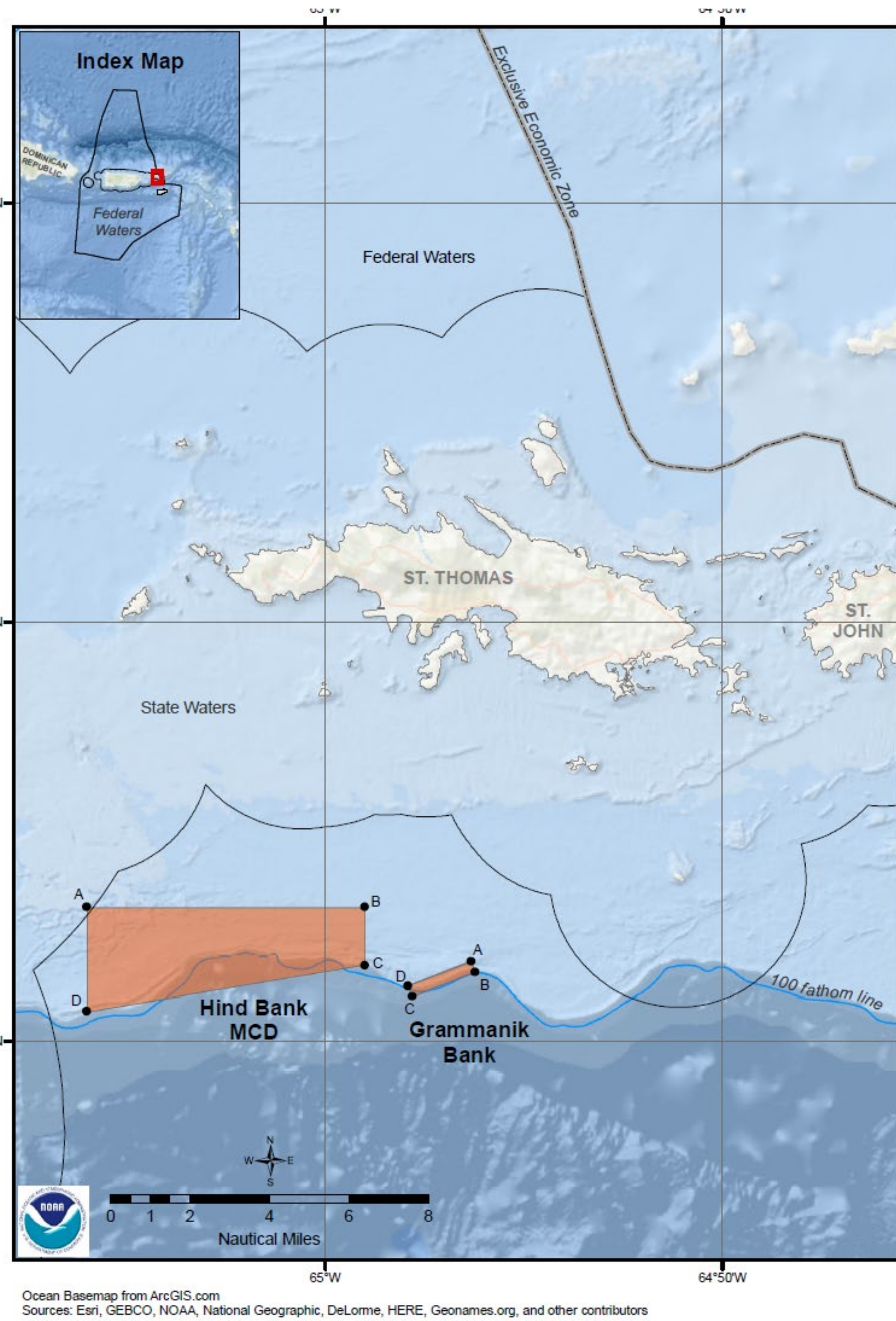

Figure 5.10.1. Map of the seasonally closed areas off the south coast of St. Thomas/St. John.

5.11 Permitting and Reporting

Federal permits are not needed for the harvest of Council-managed species.

5.12 Adjustment of Management Measures

The following table lists the framework procedure established in the St. Thomas/St. John FMP and lists the situations when management measures can be adjusted through framework. The framework procedure was selected by the Council and analyzed in Section 2.7 of the EA within this document.

Table 5.12.1. Framework procedure in the St. Thomas/St. John FMP.

OPEN FRAMEWORK
1. Situations under which this open framework procedure can be used: A. A new stock assessment or other information indicates changes should be made to: MSY, OFL, ABC, or other related management reference points and status determination criteria (SDC). B. New information or circumstances indicates management measures should be changed. • The Council will, as part of a proposed framework action, identify the new information and provide rationale as to why this new information indicates that management measures should be changed. C. Changes are required to comply with applicable laws such as MSA, ESA, MMPA, or are required as a result of a court order. • In such instances, the RA will notify the Council in writing of the issue and the action that is required. If there is a legal deadline for taking action, the deadline will be included in the notification. **2. Types of open frameworks:** A. Standard Framework • Changes that do not qualify as routine or insignificant. • Requires a completed framework document with supporting analyses. B. Abbreviated Framework • Can be used for routine or insignificant changes • Request is made with letter or memo from the Council to the RA with supporting analyses (biological, social, economic). • If RA concurs and approves action, it will be implemented through publication of FR Notice. **3. Actions available under the different open frameworks:** A. Abbreviated Framework i. Gear marking requirements ii. Vessel marking requirements iii. Restrictions related to maintaining fish in a specific condition (whole condition, filleting, use as bait, etc.) iv. Recreational bag and possession limit changes of not more than 1 fish per boat v. Size limit changes of not more than 1-inch of the prior size limit for reef fish. vi. Commercial vessel trip limit changes of not more than 10% of the prior trip limit vii. Changes to the length of an established closed season by no more than 1 day of the existing season.

OPEN FRAMEWORK
viii. Minor changes to gear modifications to address conservation issues including to respond to interactions with listed species. B. Standard Framework In addition to making changes specified under Abbreviated Framework (above) that exceed the established thresholds, the following actions can be completed via a standard framework: i. Re-specify ABC ii. Re-specify MSY and OY, and SDC iii. Re-specify SYL iv. Re-specify ACLs v. Re-specify ACTs vi. Rebuilding plans and revisions to approved rebuilding plans vii. Revise accountability measures (e.g., change AM triggers and AM timing) viii. Modify reporting and monitoring requirements ix. Modify seasonal or year-round closures and closure procedures x. Modify area closures and closure procedures **4. Open Framework Steps:** • The Council will initiate the open framework process to inform the public of the issues and develop potential alternatives to address the issues. The framework process will include the development of documentation and public discussion during at least one council meeting. • Prior to taking final action on the proposed framework action, the Council may convene its Scientific and Statistical Committee (SSC) or applicable Advisory Panel (AP), as appropriate, to provide recommendations on the proposed actions. • For all framework actions, the Council will provide the letter, memo, or the completed framework document along with proposed regulations to the Regional Administrator in a timely manner following final action by the Council. • For all framework action requests, the Regional Administrator will review the Council's recommendations and supporting information and notify the Council of the determinations, in accordance with the MSA and other applicable law.
CLOSED FRAMEWORK
Consistent with existing requirements in the FMP and implementing regulations, the RA is authorized to conduct the following closed framework actions through appropriate notification in the Federal Register: • Reopen any sector of the fishery that had been prematurely closed. • Implement AMs, either in-season or post-season. Implement an in-season AM for a sector that has reached or is projected to reach, or is approaching or is projected to approach its ACL according to the process established in the FMP, or implement a post-season AM for a sector that exceeded its ACL according to the process established in the FMP, or any other established AM.

5.13 Application of Status Determination Criteria and Management Reference Points

National Standard 1 of the Magnuson-Stevens Act mandates that conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery (16 U.S.C. 1851(a)(1)). The optimum yield from the fishery is based on the maximum sustainable yield. NMFS's guidelines on National Standard 1 provide additional information on establishing MSY and ensuring compliance with the fundamental goal of fisheries management expressed in NS1. Per the National Standard 1 guidelines, when data are insufficient to estimate MSY directly, Councils should adopt other measures of reproductive potential that can serve as a reasonable proxy for MSY (50 CFR § 600.310(e)(1)(v)). In the U.S. Caribbean region, scientific assessments from which MSY and SDC (maximum fishing mortality threshold [MFMT], overfishing limit [OFL], and minimum stock size threshold [MSST]) are derived are not available due to data limitations. As a result, the Council and their Scientific and Statistical Committee (SSC) chose to adopt the sustainable yield level (SYL) as their alternative measure of reproductive potential for stocks and stock complexes identified in Chapter 2 of this document, in addition to proxies for MSY based on qualitative estimates of fishing mortality rates and biomass expected when achieving MSY noted in Section 5.13.1 below. The SYL is based on an equilibrium (long-term) concept. It is set based on long-term landings, but is adjusted to account for variability in landings. MSY is an equilibrium concept and OFL is a non-equilibrium (short-term) quantity defined as the annual amount of catch that corresponds to the estimate of the MFMT applied to a stock's abundance. The value of OFL increases or decreases in accordance with the abundance of the stock, and MSY is the long-term average of such catches. OFLs are set accounting for this variation and are intended to represent the annual metric that corresponds to MSY. The SYL, as a measure that is based on long-term landings, but accounts for variability, is similar to an OFL. In addition, in the absence of better information, it can be considered to be a minimum estimate of MSY. It is intended to ensure a stock is maintained at a sustainable level until the stock's status relative to formal stock assessment-based MSY-related reference points can be determined. Thus, SYL will be used to understand the sustainability of the fishery. While landings in excess of SYL will not establish that overfishing is occurring, they indicate that catch could be above a sustainable level and will be investigated to determine whether overfishing is occurring, and whether, as a result of such SYL exceedances, the stock or stock complex is overfished. See below for a summary of each of these SDCs and management reference points or their proxies, selected by the Council in Action 4, as they are applied to stock and stock complexes in the St. Thomas/St. John FMP.

5.13.1 Maximum Sustainable Yield (MSY)

The MSY for stocks and stock complexes in the St. Thomas/St. John FMP is a proxy that is equal to the long-term yield at F_{MSY}. The F_{MSY} cannot be estimated from available data at this time and thus a proxy is specified (see discussion in Section 2.4, under Preferred Alternative 3). In the St. Thomas/St. John FMP, the F_{MSY} proxy equals $F_{30\%SPR}$. In addition, as discussed in Section 5.13.4, MSY is greater than or equal to the SYL, and is considered a proxy for MSY.

5.13.2 Maximum Fishing Mortality Yield (MFMT)

The MFMT is a determined level used by fishery managers to assess whether a fish stock is undergoing overfishing. If fishing mortality rates exceed MFMT, a stock is determined to be undergoing overfishing[65]. The MFMT for stocks and stock complexes in the St. Thomas/St. John FMP is equal to the F_{MSY} proxy as defined in Section 5.13.1 above.

5.13.3 Minimum Stock Status Threshold (MSST)

The MSST is a biomass level used by fishery managers to assess whether a fish stock is overfished. If the biomass of a fish stock falls below MSST, a stock is determined to be overfished. For stocks and stock complexes in the St. Thomas/St. John FMP, the MSST = 0.75* long-term Spawning Stock Biomass at MFMT (SSB_{MFMT}).

5.13.4 Sustainable Yield Level (SYL)

The SYL would serve the Council as a guidepost, alerting the Council there is a need to reconsider their approach to managing a stock or stock complex. As discussed in Section 2.4.2, and above, the SYL is considered to be a proxy for OFL and a minimum estimate of MSY (where MSY $\geq$ SYL) and thus another MSY proxy. The SYL is not intended as a metric for reporting stock status in terms of overfishing or overfished, meaning that an SYL exceedance does not automatically trigger a determination that the stock is undergoing overfishing or overfished. Instead, the SYL is intended to ensure a stock or stock complex is maintained at a sustainable level. While landings in excess of SYL would not establish that overfishing is occurring, they would indicate that harvest could be above a sustainable level. Therefore, when landings exceed the SYL, those landings would need to be investigated to determine whether overfishing is occurring and whether, as a result of continued SYL exceedance, the stock or stock complex would become overfished.

To evaluate the status of a stock or stock complex relative to the SYL, the approach would be to compare the most recent three years of adjusted landings. However, during the first few years following implementation of the St. Thomas/St. John FMP, the landings data would be compared to stepped series of fishing years, similar to the process used to determine whether an AM is triggered following ACL exceedances in Section 2.5.1 of this FMP (Preferred Alternative 2). In the initial year following FMP implementation, only the single most recently available year of landings would be compared against the SYL, and similarly for the second year following implementation. In the third year following implementation, the average of the two most recent years of available landings would be compared to the SYL. In the fourth year and for all subsequent years, the average of the most recent three years of available landings would be compared to the SYL. This approach maintains consistency with the approach used to evaluate fishery landings relative to the ACL, thereby ensuring management responses to fishing activity act in concert rather than in potential opposition.

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[65] https://sero.nmfs.noaa.gov/sustainable_fisheries/more_info/documents/pdfs/glossary_of_fishery_terms.pdf

In the event the appropriate landings benchmark exceeds the established SYL for a stock, stock complex, or indicator stock representing a stock complex, the Council would evaluate their management of that stock or stock complex, identify factors contributing to the SYL exceedance, and revise their management regime accordingly. Revisions to the Council's management regime could include (but are not limited to) reductions in the allowable catch, implementation of size or bag limits, or expansion or establishment of seasonal or areal closures. Table 5.13.2 below shows the SYL values for each of the stock/stock complexes managed under the St. Thomas/St. John FMP.

5.13.5 Overfishing Limit (OFL)

The OFL is the annual amount of catch that corresponds to the estimate of MFMT applied to a stock or stock complex's abundance and is expressed in terms of numbers or weight of fish. Because OFL cannot be quantified for stocks in Tier 4, which includes all stocks/stock complexes managed in the St. Thomas/St. John FMP, the SYL would be used as a proxy for OFL.

5.13.6 Acceptable Biological Catch (ABC)

The ABC is the catch level recommended by the Council's Scientific and Statistical Committee (SSC) that accounts for scientific uncertainty in the estimate of OFL, as well as any other sources of scientific uncertainty[66]. The ABC is a product of the ABC Control Rule (ABC CR), as developed and applied by the Council's SSC.

<u>ABC Control Rule</u>

The Council's ABC CR contains four tiers to be used by the Council's SSC in specifying recommendations and other management reference points for stocks managed under the St. Thomas/St. John FMP (Table 5.13.1) (See Section 2.4.2). The Council's ABC CR responds to different levels of data availability, and results in reference point estimates culminating in an ABC for each managed stock (Table 5.13.2). As set forth in NMFS's guidelines on National Standard 1, the Council's SSC may recommend an ABC that differs from the result of the ABC control rule calculation, based on factors such as data uncertainty, recruitment variability, declining trends in population variables, and other factors, but must provide an explanation for the deviation. 50 CFR 600.310(f)(3).

[66] https://www.fisheries.noaa.gov/insight/frequent-questions-national-standard-1-final-rule

Table 5.13.1. Caribbean Fishery Management Council Acceptable Biological Catch Control Rule for stocks/stock complexes managed under the St. Thomas/St. John FMP.

Tier 1: Data Rich	
Condition for Use	Full stage-structured stock assessment available with reliable time series on (1) catch, (2) stage composition, and (3) index of abundance. The assessment provides estimates of minimum stock size threshold (MSST), maximum fishing mortality threshold (MFMT), and the probability density function (PDF) of the overfishing limit (OFL).
MSY	MSY = long-term yield at F_{MSY} (or, MSY proxy = long-term yield at F_{MSY} proxy); assumes spawner-recruit relationship known.
SDC	MFMT = F_{MSY} or proxy MSST = 0.75*long-term Spawning Stock Biomass at MFMT (SSB_{MFMT}) OFL = Catch at MFMT
ABC	ABC = OFL as reduced (buffered) by scientific uncertainty[1] and reflecting the acceptable probability of overfishing[2]. The buffer is applied to the PDF of OFL (σ), where the PDF is determined from the assessment (where $\sigma > \sigma_{min}$) [3]. ABC= d * OFL where $d = \begin{cases} \text{Scalar} & \text{if } B \geq B_{MSY} \\ \text{Scalar} * (B-B_{critical}) / (B_{MSY}- B_{critical}) & \text{if } B < B_{MSY} \end{cases}$ Scalar = 1 if acceptable probability of overfishing is specified (<0.5), < 1 if not specified (=0.5). $B_{critical}$ is defined as the minimum level of depletion at which fishing would be allowed.
Tier 2: Data Moderate	
Condition for Use, MSY, SDC	Data-moderate approaches where two of the three time series (catch, stage composition, and index of abundance) are deemed informative by the assessment process, and the assessment can provide MSST, MFMT, and PDF of OFL.
ABC	Same as Tier 1, but variation of the PDF of OFL (σ) must be greater than 1.5 σ_{min} (in principle there should be more uncertainty with data-moderate approaches than data-rich approaches).
Tier 3: Data Limited: Accepted Assessment Available	
Condition for Use	Relatively data-limited or out-of-date assessments
MSY	MSY proxy = long-term yield at proxy for F_{MSY}
SDC	MFMT = F_{MSY} proxy MSST = 0.75* SSB_{MFMT} or proxy OFL = Catch at MFMT
ABC	ABC determined from OFL as reduced (buffered) by scientific uncertainty[4] and reflecting the acceptable probability of overfishing[2] a. Where the buffer is applied to the PDF of OFL when the PDF is determined from the assessment (with $\sigma \geq 2\sigma_{min}$) **OR** b. Where ABC = buffer * OFL, where buffer must be $\leq$ 0.9
Tier 4: Data Limited: No Accepted Assessment Available	
MSY	MSY proxy = long-term yield at proxy for F_{MSY}.
SDC	MFMT = F_{MSY} proxy MSST = 0.75* SSB_{MFMT}

	SYL[5] = a level of landings that can be sustained over the long-term. OFL proxy = SYL
Tier 4a **Conditions for Use**	No accepted[6] assessment, but the stock has relatively low vulnerability to fishing pressure. A stock's vulnerability to fishing pressure is a combination of its productivity and its susceptibility to the fishery. Productivity refers to the capacity of the stock to produce MSY and to recover if the population is depleted. Susceptibility is the potential for the stock to be impacted by the fishery. If SSC consensus[7] cannot be reached on the use of Tier 4a, Tier 4b should be used.
SYL	SYL = Scalar * ***75th percentile*** of reference period landings, where the reference period of landings is chosen by the Council, as recommended by the SSC in consultation with the SEFSC. Scalar $\leq$ 3 depending on perceived degree of exploitation, life history and ecological function.
ABC	ABC = buffer * SYL, where buffer must be $\leq$ 0.9 (e.g., 0.9, 0.8**,** 0.75, 0.70…) based on the SSC's determination of scientific uncertainty[8].
Tier 4b **Conditions for Use**	No accepted[6] assessment, but the stock has relatively high vulnerability to fishing pressure (see definition in Tier 4a Condition for Use), or SSC consensus[7] cannot be reached on the use of Tier 4a.
SYL	SYL = Scalar * ***mean*** of the reference period landings, where the reference period of landings is chosen by the Council, as recommended by the SSC in consultation with the SEFSC. Scalar < 2 depending on perceived degree of exploitation, life history, and ecological function.
ABC	ABC[9] = buffer * SYL, where buffer must be $\leq$ 0.9 (e.g., 0.9, 0.8, 0.75, 0.70…) based on the SSC's determination of scientific uncertainty[8].
Footnotes	[1]Scientific uncertainty would take into account, but not be limited to, the species life history and ecological function. [2]Acceptable probability of overfishing determined by Council. [3]σ_{min} could be equal to coefficient of variation; σ_{min} is in a log scale. [4]Scientific uncertainty would take into account, but not be limited to, the species life history and ecological function, the perceived level of depletion, and vulnerability of the stock to collapse. [5]MSY $\geq$ SYL. See Appendix G for a detailed explanation of SYL. [6]Accepted means that the assessment was approved by the SSC as being appropriate for management purposes. [7]The SSC defines consensus as having 2/3 of the participating members in favor of a Tier 4a assignment, otherwise the assignment would be Tier 4b of the ABC CR. [8]Scientific uncertainty would take into account, but not be limited to, deficiencies in landings data, availability of ancillary data, species life history, and ecological function, perceived level of depletion, and vulnerability of the stock to collapse. [9]The ABC for a Tier 4b stock should not exceed mean landings during the reference period.

Table 5.13.2. Sustainable yield level (SYL) and acceptable biological catch (ABCs) in pounds, calculated following the ABC CR for each stock/stock complex selected for management in the St. Thomas/St. John FMP. Indicator stocks are marked in bold.

Stock/Stock Complex	SYL (lbs)	ABC (lbs)
Spiny Lobster	367,035	220,221
Queen Conch	3,359	0
Snapper 1 (black, **blackfin**, silk, vermilion)	55,651	21,147
Snapper 2 (queen)	1,574	598
Snapper 3 (lane, **mutton**)	85,274	32,404
Snapper 4 (yellowtail)	246,405	93,634
Grouper 1** (Nassau)	NA	0
Grouper 2** (goliath)	NA	0
Grouper 3 (coney, **red hind**)	159,194	68,453
Grouper 4 (black, red, tiger, yellowfin)	6,244	2,373

Stock/Stock Complex	**SYL (lbs)**	**ABC (lbs)**
Grouper 5 (misty, yellowedge, yellowmouth)	1,083	411
Parrotfish 1** (blue, midnight, rainbow)	NA	0
Parrotfish 2 (princess, queen, redfin, **redtail**, **stoplight**, redband, striped)	141,237	70,619
Grunts 1 (**white**, bluestriped)	84,711	32,190
Grunts 2 (margate)	6,425	2,441
Porgies (jolthead, sea bream, sheepshead, **saucereye**)	61,133	30,567
Jacks (blue runner)	123,727	47,016
Surgeonfish (blue tang, ocean, **doctorfish**)	70,061	26,623
Wrasses (hogfish)	6,212	3,106
Angelfish (queen, **gray,** French)	43,051	21,526
Triggerfish (queen)	205,621	102,810
Dolphin	20,585	10,293
Wahoo	14,482	7,241
Sea cucumbers** (all species)	NA	0
Sea urchins** (all species)	NA	0
Corals** (all species)	NA	0

** For the stocks/stock complexes with the SYL listed as NA, landings data were not available, thus the ABC CR was not able to calculate SYL for those stocks/stock complexes. In those instances, the SSC set the ABC equal to zero.

5.13.7 Annual Catch Limits (ACLs) and Optimum Yield (OY)

The methods for setting ACLs for stocks/stock complexes in the St. Thomas/St. John FMP are discussed in Section 2.4. Table 5.13.3 lists the ACLs (and OY = ACL) established for stocks and stock complexes in St. Thomas/St. John.

5.13.7.1 Annual Catch Limits and Optimum Yield for Fish (Reef Fish and Pelagics)

In the EEZ management area surrounding St. Thomas/St. John, only commercial harvest data are collected for Council-managed fish (reef fish and pelagics). However, the ACL and the AM (discussed below) governs all harvest, whether commercial or recreational. With the exceptions of goliath grouper, Nassau grouper, midnight parrotfish, blue parrotfish, and rainbow parrotfish (discussed below), ACLs are based on the combined commercial St. Thomas/St. John EEZ and territorial landings reported for St. Thomas/St. John. Annual catch limits are discussed in Section 2.4. This section lists the outcomes from the preferred alternatives, which establish ACLs for stocks/stocks complexes managed under the St. Thomas/St. John FMP.

For fish stocks (reef fish and pelagics), OY would equate to the ACL. The ACLs for all Council-managed stocks and stock complexes are listed in Table 5.13.3.

5.13.7.2 Annual Catch Limits and Optimum Yield for Caribbean Spiny Lobster

In St. Thomas/St. John, only commercial harvest data are collected for spiny lobster (recreational landings are not available). However, the ACL and the AM (discussed below) for spiny lobster governs all harvest of spiny lobster, whether commercial or recreational. The ACL is based on available commercial landings information, whether reported as landed from federal or territorial waters. For Caribbean spiny lobster, the OY would equate to the ACL (Table 5.13.3).

5.13.7.3 Annual Catch Limits and Optimum Yield for Stocks with Harvest Prohibitions

Harvest for the following stocks/stock complexes would be prohibited in the St. Thomas/St. John EEZ: queen conch, Nassau grouper, goliath grouper, midnight parrotfish, rainbow parrotfish, blue parrotfish, sea cucumbers, sea urchins, and corals. The ACL and the OY for each one of these stocks/stock complexes would be zero (Table 5.13.3).

Table 5.13.3. Annual catch limits for commercial harvest of stocks/stock complexes selected for management in the St. Thomas/St. John FMP. Values are in pounds (lbs) of whole weight. Indicator stocks are marked in bold text. Note that the ACL = optimum yield.

Stock/Stock Complex	Annual Catch Limit (lbs)
Spiny Lobster	209,210
Queen conch	0
Snapper 1 (black, **blackfin**, silk, vermilion)	20,090
Snapper 2 (queen)	568
Snapper 3 (lane, **mutton**)	30,784
Snapper 4 (yellowtail)	88,952
Grouper 1 (Nassau)	0
Grouper 2 (goliath)	0
Grouper 3 (coney, **red hind**)	65,030
Grouper 4 (black, red, tiger, yellowfin)	2,254
Grouper 5 (yellowmouth, yellowedge, misty)	390
Parrotfish 1 (midnight, blue, rainbow)	0
Parrotfish 2 (queen, princess, **redtail**, **stoplight**, redband, striped, redfin	60,026
Grunts 1 (**white**, bluestriped)	30,581
Grunts 2 (margate)	2,319
Porgies (jolthead, **saucereye**, sheepshead, sea bream)	29,039
Jacks (blue runner)	44,665
Surgeonfish (blue tang, ocean surgeonfish, **doctorfish**)	22,630
Wrasses (hogfish)	2,951
Angelfish (queen, **gray**, French)	18,297
Triggerfish (queen)	97,670
Dolphin	9,778
Wahoo	6,879

Stock/Stock Complex	Annual Catch Limit (lbs)
Sea cucumbers (all species)	0
Sea urchins (all species)	0
Corals (all species)	0

5.13.8 Accountability Measures (AM) and Closure Provisions

Accountability measures, including methods to identify ACL exceedance and performance standards are discussed in Section 2.5. This section lists the outcomes from the preferred alternatives, which establishes how AMs are triggered and implemented and the closure provisions associated with the AMs.

5.13.8.1 Accountability Measures for Reef Fish and Spiny Lobster

For all St. Thomas/St. John reef fish for which harvest is allowed and for spiny lobster, landings would be evaluated relative to the applicable ACL based on annual or average landings, as described below.

Process for Triggering an AM for Reef Fish and Spiny Lobster
An AM would be triggered if commercial landings exceed the established ACL for that stock/stock complex, unless NMFS' Southeast Fisheries Science Centet (SEFSC) determines the overage occurred because data collection/monitoring improved rather than because catch increased.

Commercial landings from the following years, in order, would be used to evaluate an exceedance of the ACL, as described above:

(1) Landings from 2018
(2) Landings from 2019
(3) Two-year average of landings from 2019 and 2020
(4) Three-year average of landings from 2019, 2020, and 2021
(5) Thereafter, a progressive running three-year average (2020-2022, 2021-2023, etc.).

The Regional Administrator in consultation with the Council may deviate from the specific time sequences based on data availability.

Process for Applying an AM for Reef Fish and Spiny Lobster
If an AM is triggered, NMFS will reduce the length of the fishing season for the applicable stock/stock complex the year following the overage determination by the amount necessary to ensure (to the greatest practicable extent) landings do not again exceed the ACL in the year of application. Any fishing season reduction resulting from an AM application would be applied

from September 30 backward, toward the beginning of the fishing year. If the length of the required fishing season reduction exceeds the time period of January 1 through September 30, any additional fishing season reduction will be applied from October 1 forward, toward the end of the fishing year.

The Council will revisit the use of September 30 as the end date for AM-based closures every two years.

5.13.8.2 Closure Provisions for Reef Fish and Spiny Lobster

Restrictions applicable after a St. Thomas/St. John EEZ closure for reef fish stock or stock complexes and spiny lobster: During the closure period announced in the *Federal Register*, such stocks or stock complexes in or from the St. Thomas/St. John EEZ may not be harvested, purchased, or sold, and the bag and possession limits for such stocks or stock complexes in or from the St. Thomas/St. John EEZ are zero.

5.13.8.3 Accountability Measures for Pelagic Stocks

For the following pelagic stocks, Dolphin and Wahoo, an AM-based season length reduction in the event of an ACL overage would not be applied. Instead, the Council would establish an annual catch target (ACT) as a percentage of the ACL that would serve as the AM trigger (See Section 2.5) as discussed below. If an AM is triggered, the Council in consultation with the SEFSC would assess whether corrective action is needed.

<u>Annual Catch Target</u>

The ACT is a level of catch set to account for management uncertainty in controlling catch at or below the ACL. The following ACTs apply to the pelagic stocks/stock complexes listed in Table 5.13.4. The ACTs were set at 90% of the applicable ACL.

Table 5.13.4. Annual catch targets (ACT) for pelagic stocks in the St. Thomas/St. John FMP. Values are in pounds (lbs) of whole weight.

Stock	ACT (lbs)
Dolphin	8,800
Wahoo	6,191

<u>Process for Triggering an AM for the Listed Pelagic Stocks</u>

An AM would be triggered if the commercial landings exceed the ACT for the stock.

Commercial landings from the following years, in order, would be used to evaluate an exceedance of the ACT:

(1) Landings from 2018

(2) Landings from 2019
(3) Two-year average of landings from 2019 and 2020
(4) Three-year average of landings from 2019, 2020, and 2021
(5) Thereafter, a progressive running three-year average (2020-2022, 2021-2023, etc.).

The Regional Administrator in consultation with the Council may deviate from the specific time sequences based on data availability.

Process for Applying an AM for Pelagic Stocks
If an AM is triggered, the Council in consultation with the SEFSC would assess whether corrective action is needed.

5.13.8.4 Accountability Measures for Stocks with Prohibited Harvest

The harvest prohibition (ACL = 0) would serve as the AM for queen conch, Nassau grouper, goliath grouper, midnight parrotfish, rainbow parrotfish, blue parrotfish, and all managed sea cucumbers, sea urchins, and corals.

5.13.9 Stocks Under Rebuilding Plans

Three stocks and one stock complex were identified in the Caribbean Sustainable Fisheries Act (SFA) Amendment (CFMC 2005) as in need of rebuilding. The three stocks included queen conch (15-year plan), Nassau grouper (25-year plan), and goliath grouper (30-year plan). These stocks were classified as overfished in the 2003 Report to Congress. Each of those three stocks remains in a rebuilding status, and all provisions designed to ensure rebuilding within the defined time frames remain in place. Specifically, harvest of all three stocks remains prohibited in St. Thomas/St. John EEZ waters. The rebuilding plans for queen conch, Nassau, and goliath grouper are listed in the Caribbean SFA Amendment (CFMC 2005) and are incorporated herein by reference and summarized below.

The rebuilding plan for the Grouper Unit 4 stock complex, which at the time of the Caribbean Sustainable Fisheries Amendment included misty, yellowedge, yellowfin, red, tiger, and black grouper, lasted ten years and ended in 2015. Under the St. Thomas/St. John FMP, the Grouper 4 complex composition has changed.

Rebuilding plan for Nassau grouper: Rebuild Nassau grouper to B_{MSY} in 25 years, using the formula T_{MIN} (10 years) + one generation (15 years) = 25 years.
Rebuilding strategies:
- Prohibit the filleting of fish in federal waters of the U.S. Caribbean. Require that fish captured or possessed in federal waters be landed with heads and fins intact.

- Develop a memorandum of understanding (MOU) between NMFS and the USVI government to develop compatible regulations to achieve the objectives for Nassau grouper set forth in the Council's Reef Fish FMP in USVI and federal waters of the U.S. Caribbean.

Rebuilding plan for goliath grouper: Rebuild goliath grouper to B_{MSY} in 30 years, using the formula T_{MIN} (10 years) + one generation (20 years) = 30 years.
Rebuilding strategy:
- Prohibit the filleting of fish in federal waters of the U.S. Caribbean. Require that fish captured or possessed in federal waters be landed with heads and fins intact.

Rebuilding plan for queen conch: Rebuild queen conch to B_{MSY} in 15 years, using the formula T_{MIN} (10 years) + one generation (5 years) = 15 years.
Rebuilding Strategies:
- Prohibit commercial and recreational catch, and possession of queen conch in federal waters of the U.S. Caribbean, with the exception of Lang Bank near St. Croix.
- Develop a MOU between NMFS and the state governments to develop compatible regulations to achieve the management objectives set forth in the Council's Queen Conch FMP in state and federal waters of the U.S. Caribbean.

5.14 Essential Fish Habitat

A general description of EFH for species managed under the St. Thomas/St. John FMP is described in Chapter 3, Section 3.2.3.1. EFH identified for each life stage for each species managed under the St. Thomas/St. John FMP is listed below. EFH for species in the St. Thomas/St. John FMP was identified and described according to functional relationships between life stages of the species and marine and estuarine habitats, as based on best scientific information available from the literature, landings data, fishery-independent surveys, and expert opinion. For the species that were previously managed under the Council's U.S. Caribbean-wide FMPs that were retained in the St. Thomas/St. John FMP under Action 2 (spiny lobster, queen conch, and 44 reef fish), EFH was described and identified in the Final Environmental Impact Statement (FEIS) for the Generic EFH Amendment (CFMC 2004) and the Caribbean Sustainable Fisheries Act (SFA) Amendment (CFMC 2005). Those descriptions are incorporated herein by reference. Those existing designations are being evaluated during the ongoing EFH Five-Year Review and the Council's ongoing data analysis efforts. EFH for newly managed species in the St. Thomas/St. John FMP was identified and described in Action 6 of this FMP (see Section 2.6 and Tables 2.6.1 and 2.6.2). Appendix I summarizes the available information (e.g., literature, landings data, fishery-independent surveys, expert opinion) on the functional relationships between life history stages of federally-managed species and St. Thomas/St. John marine and estuarine habitats that were used to designate EFH for species new to management.

Reef Fish EFH in the St. Thomas/St. John FMP

EFH for the Reef Fish[67] consists of all waters from mean high water to the outer boundary of the EEZ (habitats used by eggs and larvae) and all substrates from mean high water to 100 fathoms depth (habitats used by other life stages).[68]

Pelagic Fish EFH in the St. Thomas/St. John FMP

EFH for dolphin (*Coryphaena hippurus*) consists of all waters from mean high water to the outer boundary of the U.S. Caribbean EEZ (habitats used by eggs, larvae, juveniles, and adults) and coral reef, hard bottom, and sargassum substrates from mean high water to the outer boundary of the U.S. Caribbean EEZ (habitats used by juveniles, adults, and larvae [for larvae, sargassum substrates only]).

EFH for wahoo (*Acanthocybium solandri*) consists of all waters from mean high water to the outer boundary of the U.S. Caribbean EEZ (habitats used by eggs, larvae, juveniles, and adults) and coral reef, hard bottom, and sargassum subsubstrates and the water column from mean high water to the outer boundary of the U.S. Caribbean EEZ (habitats used by juveniles, adults, and larvae [for larvae, sargassum substrates only]).

Spiny Lobster EFH in the St. Thomas/St. John FMP

EFH for spiny lobster consists of all waters from mean high water to the outer boundary of the U.S. Caribbean EEZ (habitats used by phyllosome larvae) and seagrass, benthic algae, mangrove, coral, and live/hard bottom substrates from mean high water to 100 fathoms depth (habitats used by other life stages)[69].

Queen Conch EFH in the St. Thomas/St. John FMP

EFH for queen conch consists of all waters from mean high water to the outer boundary of the EEZ (habitats used by eggs and larvae) and seagrass, benthic algae, coral, live/hard bottom and sand/shell substrates from mean high water to 100 fathoms depth (habitats used by other life stages)[70].

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[67] For specific information about EFH descriptions for previously managed reef fish retained in the St. Thomas/St. John FMP see the 2004 EFH-FEIS (CFMC 2004) and the Caribbean SFA Amendment (CFMC 2005).

[68] The Reef Fish EFH description includes yellowmouth grouper, a species newly added to management. For specific details about particular habitat used per life stage by the yellowmouth grouper, see Section 2.6.2. For specific information about EFH descriptions for previously managed reef fish retained in the St. Thomas/St. John FMP see the 2004 EFH-FEIS (CFMC 2004) and the Caribbean SFA Amendment (CFMC 2005).

[69] For specific information about the EFH description for spiny lobster in the St. Thomas/St. John FMP see the 2004 EFH-FEIS (CFMC 2004) and the Caribbean SFA Amendment (CFMC 2005).

[70] For specific information about the EFH description for queen conch in the St. Thomas/St. John FMP see the 2004 EFH-FEIS (CFMC 2004) and the Caribbean SFA Amendment (CFMC 2005).

Coral Reef Resources

EFH for sea urchins (Sea urchins stock complex) consists of all waters from mean low water to the outer boundary of the U.S. Caribbean EEZ (habitats used by eggs and larvae) and mangrove, seagrass, coral reef, hard bottom, sand, mud, and algal plain substrates from mean low water to the outer boundary of the U.S. Caribbean EEZ (habitats used by juveniles and adults).

EFH for sea cucumbers (Sea cucumbers stock complex) consists of all waters from mean low water to the outer boundary of the U.S. Caribbean EEZ (habitats used by eggs and larvae) and mangrove, seagrass, coral reef, hard bottom, sand, and algal plain substrates from mean low water to the outer boundary of the U.S. Caribbean EEZ (habitats used by juveniles and adults).

EFH for corals (Corals stock complex) consists of all waters from mean low water to the outer boundary of the U.S. Caribbean EEZ (habitats used by eggs and larvae) and coral reef and hard bottom substrates from mean low water to the outer boundary of the U.S. Caribbean EEZ (habitats used by juveniles and adults).

Chapter 6. Fishery Impact Statement

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) requires a Fishery Impact Statement (FIS) be prepared for all Fishery Management Plans (FMP) and amendments. The FIS contains an assessment of the likely biological, social, and economic effects of the conservation and management measures on: (1) fishery participants and their communities; (2) participants in the fisheries conducted in adjacent areas under the authority of another Council; and (3) the safety of human life at sea. Detailed discussion of the expected effects for all alternatives considered is provided in Chapter 4. The FIS provides a summary of these effects.

Actions contained in the St. Thomas/St. John FMP

The affected area of this proposed action encompasses federal waters off St. Thomas/St. John as well as their fishing communities dependent on fishing for fish (including reef fish and pelagics), spiny lobster, queen conch, and coral reef resources and the ecosystem services they provide. Additionally, because implementation of the St. Thomas/St. John FMP requires transitioning U.S. Caribbean-wide management included in each of the Spiny Lobster, Queen Conch, Reef Fish, and Corals FMPs to island-based management, the geographic scope of the action includes those EEZ waters surrounding the islands of St. Croix in the U.S. Virgin Islands (USVI) and Puerto Rico. The St. Thomas/St. John FMP has seven actions: Action 1 reorganizes existing management measures such that they apply only in the St. Thomas/St. John EEZ, rather than throughout the U.S. Caribbean EEZ. It has two alternatives. Under **Alternative 1** (No Action), the transition from a U.S. Caribbean-wide approach to an island-based approach to management in St. Thomas/St. John would not be implemented. Instead, the four U.S. Caribbean-wide FMPs (Reef Fish, Spiny Lobster, Queen Conch, and Coral) would remain in place. **Preferred Alternative 2** would establish a new St. Thomas/St. John FMP and would repeal the U.S. Caribbean-wide FMPs, as they apply to the St. Thomas/St. John management area. The new St. Thomas/St. John FMP would include all fishery management measures presently included in the four Council FMPs that are applicable to the St. Thomas/St. John EEZ.

Actions 2-7 tier from Action 1.

Action 2 revises the list of species (i.e., stocks) included for management, focusing on those applicable to the St. Thomas/St. John EEZ and provides two alternative approaches. Under **Alternative 1** (No Action), the St. Thomas/St. John FMP would continue to manage all stocks that are managed within the U.S. Caribbean-wide FMPs. **Preferred Alternative 2** has five criteria to be applied in a stepwise fashion to identify stocks in need of conservation and management. The criteria are applied to stocks for which landings data are available.

<u>Action 3</u> considers alternative methods for grouping stocks into stocks complexes (**Alternatives 1-3**), then determines if one or more indicator stocks (and which stock, if using) should be assigned to the stock complex (**Alternative 4**). Under **Alternative 1** (No Action), the St. Thomas/St. John FMP would not revise stock complex groupings; and species newly added to management based on Action 2 would not be assigned to complexes, but would be managed individually. **Alternative 2** would result in stocks not being assigned to stock complexes; all stocks would be managed individually. **Preferred Alternative 3** would organize stock complexes based on scientific analysis, applying outcomes from one or more methods such as statistical analyses, information from past data evaluations, biological and life history similarities, or expert opinion. **Preferred Alternative 4** concerns indicator stocks and has two sub-alternatives. **Preferred Sub-alternative 4a** determines if indicator stocks would be used, and then describes the process to be used to identify one or more appropriate indicator stocks. No indicator stocks would be assigned under **Preferred Sub-alternative 4b.**

<u>Action 4</u> describes alternative approaches for establishing status determination criteria (SDC) and management reference points. Three alternatives are included. Under **Alternative 1** (No Action), the previously established SDC and management reference points for those stocks currently under federal management in the four U.S. Caribbean-wide FMPs, would still apply. This alternative would not establish SDC or reference points for those stocks new to management resulting from Preferred Alternative 2 of Action 2, and thus would not comply with the Magnuson-Stevens Act.

Preferred Alternative 2 defines a three-step process for determining SDC and management reference points. Step 1 would require application of the Council's four-tier Acceptable Biological Catch (ABC) Control Rule (CR). At this time, all stocks/stock complexes in the St. Thomas/St. John FMP would fall under Tier 4 (applied when inadequate data are available with which to conduct a formal stock assessment). Step 2 provides three sub-alternatives for setting an estimate of fishing mortality rate when harvest is at the maximum sustainable yield (MSY) (the "F_{MSY} proxy") based on various fishing mortality rates. This step is applied only when this fishing mortality rate cannot be defined from the tiered control rule. **Sub-alternative 2a** establishes a fishing mortality rate equivalent to maximum fishing mortality rate (F_{MAX}), whereas **Sub-alternative 2b** equates F_{MSY} to the fishing mortality rate at a 40% spawning potential ratio (SPR) and **Preferred Sub-alternative 2c** sets that rate at a 30% SPR. Step 3 provides six sub-alternatives for establishing the ACL from the ABC derived from applying the control rule in Step 1. The OY would be set equal to the ACL. **Sub-alternative 2d** would set OY = ACL = ABC; **Sub-alternative 2e** (**preferred for all stocks except angelfish, parrotfish, and surgeonfish**) would set OY = ACL = ABC x 0.95; **Sub-alternative 2f** sets the OY = ACL = ABC x 0.90; **Sub-alternative 2g** (**preferred for angelfish, parrotfish, and surgeonfish**) sets the OY = ACL = ABC x 0.85; **Sub-alternative 2h** sets the OY = ACL = ABC x 0.75; and **Sub-alternative 2i** would set OY = ACL = 0.

Alternative 3 follows previously established procedures for determining stock/stock complex SDC and reference points (2010 and 2011 Caribbean ACL Amendments). This alternative has four steps, each containing various sub-alternatives. Step 1 has four sub-alternatives for defining the year sequence to calculate average landings to set reference points: **Sub-alternative 3a** uses the longest year sequence of reliable landings data available, as applicable; **Sub-alternative 3b** uses the longest time series of pre-Caribbean Sustainable Fisheries Act (SFA) Amendment landings data that is considered to be consistently reliable; **Sub-alternative 3c** uses 2012-2016 as the most recent five years of available landings data; and **Sub-alternative 3d** uses another year sequence, as recommended by the Council's SSC. Step 2 determines how the year sequence chosen in Step 1 would be used to establish the proxy for MSY and, from that, the OFL, and has two sub-alternatives: **Sub-alternative 3e** uses the median annual landings from the year sequence selected in Alternative 4, Step 1; and **Sub-alternative 3f** uses the mean annual landings from the year sequence selected in Alternative 4, Step 1. Step 3 has five sub-alternatives for establishing the ABC for each stock/stock complex based on the OFL for that stock/stock complex: **Sub-alternative 3g** does not specify an ABC CR and adopts the ABC recommended by the Council's SSC; **Sub-alternative 3h** adopts an ABC CR where ABC= OFL; **Sub-alternative 3i** adopts an ABC CR where ABC = OFL x 0.90; **Sub-alternative 3j** adopts an ABC Control Rule where ABC =OFL x 0.85; and **Sub-alternative 3k** adopts an ABC CR where ABC = OFL x 0.75. Step 4 provides six sub-alternatives for establishing the ACL for each stock/stock complex based on the ABC. The OY is then set equal to the ACL. **Sub-alternative 3l** sets OY = ACL = ABC; **Sub-alternative 3m** sets OY = ACL =ABC x 0.95; **Sub-alternative 3n** sets OY = ACL= ABC x 0.90; **Sub-alternative 3o** sets OY = ACL =ABC x 0.85; **Sub-alternative 3p** sets OY = ACL =ABC x 0.75; and **Sub-alternative 3q** sets OY = ACL = 0.

Action 5 establishes accountability measures (AM) to be implemented when landings exceed the ACL and includes five alternatives. **Alternative 1** (No Action), would retain the methods for triggering and applying an AM included in the U.S. Caribbean-wide FMPs for previously managed stocks but would not establish AMs for stocks added to management in Action 2. **Preferred Alternative 2** (**preferred for reef fish and spiny lobster**) applies the same post-season approach to applying AMs as was prescribed in the U.S. Caribbean-wide FMPs, but allows the Council to expand that AM approach to newly managed stocks/stock complexes. This alternative includes sub-alternatives to select the determinant for triggering an AM. **Sub-alternative 2a** uses a single year of applicable landings, beginning with the most recent available complete year of landings; **Sub-alternative 2b** uses a single year of applicable landings, beginning with the most recent available complete year of landings, then a two-year average of total landings from that single year and the subsequent year, and thereafter a progressive running two-year average; **Sub-alternative 2c** uses a single year of applicable landings, beginning with the most recent available complete year of landings, then a two-year average of applicable landings from that single year and the subsequent year, then a three-year average of applicable landings from those two years and the subsequent year, and thereafter a progressive running three-year average; **Preferred Sub-alternative 2d** uses a single year of applicable landings, using landings from 2018; then a single year of applicable landings, using landings from 2019; then a two-year average of applicable landings from 2019 and the subsequent year (2019-2020); then a three-year average of applicable landings from those two years and the subsequent year (2019-2021); and thereafter a progressive running three-year average (2020-2022, 2021-2023, etc.). The Regional Administrator in consultation with the Council may deviate from the specific time sequences based on data availability.

Preferred Alternative 3 would establish an annual catch target (ACT) for the pelagic stocks/stock complexes (dolphin and wahoo) only, and rely on the ACT as an AM; upon exceeding the ACT, the Council in consultation with the Southeast Fisheries Science Center (SEFSC) would assess whether corrective action is needed. **Preferred Alternative 3** has two steps. Step 1 has three options to specify the ACT for each pelagic stock: **Preferred Sub-alternative 3a** sets the ACT as 90% of the ACL; **Sub-alternative 3b** sets the ACT as 80% of the ACL; and **Sub-alternative 3c** sets the ACT as 70% of the ACL. In Step 2, the Council would choose one of four options to determine the sequence of years to be used to determine if an ACL overage has occurred, thereby triggering an AM. **Sub-alternatives 3d, 3e, 3f,** and **3g (Preferred)** propose the use of the same years as in **Preferred Alternative 2, Sub-alternatives 2a-2d**. **Alternative 4** would establish an in-season AM for stocks or stock complexes in the FMP. **Preferred Alternative 5 (preferred for corals, sea cucumbers, sea urchins, Nassau grouper, goliath grouper, queen conch, midnight, blue, rainbow parrotfish)** proposes that for a stock with a harvest prohibition, the prohibition would serve as the AM.

<u>Action 6</u> identifies and describes essential fish habitat (EFH) only for species included in the FMP that have not been previously managed by the Council and has three alternatives. Under **Alternative 1** (No Action), EFH would not be described and identified for species included in the St. Thomas/St. John FMP that were not previously managed. Under **Preferred Alternative 2**, functional relationships between life history stages and the marine and estuarine habitats of St. Thomas/St. John would be use to describe and identify EFH, which is the same process previously used to describe EFH for managed species in the U.S. Caribbean-wide FMPs. **Alternative 3** would allow the use of one or more methods for describing and identifying EFH, including distribution data, species density within specific habitats, spatial relationships between habitat and species, habitat suitability models, life history traits, or habitat-specific production estimates.

<u>Action 7</u> establishes framework procedures that would allow the Council to adjust reference points and management measures more quickly. It includes four alternatives. Under **Alternative 1** (No Action), framework measures in the U.S. Caribbean-wide FMPs, and included in the St. Thomas/St. John FMP under Action 1, would be retained, and no additional framework

measures added. **Preferred Alternative 2** would utilize a base framework procedure for determining items to be included as framework measures, and includes an abbreviated framework procedure within the open framework. **Alternative 3** would utilize a broad framework procedure for determining items to be included as framework measures. **Alternative 4** would utilize a narrow framework procedure for determining items to be included as framework measures.

Assessment of Biological Effects

Preferred Alternative 2 of Action 1 would not have short-term biological effects because the applied regulatory environment would not change. In the long-term, impacts to the biological environment from fishing activities could potentially be minimized by enhancing fisheries management.

Preferred Alternative 2 of Action 2 would be biologically beneficial because it would rearrange species to be managed, focusing management on species in need of conservation and management. Managing additional species would increase the likelihood of sustainable harvest, as the Council must establish ACLs and could establish other measures that would provide a more comprehensive management of the coral reef ecosystem. The effects of removing species from management depends on how harvest changes without federal oversight. For stocks predominantly caught in territorial waters, the absence of federal oversight might not change how they are harvested and might not be expected to have indirect biological effects.

Preferred Alternative 3 of Action 3, revising stock complex organization and composition, and also **Preferred Sub-alternative 4b** (i.e., not selecting an indicator stock), would be expected to result in more careful and responsive management of the fisheries, and provide increased indirect benefits to the biological environment. Where data is not available to manage stocks individually, selecting an indicator stock that is targeted by the fishery in **Preferred Sub-alternative 4a** would provide more conservative management for all the stocks in the complex, because management measures, including ACLs and AMs, would be tailored to the indicator.

Preferred Alternative 2 of Action 4 would have positive short- and long-term biological effects because applying the best scientific information available to ensure federally managed stocks are harvested sustainably over the long-term ensures those fish and invertebrate populations supporting harvest are exploited to the greatest practicable extent while protecting reproductive capacity and maintaining effective ecological contributions. **Preferred Sub-alternative 2c** would control fishing effort thus benefitting the biological environment. **Preferred Sub-alternative 2e** (preferred for all stocks except angelfish, parrotfish, surgeonfish) would account for management uncertainty with a relatively minimal reduction that is more conservative than status quo. The buffer applied in **Preferred Sub-alternative 2g** (preferred for angelfish, parrotfish, surgeonfish) would be beneficial to the biological environment as it accounts for the ecological services to the coral reef ecosystem that these species provide.

Preferred Alternative 2 of Action 5 would have positive biological benefits to reef fish and spiny lobster by ensuring fishing effort is managed as necessary to prevent a subsequent exceedance of the ACL. Specific effects from **Preferred Sub-alternative 2d** (landing years to evaluate ACL exceedance) depend on the stock and the variability in landings associated with that stock, but using a longer time series as in this alternative, would allow to more closely achieve OY.

Preferred Alternative 3 in general could risk potential depletion of a pelagic resource as harvest is not closed if an AM is triggered; however, the Council could revise its management approach or determine a closure is necessary in response to recommendations from the Southeast Fisheries Science Center. Those management revisions would benefit stock productivity in the long-term. **Preferred Sub-alternative 3a** (establishing an ACT based on 90% of the ACL) is the least conservative sub-alternative as it provides the least likelihood for convening the Council's response, however it does not prevent a response. Specific effects from **Preferred Sub-alternative 3g** (landings years to evaluate ACT exceedance) depend on the pelagic stock and the variability in landings associated with that stock, but using a longer time series, would allow to more closely achieve OY.

By equating the AM with a complete prohibition on harvest, **Preferred Alternative 5** provides the greatest overall biological benefit but only for those stocks for which the Council assigned an ABC of zero based on the SSC recommendations.

Preferred Alternative 2 of Action 6 would have no direct biological effects, and no indirect biological effects unless actions were to be taken to regulate or mitigate impacts to the EFH designations. Although the EFH descriptions for species newly added to management were updated to include substrates beyond the 100 fathom countour line, additional protections via management measures or from consultations on actions that could adversely affect EFH would not be expected due to the limited interactions that may occur between fishing gear and the bottom at these deeper water depths (i.e., greater than 100 fathoms). In addition, projects affecting substrates located beyond 100 fathoms are generally infrequent (e.g., submarine cables and transmission lines) and the landward extent of those project from 100 fathoms that may adversely affect substrates already trigger EFH consultations.

Under **Preferred Alternative 2** of Action 7, more expeditious regulation changes in response to changes in resource abundance and new scientific information would indirectly protect the biological integrity of managed resources and decrease the risk of overfishing those resources.

Assessment of Economic Effects

No direct economic effects are expected from **Preferred Alternative 2** of Action 1 but it would result in indirect economic benefits due to an expected increase in compliance with fishery regulations and potential improvements in fishery-dependent data collected, as the fishing community requested and is supportive of the transition to island-specific management measures. Benefits also are expected from the development of effective island-specific management measures.

Preferred Alternative 2 of Action 2 would not be expected to result in direct economic effects but positive indirect economic effects would be expected from allowing management and enforcement activities to focus on more important species, from the additional protection to vulnerable species included in the FMP; from the fishing opportunities to recreational and commercial fishermen by including economically important species; and potential increased fishing opportunities that could result from future management measures for species in need of conservation and management included in the FMP.

Preferred Alternative 3 and **Preferred Sub-alternatives 4a** and **4b** of Action 3, would not be expected to result in direct economic effects, but indirect effects are expected by relying on better and more recent scientific information to create stock complexes. **Preferred Alternative 3** may increase the likelihood of setting ACLs that would provide adequate protection to the stocks, thereby resulting in positive indirect economic benefits. The selection of one or more indicator stocks (**Preferred Sub-alternative 4a**) and the non-assignment of indicator stocks (**Preferred Sub-alternative 4b**) may result in positive or negative indirect economic effects depending on the indicator stock selected and on the jointness-in-catch among the species included in a given stock complex.

Adoption of the ABC CR in **Preferred Alternative 2** of Action 4 is an administrative action and would not be expected to result in direct or indirect effects on the economic environment. There are no cost data by which to estimate the differences in producer surplus to the commercial sector that might be forthcoming (at least in the short run) under the different sub-alternatives nor is there information that would allow for estimation in the change in benefits that would occur in the recreational sector (either private or for-hire) (See Section 4.4.3 for additional information). However, setting reference points and ACLs that protect the stock or stock complexes while optimizing yield are expected to result in positive indirect economic benefits.

Preferred Sub-alternative 2d of Action 5 would be expected to result in net economic benefits because it would be expected to smooth out landings data fluctuations and mitigate potential adverse economic effects by relying on a stepwise temporal approach to trigger an AM. Effects from **Preferred Sub-alternatives 3a** and **3g** would be determined by the nature of the corrective actions, if any, taken by the Council once an AM is triggered. **Preferred Alternative 5** is expected to result in substantial economic benefits for those species with harvest prohibitions due to the enhanced protection conferred to these stocks.

Preferred Alternative 2 of Action 6 would not be expected to result in economic effects. Direct economic effects would be expected if there are impacts to EFH from fishing activities and regulations are implemented to protect EFH, or if impacts to EFH are mitigated in EFH consultations. **Preferred Alternative 2** identified additional EFH beyond 100 fathoms for some newly managed species. However, projects affecting substrates located beyond 100 fathoms are generally infrequent and the landward extent of those project from 100 fathoms already trigger EFH consultations. Additional management measures to protect EFH from fishing impacts would not be expected due to the limited interactions that may occur between fishing gear and the bottom at these deeper water depths (i.e., greater than 100 fathoms). Any potential economic costs and benefits (and their relative magnitude) that could be expected from **Preferred Alternative 2** may only be estimated if (and once) specific regulations to protect EFH are outlined and enacted.

Preferred Alternative 2 of Action 7 would be expected to allow for a timelier implementation of a wider suite of measures that would be beneficial to the stocks, thereby resulting in future biological benefits and associated indirect positive economic effects.

Assessment of Social Effects

By creating an individual FMP for St. Thomas/St. John, **Preferred Alternative 2** of Action 1 addresses the concerns expressed by the public regarding island management. By allowing for more island centric management, each locale may be able to take advantage of the historical trends that have created each unique social and cultural environment that may offer more streamlined and effective management. This may bring about more participation as stakeholders see management more responsive to their local needs, and the increased cooperation may lead to more compliance which should benefit the social environment.

The criteria included in **Preferred Alternative 2** of Action 2 offer an opportunity to consider social, economic, and ecological benchmarks by which to include species that are important to St. Thomas/St. John into the FMP and should have indirect positive social effects. By including economically and socially important species, the Council can tailor management to ensure their continued positive social effects. Furthermore, with the addition of all sea cucumbers and sea urchins, there would likely be positive social effects from management and conservation of these species.

The organization of stock complexes or individual stocks under **Preferred Alternative 3** of Action 3 relied on analysis and extensive review by expert and experience-based panels in a process that garnered both scientific and public support and is consistent with the purpose of creating an FMP tailored to St. Thomas/St. John, thus providing benefits to the social environment. **Preferred Alternative 4** would have positive social benefits through practical selection (**Sub-alternative 4a**) or non-selection (**Preferred Sub-alternative 4b**) of indicator stocks, that reflect available information. However, the formation of reference points for grouped stocks and the use of indicator stocks may induce some changes in fishing behavior if unanticipated closures occur as a result of thresholds for the stock complex being exceeded. In the long-term, if these measures provide sufficient protection for stocks there should be positive social effects.

Preferred Alternative 2 of Action 4 has social benefits as the stepped process allows for more and specific information to be considered in establishing reference points and status determination criteria for those stocks or complexes that have assessments or those with more data, and helps assess the risk of overfishing. The long-term social effects would likely be positive if the OY and ACLs established in this action provide protection for the stocks and ensure the sustainability of stocks and stock complexes.

In **Preferred Alternative 2** of Action 5, an AM would be triggered if landings exceed the ACL for a stock/stock complex in the St. Thomas/St. John FMP, and may be more aligned with stakeholder desires, benefitting the social environment. It is difficult to determine social effects from **Preferred Sub-alternative 2d**, but by incorporating running averages and allowing flexibility based on data availability, it may be more in tune with fishing practices at the time considered and what may occur in the future. Effects from **Preferred Sub-alternatives 3a** and **3g** would be determined by the nature of the corrective actions, if any, taken by the Council once an AM is triggered. There would be few if any immediate social effects from **Preferred Alternative 5** (harvest prohibition as the AM), however, over time as these stocks recover there could be positive social effects in the long-term.

The social effects of **Preferred Alternative 2** in Action 6 would be hard to determine, given the indirect links to other management alternatives that may or may not have some impacts. Any protection to fishery habitat that is afforded by any alternative should have beneficial social impacts if it provides protection for stocks throughout their life history which in turn ensures healthy stocks that can be harvested at levels that provide OY.

Preferred Alternative 2 of Action 7 is likely to have the most positive social effects of all alternatives proposed as it reflects the flexible suite of options and what the Council views are the appropriate procedures given the current status and condition of the fisheries being managed.

Assessment of Effects on Safety at Sea

The actions in the St. Thomas/St. John FMP are not expected to have a direct impact on safety at sea, as none of them have safety implications or would significantly change the way in which the St. Thomas/St. John EEZ fisheries operate.

Chapter 7. Regulatory Impact Review

7.1 Introduction

The National Marine Fisheries Service (NMFS) requires a Regulatory Impact Review (RIR) for all regulatory actions that are of public interest. The RIR does three things: (1) it provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action; (2) it provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problem; and, (3) it ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost-effective way. The RIR also serves as the basis for determining whether the regulations are a "significant regulatory action" under the criteria provided in Executive Order (E.O.) 12866. This RIR analyzes the impacts this action would be expected to have on the fisheries of the St. Thomas/ St. John exclusive economic zone (EEZ).

7.2 Problems and Objectives

The problems and objectives addressed by this action are discussed in Section 1.2.

7.3 Description of Fisheries

A description of the fisheries of the St. Thomas/St. John EEZ is provided in Section 3.5.

7.4 Impacts of Management Measures

7.4.1 Action 1: Transition Fisheries Management in the St. Thomas/St. John EEZ from a U.S. Caribbean-wide Approach to an Island-based Approach

A detailed analysis of the economic effects expected to result from this action is provided in Section 4.1.3. The following discussion summarizes the expected economic effects of the preferred alternative.

Preferred Alternative 2 would repeal the U.S. Caribbean-wide fishery management plans (FMP) as they apply to the St. Thomas/St. John management area and replace them with the island-based FMP for St. Thomas/St. John EEZ waters. **Preferred Alternative 2** would not be expected to result in direct economic effects because it would not affect the harvest or other customary uses of fishery resources. However, **Preferred Alternative 2** would be expected to result in indirect economic benefits due to an expected increase in compliance with fishery regulations, potential improvements in fishery-dependent data collected, and the development of effective island-specific management measures. The magnitude of these expected economic benefits is unknown because it would be determined by a range of factors including, the extent to which compliance would improve, costs associated with the commercial harvest of seafood, changes in producer and consumer surplus, and the management measures that would be implemented following the transition to an island-specific FMP.

7.4.2 Action 2: Identify Stocks in Need of Federal Conservation and Management

A detailed analysis of the economic effects expected to result from this action is provided in Section 4.2.3. The following discussion summarizes the expected economic effects of the preferred alternative.

Preferred Alternative 2 uses a stepwise process based on five specified criteria to determine the species to include in (or exclude from) the island-specific St. Thomas/St. John FMP. **Preferred Alternative 2** would not be expected to affect the harvest or other customary uses of fishery resources and would therefore not be expected to result in direct economic effects. However, **Preferred Alternative 2** would be expected to result in an array of indirect economic effects. As with the U.S. Caribbean-wide FMPs, the inclusion of overfished stocks in the island-specific FMP would be expected to increase the likelihood of successfully rebuilding these stocks, thereby resulting in positive economic effects due to increased fishing opportunities in the long run. The exclusion of species that are infrequently occurring in the St. Thomas/St. John EEZ would be expected to result in economic benefits by allowing management and enforcement activities to focus on targeted species. The inclusion of vulnerable species in this island-specific FMP could also be expected to result in positive economic effects if the Council enacts management measures affording additional protection to these species. The inclusion of species of economic importance to the regional or national economy could be expected to result in economic benefits derived from the fishing opportunities that could be provided to recreational and commercial fishermen in the St. Thomas/St. John EEZ. Finally, the inclusion in this island-specific FMP of species in need of conservation and management, as determined by the Council, could be expected to result in positive economic effects due to potential increased fishing opportunities that could result from future management measures. Overall, the net economic effects expected to result from **Preferred Alternative 2** would be determined by the management measures implemented by the Council after it determines the list of species included in this island-specific FMP.

7.4.3 Action 3: Compose Stock Complexes and Identify Indicator Stocks as Appropriate

A detailed analysis of the economic effects expected to result from this action is provided in Section 4.3.3. The following discussion summarizes the expected economic effects of the preferred alternatives.

Preferred Alternative 3 would, based on scientific analysis, manage species included in the St. Thomas/St. John FMP as individual stocks or stock complexes. For stock complexes identified under **Preferred Alternative 3**, indicator stocks may be used (**Preferred Sub-alternative 4a)** or not used (**Preferred Sub-alternative 4b**). The management of species as individual stocks or stock complexes and the assignment of indicator stocks are administrative measures that would not be expected to alter the harvest or other customary uses of these stocks. Therefore, **Preferred Alternative 3** and **Preferred Sub-alternatives 4a** and **4b** would not be expected to result in direct economic effects. The set of preferred alternatives selected in this action (Action 3) would however be expected to result in indirect economic effects. By relying on better and more recent scientific information to create stock complexes, **Preferred Alternative 3** may increase the likelihood of setting annual catch limits (ACL) that would provide adequate protection to the stocks, thereby resulting in positive indirect economic benefits. The selection of one or more indicator stocks (**Preferred Sub-alternative 4a**) and the non-assignment of indicator stocks (**Preferred Sub-alternative 4b**) may result in positive or negative indirect economic effects depending on the indicator stocks selected and on the jointness-in-catch among the species included in a given stock complex. If harvests of species belonging to a given stock complex are highly joint in nature, the use of indicator stocks would be expected to assist in the management and evaluation of other stocks within the stock complex, particularly those stocks for which landings and other relevant data are limited, thereby resulting in indirect economic benefits. Conversely, the non-assignment of indicator stocks when jointness in catch exists within a stock complex could be expected to result in adverse indirect economic effects because data that could assist in improving the management process would be forgone. Alternatively, if jointness in the harvesting process is weak or non-existent, potential indirect economic effects that would be expected to be derived from the use of indicator stocks would be reduced.

7.4.4 Action 4: Establish SDC and Management Reference Points

A detailed analysis of the economic effects expected to result from this action is provided in Section 4.4.3. The following discussion summarizes the expected economic effects of the preferred alternatives.

Preferred Alternative 2 uses a sequential approach to specify status determination criteria and management reference points. Under **Preferred Alternative 2**, the first step is the adoption and application of an acceptable biological catch (ABC) control rule. This first step is administrative in nature and would not be expected to result in direct or indirect effects on the economic environment. In the second step, **Preferred Sub-alternative 2c** sets the F_{MSY} proxy equal to $F_{30\%SPR}$. If **Preferred Sub-alternative 2c** provides warranted additional protection to a given stock or stock complex, then biological benefits in the long-term and associated economic benefits would be expected to result. The final step in **Preferred Alternative 2**, **Preferred Sub-alternative 2e** sets, for all stocks except angelfish, parrotfish, and surgeonfish, an optimum yield (OY) and ACL equal to 95% of the ABC determined in step one. For angelfish, parrotfish, and surgeonfish, **Preferred Sub-alternative 2g** sets an OY and ACL equal to 85% of the ABC. For a given stock or stock complex, if the ACL established under **Preferred Sub-alternative 2g** increases fishing opportunities (and in turn landings) relative to the status quo, then positive economic benefits would be expected to follow. Conversely, reductions in fishing opportunities would be associated to adverse economic effects. Net economic effects that would be expected to result from **Preferred Alternative 2** (**Preferred Sub-alternative 2c** and **Preferred Sub-alternative 2g**) would be determined by the relative sizes of economic effects expected to result from changes in protection to a given stock or stock complex and of changes in fishing opportunities and associated landings.

7.4.5 Action 5: Accountability Measures (AM) for Stocks and Stock Complexes

A detailed analysis of the economic effects expected to result from this action is provided in Section 4.5.3. The following discussion summarizes the expected economic effects of the preferred alternatives.

Preferred Sub-alternative 2d uses a stepwise temporal approach to calculating average landings for comparison against the applicable ACL to determine if an AM would be triggered. For a given stock or stock complex, if an AM is triggered, **Preferred Sub-alternative 2d** would be expected to result in positive economic effects derived from the added protection to the stock or stock complex. However, **Preferred Sub-alternative 2d** would also be expected to result in adverse economic effects due to disruptions to fishing communities and losses in economic benefits derived from fishing activities, regulatory discards from bycatch of species caught during an AM closure, and an increased administrative burden. Landings data for St. Thomas/St. John, which are self-reported, are relatively imprecise and are subject to sizeable annual fluctuations. Overall, **Preferred Sub-alternative 2d** would be expected to result in net economic benefits because it would be expected to smooth out these fluctuations and mitigate potential adverse economic effects by relying on a stepwise temporal approach to trigger an AM.

For pelagic stocks only, **Preferred Alternative 3** uses a two-step process to set an annual catch target (ACT) and trigger an AM. **Preferred Sub-alternative 3a** sets an ACT equal to 90% of the ACL. **Preferred Sub-alternative 3g** use a stepwise temporal method to trigger an AM.

Based on data availability, the Regional Administrator in consultation with the Council may modify the specific time sequences considered under **Preferred Sub-alternative 3g**. The economic effects expected to result from the set of sub-alternatives selected in **Preferred Alternative 3** would reflect the trade-off between economic benefits resulting from the added protection to the stock expected from the establishment of an AM and the associated economic costs due to losses of fishing opportunities and landings once an AM is triggered. Overall, the net economic effects expected to result from **Preferred Sub-alternative 3a** and **Preferred Sub-alternative 3g** would be determined by the nature of the corrective actions, if any, taken by the Council once an AM is triggered.

For stocks with harvest prohibitions, **Preferred Alternative 5** uses the prohibitions as the AM. Because the ABC for these species is set to zero due to the overfished condition of some stocks (i.e., queen conch, Nassau grouper, goliath grouper) and the ecological importance of others (blue parrotfish, midnight parrotfish, rainbow parrotfish, sea cucumbers, sea urchins, and corals), the enhanced protection of these stocks is warranted and is expected to result in substantial economic benefits.

7.4.6 Action 6: Describe and Identify Essential Fish Habitat (EFH) for Species not Previously Managed in the St. Thomas/St. John EEZ

A detailed analysis of the economic effects expected to result from this action is provided in Section 4.6.3. The following discussion summarizes the expected economic effects of the preferred alternative.

Preferred Alternative 2 would describe and identify EFH according to functional relationships between life history stages for stocks not previously managed in the St. Thomas/St. John EEZ and marine and estuarine habitats. **Preferred Alternative 2** would not be expected to result in economic effects if fishing gear and fishing activities do not impact EFH. However if there are impacts to EFH from fishing gear and/or activities and regulations are implemented to protect EFH, **Preferred Alternative 2** would be expected to result in direct economic effects. **Preferred Alternative 2** would result in economic benefits due to the added protection to EFH and the economic value it would generate, e.g., direct benefits enjoyed by non-consumptive users such as scuba divers. Any regulations implemented to protect EFH would also result in direct economic costs borne by those sectors upon which the regulations are imposed. For example, regulations may include costly gear restrictions or limitations resulting in a reduction in catch. The net economic effects expected to result from **Preferred Alternative 2** cannot be determined at this time. The relative magnitude of any potential economic costs and benefits that could be expected to result from **Preferred Alternative 2** may only be estimated if (and once) specific regulations to protect EFH are outlined and enacted. However, at this time, no economic effects are expected. **Preferred Alternative 2** identified additional EFH beyond 100 fathoms for some newly managed species. Additional EFH consultations are not likely as projects affecting substrates located beyond 100 fathoms are generally infrequent and the landward extent of those project from 100 fathoms already trigger EFH consultations. Additional management measures to protect EFH from fishing impacts would not be expected due to the limited interactions that may occur between fishing gear and the bottom at these deeper water depths (i.e., greater than 100 fathoms). Therefore, this alternative will not impose any additional economic costs or result in additional economic benefits.

7.4.7 Action 7: Framework Procedures for the St. Thomas/St. John FMP

A detailed analysis of the economic effects expected to result from this action is provided in Section 4.7.3. The following discussion summarizes the expected economic effects of the preferred alternative.

Preferred Alternative 2 would expand the range of management measures that can be implemented by the Council without going through a full plan amendment process. Compared to the time typically required to develop an FMP amendment, **Preferred Alternative 2** would be expected to allow for a timelier implementation of a wider suite of measures that would be beneficial to the stocks, thereby resulting in future biological benefits and associated indirect positive economic effects. The magnitude of the indirect economic benefits expected to result from **Preferred Alternative 2** would depend upon the relative speed at which regulatory changes can be implemented.

7.5 Public and Private Costs of Regulations

The preparation, implementation, and monitoring of this or any federal action involves the expenditure of public and private resources which can be expressed as costs associated with the regulations. Estimated costs associated with this action include:

Council costs of document preparation, meetings, public hearings, and information dissemination______________________________$333,650

NMFS administrative costs of document preparation, meetings and review______$756,650

TOTAL______________________________$1.09 million

7.6 Determination of Significant Regulatory Action

Pursuant to E.O. 12866, a regulation is considered a "significant regulatory action" if it is likely to result in: (1) an annual effect of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities; (2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; (3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; or (4) raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this executive order. Based on the information provided above, this action has been determined to not be economically significant for the purposes of E.O. 12866.

Chapter 8. List of Preparers

List of personnel that assisted with development of the St. Thomas/St. John Fishery Management Plan and Environmental Assessment.

Table 8.1. List of interdisciplinary plan team members and other contributors.

Name	Agency	Title
Bill Arnold	NMFS/SFD	Caribbean Branch Chief / Fishery Biologist
María del Mar López	NMFS/SFD	IPT Co-lead / Fishery Biologist
Sarah Stephenson	NMFS/SFD	Fishery Biologist
Graciela García-Moliner	CFMC	IPT Co-lead / Fishery Biologist
Miguel Lugo	NMFS/SFD[71]	Fishery Biologist (Former IPT Co-lead)
Michael Jepson	NMFS/SFD	Anthropologist
David Dale	NMFS/HCD	EFH Specialist
Kate Quigley	CFMC[72]	Economist
Karla Gore	NMFS/SFD	Fishery Biologist
Denise Johnson	NMFS/SFD	Economist
Jennifer Lee	NMFS/PRD	Fishery Biologist
Patrick O'Pay	NMFS/PRD	Fishery Biologist
Michael Larkin	NMFS/SFD	Data Analyst
Shannon Cass-Calay	NMFS/SEFSC	Fishery Biologist
Jocelyn D'Ambrosio	NOAA/GC	Attorney
Iris Lowery	NOAA/GC	Attorney
Shepherd Grimes	NOAA/GC	Attorney
Adam Bailey	NMFS/SFD	Technical Writer
Jose Rivera	NMFS/HCD	EFH Specialist
Brent Stoffle	NMFS/SEFSC	Anthropologist
Lynn Rios	NOAA/OLE	Enforcement Officer
Noah Silverman	NMFS/SERO	Regional NEPA Coordinator
Nancie Cummings	NMFS/SEFSC	Biologist
Pace Wilber	NMFS	Habitat Specialist
Walter R Keithly	CFMC	Economist
Peggy Overbey	Contractor	Social Sciences
Adyan Rios	NMFS/SEFSC	Biologist
Skyler Sagarese	NMFS/SEFSC	Biologist

NMFS = National Marine Fisheries Service; CFMC = Caribbean Fishery Management Council;
SERO = Southeast Regional Office; SEFSC = Southeast Fisheries Science Center
SFD = Sustainable Fisheries Division; PRD = Protected Resources Division;
HCD = Habitat Conservation Division; GC = General Counsel; OLE= Office of Law Enforcement

[71] Currently at NOAA NMFS Seafood Inspection Program, Southeast Inspection Branch
[72] Currently at NOAA Office for Coastal Management, South Carolina

Chapter 9. List of Agencies, Organizations, and Persons Consulted

Department of Commerce Office of General Counsel
National Marine Fisheries Service Office of General Counsel
National Marine Fisheries Service Office of General Counsel Southeast Region
National Marine Fisheries Service Southeast Regional Office
National Marine Fisheries Service Southeast Fisheries Science Center
National Marine Fisheries Service Silver Spring Office
National Marine Fisheries Service Office of Law Enforcement Southeast Division
United States Coast Guard
United States Department of the Interior
U.S. Virgin Islands Department of Planning and Natural Resources
St. Thomas/St. John Environmental Quality Board

Chapter 10. References

Acosta, A., and A. Acevedo. 2006. Population structure and colony condition of *Dendrogyra cylindrus* (Anthozoa: Scleractinia) in Providencia Island, Columbian Caribbean. Proceedings of the 10th International Coral Reef Symposium, Okinawa, Japan 1605-1610.

Adey, W. H. 1978. Coral reef morphogenesis: A multidimensional model. Science 202(4370):831-837.

Armstrong A.O., A. J. Armstrong, F. R. A. Jaine, L.I.E. Couturier, K. Fiora, J. Uribe-Palomino, et al. 2016. Prey density threshold and tidal influence on reef manta ray foraging at an aggregation site on the Great Barrier Reef. PLoS ONE 11(5):e0153393. https://doi.org/10.1371/journal.pone.0153393

Appeldoorn, R. S., E. C. Gonzalez, R. Glazer, and M. Prada. 2011. Applying EBM to Queen conch fisheries in the Caribbean. In: Fanning, L., Mahon, R., McConney, P. (Eds.), Towards Ecosystem-Based Management in the Wider Caribbean. Amsterdam University Press, Amsterdam, pp. 177–186.

Backus, R. H., S. Springer, and E. L. Arnold. 1956. A contribution to the natural history of the white-tip shark, *Pterolamiops longimanus* (Poey). Deep Sea Research (1953) 3(3):178-188.

Bardach, J. E. 1958. On the movements of certain Bermuda reef fishes. Ecology 39(1):139-146.

Barnette, M. C. 2001. A review of fishing gear utilized within the Southeast Region and their potential impacts on essential fish habitat. NOAA Technical Memorandum NMFS SEFSC. 449 pp.

Baum, J., E. Medina, J. A. Musick, and M. Smale. 2006. *Carcharhinus longimanus*. 2011 IUCN Red List of Threatened Species. International Union for Conservation of Nature and Natural Resources.

Beets, J., and M. A. Hixon. 1994. Distribution, persistence, and growth of groupers (Pisces: Serranidae) on artificial and natural patch reefs in the Virgin Islands. Bulletin of Marine Science (55):470-483.

Bonfil, R., S. Clarke, and H. Nakano. 2008. The biology and ecology of the oceanic whitetip shark, *Carcharhinus longimanus*. Pages 128-139 in T.J. Pitcher, editor. Sharks of the open ocean: biology, fisheries, and conservation. Blackwell Publishing, Oxford, UK.

Bost, C. A., C. Cotte, F. Bailleul, Y. Cherel, J. B. Charrassin, C. Guinet, D. G. Ainley, and H. Weimerskirch. 2009. The importance of oceanographic fronts to marine birds and mammals of the southern oceans. Journal of Marine Systems 78(3):363-376.

Branstetter, S. 1987. Age, growth and reproductive biology of the silky shark, *Carcharhinus falciformis*, and the scalloped hammerhead, *Sphyrna lewini*, from the northwestern Gulf of Mexico. Environmental Biology of Fishes 19(3):161-173.

Brown-Peterson, N. J., J. S. Franks, and A.M. Burke. 2000. Preliminary observations on the reproductive biology of wahoo, *Acanthocybium solandri*, from the northern Gulf of Mexico and Bimini, Bahamas. Proceedings of the Gulf and Caribbean Fisheries Institute 51:414–427.

Bruckner, A. W., and R. L. Hill. 2009. Ten years of change to coral communities off Mona and Desecheo Islands, Puerto Rico, from disease and bleaching. Diseases of Aquatic Organisms 87(1-2):19-31.

Budd, A. F., H. Fukami, N. D. Smith, and N. Knowlton. 2012. Taxonomic classification of the reef coral family Mussidae (Cnidaria: Anthozoa: Scleractinia). Zoological Journal of the Linnean Society 166(3):465-529.

Bush, P. G., G. C. Ebanks, and E. D. Lane. 1996. Validation of the ageing technique for the Nassau grouper (*Epinephelus striatus*) in the Cayman Islands. Biology, Fisheries and Culture of Tropical Groupers and Snappers:449.

Cairns, S. D. 1982. Stony corals (Cnidaria: Hydrozoa, Scleractinia) of Carrie Bow Cay, Belize. Pages 271-302 in K. Rützler, and I. G. Macintyre, editors. The Atlantic Barrier Reef Ecosystem at Carrie Bow Cay, Belize, I. Structure and Communities , volume 1. Smithsonian Institution Press, Washington, DC, USA.

Carballo, J. L., C. Olabarria, and T. G. Osuna. 2002. Analysis of four macroalgal assemblages along the Pacific Mexican coast during and after the 1997-98 El Niño. Ecosystems 5(8):749-760.

Carter, J., G. J. Marrow, and V. Pryor. 1994. Aspects of the ecology and reproduction of Nassau grouper, *Epinephelus striatus*, off the coast of Belize, Central America. Pages 65-111 in Proceedings of the Gulf and Caribbean Fisheries Institute. Gulf and Caribbean Fisheries Institute.

Carter, L. M., J. W. Jones, L. Berry, V. Burkett, J. F. Murley, J. Obeysekera, P. J. Schramm, and D. Wear. 2014. Ch. 17: Southeast and the Caribbean. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 396-417.

Cass-Calay, S. L., W. S. Arnold, M. D. Bryan, and J. Shull. 2016. Report of the U.S. Caribbean Fishery-Independent Survey Workshop. NOAA Technical Memorandum NMFS-SEFSC-688, 128 p. doi: 10.7289/V5XS5SFN.

Catanzaro, D., C. S. Rogers, Z. HIllis-Starr, R. S. Nemeth, and M. Taylor. 2002. Status of Coral Reefs of the U.S. Virgin Islands. pp. 131-150. In: D.D. Turgeon, R.G. Asch, B.D. Causey, R.E. Dodge, W. Jaap, K. Banks, J. Delaney, B.D. Keller, R. Speiler, C.A. Mato, J.R. Garcia, E. Diaz, D. Catanzaro, C.S. Rogers, Z. Hillis-Starr, R.S. Nemeth, M. Taylor, G.P. Schmahl, M.W. Miller, D.A. Gulko, J.E. Maragos, A. Friedlander, C.L. Hunter, R.S. Brainard, R. Craig, R.H. Richmond, G. Davis, J. Starmer, M. Trianni, R. Houk, C.E. Birkeland, A. Edward, Y. Golbuu, J. Gutierrez, N. Idechong, G. Paulay, A. Tafileichig, and N.V. Velde (eds.). The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States: 2002. NOAA/NOS/NCCOS. Silver Spring, MD. 265 pp.

Cayré, P. 1991. Behaviour of yellowfin tuna (*Thunnus albacares*) and skipjack tuna (*Katsuwunus pelamis*) around fish aggregating devices (FADs) in the Comoros Islands as determined by ultrasonic tagging. Aquatic Living Resources 4:1-12.

Cetacean and Turtle Assessment Program. 1982. A characterization of marine mammals and turtles in the mid- and north-Atlantic areas of the U.S. Outer Continental Shelf. Cetacean and Turtle Assessment Program, Bureau of Land Management, BLM/YL/TR-82/03, Washington, D.C. 538 p.

CFMC (Caribbean Fishery Management Council). 1981. Fishery management plan, final environmental impact statement, and regulatory impact review for the spiny lobster fishery of Puerto Rico and the U.S. Virgin Islands. Caribbean Fishery Management Council, San Juan, Puerto Rico.

CFMC (Caribbean Fishery Management Council). 1985. Fishery management plan, final environmental impact statement, and draft regulatory impact review for the shallow-water reef fish fishery of Puerto Rico and the U.S. Virgin Islands. Caribbean Fishery Management Council, San Juan, Puerto Rico. 69pp. + Appendices.

CFMC (Caribbean Fishery Management Council). 1995. Fishery management plan, final environmental impact statement, and regulatory impact review for corals and reef associated plants and invertebrates of Puerto Rico and the United States Virgin Islands.

CFMC (Caribbean Fishery Management Council). 1996. Fishery Management Plan, Regulatory Impact Review and Final Environmental Impact Statement for the Queen Conch Resources of Puerto Rico and the U. S. Virgin Islands. 56 pp.

CFMC (Caribbean Fishery Management Council). 2004. Final environmental impact statement for the generic essential fish habitat amendment to: Spiny lobster Fishery Management Plan (FMP), Queen Conch FMP, Reef Fish FMP, and Coral FMP for the U.S. Caribbean, Vols. I and II. Caribbean Fishery Management Council, San Juan, Puerto Rico.

CFMC (Caribbean Fishery Management Council). 2005. Comprehensive amendment to the fishery management plans (FMPs) of the U.S. Caribbean to address required provisions of the Magnuson-Stevens Fishery Conservation and Management Act (Sustainable Fisheries Act Amendment). Caribbean Fishery Management Council, San Juan, Puerto Rico. 533 pp + Appendices.

CFMC (Caribbean Fishery Management Council). 2011a. Amendment 2 to the Fishery Management Plan for the Queen Conch Fishery of Puerto Rico and the U.S. Virgin Islands and Amendment 5 to the Reef Fish Fishery Management Plan of Puerto Rico and the U.S. Virgin Islands. Caribbean Fishery Management Council, San Juan, Puerto Rico. September 22, 2011. 523 pp + Appendices.

CFMC (Caribbean Fishery Management Council). 2011b. Comprehensive Annual Catch Limit (ACL) Amendment for the Fishery Management Plans of the U.S. Caribbean. Caribbean Fishery Management Council, San Juan, Puerto Rico. October 25, 2011. 407 pp.

CFMC (Caribbean Fishery Management Council) 2011c. Five -Year review of Essential Fish Habitat in the U.S. Caribbean. Vols. 1, 2. Caribbean Fishery Management Council, San Juan, Puerto Rico.

CFMC (Caribbean Fishery Management Council). 2013a. Amendment 4 to the Fishery Management Plan for Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the U.S. Virgin Islands: Seagrass Management. Including Final Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility Act Analysis. Caribbean Fishery Management Council, San Juan, Puerto Rico. 88 pp.

CFMC (Caribbean Fishery Management Council). 2013b. Regulatory 2 to the Fishery Management Plan for the Queen Conch Resources of Puerto Rico and the U.S. Virgin Islands: Compatibility of Trip and Bag Limits in the Management Area of St. Croix, U.S. Virgin Islands. Including Final Environmental Assessment, Regulatory Impact Review, and Regulatory

Flexibility Act Analysis. Caribbean Fishery Management Council, San Juan, Puerto Rico. 133 pp.

CFMC (Caribbean Fishery Management Council). 2013c. Regulatory Amendment 4 to the Fishery Management Plan for the Reef Fish Resources of Puerto Rico and the U.S. Virgin Islands: Parrotfish Minimum Size Limits. Including Final Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility Act Analysis. Caribbean Fishery Management Council, San Juan, Puerto Rico. 188 pp.

CFMC (Caribbean Fishery Management Council). 2016. Comprehensive Amendment to the U.S. Caribbean Fishery Management Plans: Application of Accountability Measures. Including Final Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility Act Analysis. Caribbean Fishery Management Council, San Juan, Puerto Rico. 122 pp.

CFMC (Caribbean Fishery Management Council). 2017. Amendments to the U.S. Caribbean Reef Fish, Spiny Lobster, and Corals and Reef Associated Plants and Invertebrates Fishery Management Plans: Timing of Accountability Measure-Based Closures. Including Final Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility Act Analysis. Caribbean Fishery Management Council, San Juan, Puerto Rico. 170 pp.

Chakalall, B., R. Mahon, and P. McConney. 1998. Current issues in fisheries governance in the Caribbean Community (CARICOM). Marine Policy 22(1)29-44. https://doi.org/10.1016/S0308-597X(97)80002-4

Chapple, T. K. and Botsford, L.W. 2013. A comparison of linear demographic models and fraction of lifetime egg production for assessing sustainability in sharks. Conservation Biology: the Journal of the Society for Conservation Biology 27:560-568.

Christensen, I., T. Haug, and N. Øien. 1992. A review of feeding and reproduction in large baleen whales (Mysticeti) and sperm whales (Physeter macrocephalus) in Norwegian and adjacent waters. Fauna Norvegica Series A 13:39-48.

CITES. 2013. Consideration of proposals for amendment of Appendices I and II: Manta Rays. Sixteenth meeting of the Conference of the Parties. Bangkok, Thailand, March 3-14.

Clark, T. B. 2010. Abundance, home range, and movement patterns of manta rays (*Manta alfredi, M. birostris*) in Hawai'i. Zoology, Manoa, Hawaii.

Climate Change. 2007. Synthesis Report, Summary for Policy Makers, page 9. Approved in detail at IPCC Plenary XXVII, Valencia, Spain, 12-17 November 2007.

Colburn, L. L. and M. Jepson. 2012. Social Indicators of Gentrification Pressure in Fishing Communities: A Context for Social Impact Assessment. Coastal Management 40: 289-300.

Coleman, F. C. and S. L. Williams. 2002. Overexploiting marine ecosystem engineers: potential consequences for biodiversity. Trends Ecol. Evol. (Amst.),17:40-44.

Colin, P. L., D. Y. Shapiro, and D. Weiler. 1987. Preliminary investigations of reproduction of two species of groupers. Bulletin of Marine Science 40(2):220-230.

Colin, P. L. 1992. Reproduction of the Nassau grouper, *Epinephelus striatus* (Pisces: Serranidae) and its relationship to environmental conditions. Environmental Biology of Fishes 34:357-377.

Colin, P. L., W. A. Laroche, and E. B. Brothers. 1997. Ingress and settlement in the Nassau grouper, *Epinephelus striatus* (Pisces: Serranidae), with relationship to spawning occurrence. Bulletin of Marine Science 60(3):656-667.

Committee on the Status of Endangered Wildlife in Canada. 2003. COSEWIC assessment and status report on the sei whale *Balaenoptera borealis* (Pacific population, Atlantic population) in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, Canada. vii + 27.

Compagno, L. J. V. 1984. Part 2. Carcharhiniformes. Pages 251-655 in FAO Species Catalogue. Sharks of the World. An Annotated and Illustrated Catalogue of Sharks Species Known to Date, volume 4. FAO.

Cooley, S. R. and S. C. Doney. 2009. Anticipating ocean acidification's economic consequences on commercial fisheries. Environmental Research Letters Vol. 4 (2).

Cortés, E., F. Arocha, L. Beerkircher, F. Carvalho, A. Domingo, M. Heupel, H. Holtzhausen, M. N. Santos, M. Ribera, and C. Simpfendorfer. 2012. Ecological risk assessment of pelagic sharks caught in Atlantic pelagic longline fisheries. Aquat. Living Resour. 23:25-34.
doi: 10.1051/alr/2009044

Couturier, L. I., A. D. Marshall, F. R. Jaine, T. Kashiwagi T, S. J. Pierce, K. A. Townsend, S. J. Weeks, M. B. Bennett, and A. J. Richardson. 2012. Biology, ecology and conservation of the Mobulidae. Journal of Fish Biology 80:1075-1119. doi 10.1111/j.1095-8649.2012.03264.x

Crosson, S. 2018. Hurricanes Irma and Maria Damage Assessment: Provisional Results for the U.S. Virgin Islands Commercial and For-Hire Fisheries (60-day Interim Report; Department of

Planning and Natural Resources, Division of Fish and Wildlife with the assistance of the National Oceanic and Atmospheric Administration).

Crosson, S. and L. Hibbert. 2017. Integrating Commercial Fisheries Registration, Education, and Social Science in the U.S. Virgin Islands, North American Journal of Fisheries Management, 37(2):349-352.

Cruz-Piñón, G., J. P. Carricart-Ganivet, and J. Espinoza-Avalos. 2003. Monthly skeletal extension rates of the hermatypic corals *Montastraea annularis* and *Montastraea faveolata*: Biological and environmental controls. Marine Biology 143(3):491-500.

DeAlteris, J., L. Skrobe, and C. Lipsky. 1999. The significance of seabed disturbance by mobile fishing gear relative to natural processes: a case study in Narragansett Bay, Rhode Island. pp. 224-237 in L. Beneka (editor), Fish Habitat: Essential Fish Habitat and Rehabilitation, American Fisheries Society, Symposium 22, Bethesda, Maryland.

De Boer, M. N., J. T. Saulino, T. P. Lewis, and G. Notarbartolo-Di-Sciara. 2015. New records of whale shark (*Rhincodon typus*), giant manta ray (*Manta birostris*) and Chilean devil ray (*Mobula tarapacana*) for Suriname. Marine Biodiversity Records 8: N.PAG-00. doi 10.1017/S1755267214001432

DPNR (Department of Planning and Natural Resources). 2005. United States Virgin Islands Marine Resources And Fisheries Strategic And Comprehensive Conservation Plan. 567 pp.

DPNR. 2019. United States Virgin Islands, Commercial & recreational fishers' information handbook. Division of Fish and Wildlife.

DOC (Department of Commerce). 2009. CZMA Federal Consistency Overview. Section 307 of the Coastal Zone Management Act of 1972.

Duffy, C. A. J., and D. Abbott. 2003. Sightings of mobulid rays from northern New Zealand, with confirmation of the occurrence of Manta birostris in New Zealand waters. New Zealand Journal of Marine and Freshwater Research 37: 715-721.

Eastern Caribbean Center. 2002. Telephone Survey of Boat-based Marine recreational fishing in the U.S. Virgin Islands, 2000. Report submitted to Division of Fish and Wildlife, Department of Planning and Natural Resources, Eastern Caribbean Center, University of Virgin Islands, St. Thomas.

Eckert, S. A., D. Nellis, D. W. Eckert, K. L. Kooyman, G. L. 1986. Diving patterns of two leatherback sea turtles (*Dermochelys coriacea*) during internesting intervals at Sandy Point, St. Croix, U.S. Virgin Islands. Herpetologica 42(3):381-388.

Eckert, K. L., S. A. Eckert, T. W. Adams, and A. D. Tucker. 1989. Inter-nesting migrations by leatherback sea turtles (*Dermochelys coriacea*) in the West Indies. Herpetologica 45(2):190-194.

EPA. 2005. Reviewing Environmental Impact Statements for Fishery Management Plans. Final Guidance. https://www.epa.gov/sites/production/files/2014-08/documents/reviewing-eiss-fishery-management-plans-pg.pdf.

Feingold, S. J. 2014. An Ethnographic Analysis on the Effects of the Closure of HOVENSA Oil Refinery on the Commercial Fishing Community on St. Croix, U.S.V.I. 123 pp. Coral Gables, FL: University of Miami.

Fiedler, H. and M. P. Jarvis. 1932. Fisheries of the Virgin Islands of the United States. U.S. Department of Commerce, Bureau of Fisheries. Investigational Report No. 14.

Fine, J. C. 1990. Groupers in love: spawning aggregations of Nassau groupers in Honduras. Pages 42-45 in Sea Frontiers.

Fine J.C. 1992. Greedy for Groupers. Wildlife Conservation. May/June 1992:1-5

Fleming, C. S., A. Armentrout, and S. Crosson. 2017. Economic Survey Results for United States Virgin Islands Commercial Fisheries. NOAA Technical Memorandum NMFS-SEFSC-718.

FCCA (Florida-Caribbean Cruise Association). 2015a. Economic Contribution of Cruise Tourism to the Destination Economies, Volume 1.

FCCA (Florida-Caribbean Cruise Association). 2015b. Economic Contribution of Cruise Tourism to the Destination Economies, Volume 2.

Freedman R. and S. Roy. 2012. Spatial patterning of *Manta birostris* in United States east coast offshore habitat. Applied Geography 32:652-659.

Frick, J. 1976. Orientation and behaviour of hatchling green turtles (Chelonia mydas) in the sea. Animal Behaviour 24(4):849-857.

GAO (Government Accountability Office). October 2017. U.S. Territories Public Debt Outlook. GAO-18-160. Obtained online on October 1, 2018, at https://www.gao.gov/assets/690/687545.pdf.

Gabriel, I., and P. M. Mace. 1999. A review of biological reference points in the context of the precautionary approach. Proceedings of the 5th National NMFS Stock Assessment Workshop. NOAA Tech. Memo. NMFS-F/SPO-40. https://www.st.nmfs.noaa.gov/Assets/stock/documents/workshops/nsaw_5/gabriel_.pdf

García-Sais, J. R., R. Castro, J. Sabater, and M. Carlo. 2005. Inventory and atlas of corals and coral reefs, with emphasis on deepwater coral reefs from the U.S. Caribbean EEZ (Puerto Rico and the United States Virgin Islands). Final Report submitted to the Caribbean Fishery Management Council. San Juan, PR. 215 pp.

Goenaga, C. and R. H. Boulon, Jr. 1992. The State of Puerto Rican and U.S. Virgin Islands Corals. Caribbean Fishery Management Council, Hato Rey, Puerto Rico. 66 pp.

Goreau, T. F., and J. W. Wells. 1967. The shallow-water Scleractinia of Jamaica: revised list of species and their vertical distribution range. Bulletin of Marine Science 17(2):442-453.

Goreau, T. F., and N. I. Goreau. 1973. The ecology of Jamaican coral reefs. II. Geomorphology, zonation, and sedimentary phases. Bulletin of Marine Science 23:399-464.

Graham, R. T., S. S. Witt, D. W. Castellanos, F. Remolina, S. Maxwell, B. J. Godley, and L. A. Hawkes. 2012. Satellite tracking of manta rays highlights challenges to their conservation. PLoS One 7, e36834.

Griffith, D., M. Valdés-Pizzini, and C. Garcia-Quijano. 2007. Entangled Communities: Socio-economic Profiles of Fishermen, Their Communities and Their Responses to Marine Protective Measures in Puerto Rico. NOAA Series on U.S. Caribbean Fishing Communities, NMFS-SEFSC-556.

Gudger, E. W. 1922. The most northerly record of the capture in Atlantic waters of the United States of the giant ray, *Manta birostris*. The Science Press, pp 338. http://www.library.ohiou.edu/ezpauth/redir/athens.php?http%3a%2f%2fsearch.ebscohost.com%2flogin.aspx%3fdirect%3dtrue%26db%3dedsjsr%26AN%3dedsjsr.1644731%26site%3deds-live%26scope%3dsite

Hamilton, A. N., Jr. 2000. Gear impacts on essential fish habitat in the Southeastern region. United States Department of Commerce, Southeast Fisheries Science Center, Pascagoula Facility. (unpublished report)

Heemstra, P. C., and J.E. Randall. 1993. Groupers of the world (Family Serranidae, Subfamily Epinephelinae). An annotated and illustrated catalogue of the grouper, rockcod, hind, coral grouper and lyretail species known to date. FAO, editor FAO Fisheries Synopsis. FAO, Rome.

Hemphill, A. H. 2005. Conservation on the High Seas – drift algae habitat as an open ocean cornerstone. Parks Vol 15 No 3 High Seas Marine Protected Areas, 48-56.

Hinojosa-Alvarez, S., R. P. Walter, P. Diaz-Jaimes, F. Galván-Magaña, E. M. Paig-Tran. 2016. A potential third manta ray species near the Yucatán Peninsula? Evidence for a recently diverged and novel genetic Manta group from the Gulf of Mexico. PeerJ 4: e2586 doi 10.7717/peerj.2586

Hjort, J., and J. T. Ruud. 1929. Whaling and fishing in the North Atlantic. Rapports Et Proces-Verbaux Des Reunions Conseil International Pour L'Exploration de la Mer 56:1-123.

IAI (Impact Assessment Inc.). 2007. Community Profiles and Socio-economic Evaluation of Marine Conservation Districts: St. Thomas and St. John, U.S. Virgin Islands. NOAA Technical Report/Memorandum, NMFS-SEFSC-557.

Jennings, C. A. 1992. Survey of Non-Charter Boat Recreational Fishing in the US Virgin Islands. Bulletin of Marine Science 50(2): 342-351.

Johnston, B. 1987. The Political Ecology of Development: Changing Resource Relations and the Impacts of Tourism in St. Thomas, U.S.V.I. Dissertation. University of Massachusetts: Amherst.

Jorgensen, S. J., A. P. Klimley, and A. F. Muhlia-Melo. 2009. Scalloped hammerhead shark *Sphyrna lewini*, utilizes deep-water, hypoxic zone in the Gulf of California. Journal of Fish Biology 74(7):1682-1687.

Kadison, E., M. Brandt, R. Nemeth, J. Martens, J. Blondeau, and T. Smith. 2017. Abundance of commercially important reef fish indicates different levels of over-exploitation across shelves of the U. S. Virgin Islands. PLoS ONE 12(7): e0180063. https://doi.org/10.1371/journal.pone.0180063

Kashiwagi, T., T. Ito, and F. Sato. 2010. Occurrences of reef manta ray, *Manta alfredi*, and giant manta ray, *M. birostris*. Japan, examined by photographic records Report of Japanese Society for Elasmobranch Studies 46:20-27.

Kashiwagi, T., A. D. Marshall, M. B. Bennett, and J. R. Ovenden. 2011. Habitat segregation and mosaic sympatry of the two species of manta ray in the Indian and Pacific Oceans: *Manta alfredi* and *M. birostris*—CORRIGENDUM. Marine Biodiversity Records 4:e86

Keinath, J. A., and J. A. Musick. 1993. Movements and diving behavior of a leatherback turtle, *Dermochelys coriacea*. Copeia 1993(4):1010-1017.

Kendall, M. S., M. E. Monaco, K. R. Buja, J. D. Christensen, C. R. Kruer, M. Finkbeiner, and R. A. Warner. 2001. Methods used to map the benthic habitats of Puerto Rico and the U.S. Virgin Islands.

Kjerfve, B. 1981. Tides of the Caribbean Sea. J. Geophys. Res. 86:4243-4247.

Klimley, A. P. 1993. Highly directional swimming by scalloped hammerhead sharks, Sphyrna lewini, and subsurface irradiance, temperature, bathymetry, and geomagnetic field. Marine Biology 117(1):1-22.

Kojis, B. 2004. Census of the Marine Commercial Fishermen of the United States Virgin Islands. USVI Department of Planning and Natural Resources, Division of Fish and Wildlife. Submitted to Caribbean Fishery Management Council, San Juan, Puerto Rico.

Kojis, B. and N. J. Quinn. 2011. Census of the marine commercial fishermen of the U.S. Virgin Islands (pp. 126): Department of Planning and Natural Resources, Division of Fish and Wildlife, US Virgin Islands.

Kojis, B., N. Quinn, and J. Agar. 2017. Census of licensed commercial fishermen of the U.S. Virgin Islands (2016). NOAA Technical Memorandum NMFS-SEFSC-715, 160 p. doi:10.7289/V5/TM-SEFSC-715

León, Y. M., and C. E. Diez. 2000. Ecology and population biology of hawksbill turtles at a Caribbean feeding ground. Pages 32-33 in F. A. Abreu-Grobois, R. Briseño-Dueñas, R. Márquez-Millán, and L. Sarti-Martinez, editors. Eighteenth International Sea Turtle Symposium. U.S. Department of Commerce, Mazatlán, Sinaloa, México.

Lessa, R., F. M. Santana, and R. Paglerani. 1999. Age, growth and stock structure of the oceanic whitetip shark, *Carcharhinus longimanus*, from the southwestern equatorial Atlantic. Fisheries Research 42:21-30.

Liu, K. M., and C. T. Chen. 1999. Demographic analysis of the scalloped hammerhead, *Sphyrna lewini*, in the northwestern Pacific. Fisheries Science 65(2):218-223.

Lorde, T., C. Gomes, D. Alleyne, and W. Phillips. 2013. An Assessment of the Economic and Social Impacts of Climate Change on the Coastal and Marine Sector in the Caribbean (United Nations, 2013). 41 pp.

Luckhurst, B. E. and K. Luckhurst. 1978. Analysis of the infuence of substrate variables on coral reef fsh communities. Mar Biol 49:317–323. https://doi.org/10.1007/BF00455026

Madin, K. 2010. Ocean acidification: a risky shell game. How will climate change affect the shells and skeletons of sea life? Oceanus Magazine Vol. 48, No. 1, Jun. 2010. Woods Hole Oceanographic Institution. https://www.whoi.edu/oceanus/feature/ocean-acidification--a-risky-shell-game.

Magnuson-Stevens Act, Magnuson-Stevens Fishery Conservation and Management Act, P.L. 94-265 as amended P.L. 109-479. U.S. Department of Commerce, NOAA, NMFS May 2007.

Manooch, C. S., III, D. L. Mason, and R. S. Nelson. 1984. Food and gastrointestinal parasites of dolphin *Coryphaena hippurus* collected along the southeastern and Gulf coasts of the United States. Bulletin of the Japanese Society for the Science of Fish 50:1511–1525.

Marsac F., P. Cayré, and F. Conand. 1995. Analysis of small-scale movements of yellowfin tuna around fish aggregating devices (FADs) using sonic tagging. Expert Consultation on Indian Ocean Tunas, 6th Session, Colombo, Sri Lanka, September 1995, TWS/95/2110, 20 p.

Marshall A.D., Compagno L.J., Bennett M.B. 2009. Redescription of the genus Manta with resurrection of *Manta alfredi* (Krefft, 1868) (Chondrichthyes; Myliobatoidei; Mobulidae). Zootaxa 2301: 1-28.

Marshall, A., M. B. Bennett, G. Kodja, S. Hinojosa-Alvarez, F. Galvan-Magana, M. Harding, G.Stevens, T. Kashiwagi. 2011. *Manta birostris* The IUCN Red List of Threatened Species. www.iucnredlist.org

Martin, A. R. 1983. The sei whale off Western Iceland. I. Size, distribution and abundance. (*Balaenoptera borealis*). Report of the International Whaling Commission 33:457-463.

Mateo, I. 2004. Survey of Resident Participation in Recreational Fisheries Activities in the U.S. Virgin Islands. Gulf and Caribbean Fisheries Institute 55:205-222.

Matos-Caraballo, D. and J. Agar. 2011. Census of Active Commercial Fishermen in Puerto Rico: 2008. Marine Fisheries Review 73(1):13-27.

Mayor, P. A., B. Phillips, and Z. M. Hillis-Starr. 1998. Results of the stomach content analysis on the juvenile hawksbill turtles of Buck Island Reef National Monument, U.S.V.I. Pages 230-233 in S. P. Epperly and J. Braun, editors. Seventeenth Annual Sea Turtle Symposium.

McClane, A. J. (ed.). 1974. McClane's new standard fishing encyclopedia and international angling guide. New York: Holt, Rhinehart and Winston.

Meylan, A. 1988. Spongivory in hawksbill turtles: A diet of glass. Science 239(4838):393-395.

Mignucci-Giannoni, A. A. 1998. Analysis of marine mammal strandings in Puerto Rico and the Virgin Islands. Pages 91-92 in The World Marine Mammal Science Conference, Monaco.

Miller, S. L., M. Chiappone, L. M. Rutten, and D. W. Swanson. 2008. Population status of Acropora corals in the Florida Keys. Proceedings of the 11th International Coral Reef Symposium: 775-779.

Miller, M.H. and C. Klimovich. 2017. Endangered Species Act Status Review Report: Giant Manta Ray (*Manta birostris*) and Reef Manta Ray (*Manta alfredi*). Report to National Marine Fisheries Service, Office of Protected Resources, Silver Spring, MD. September 2017. 128 pp.

Mitchell, E. 1975a. Trophic relationships and competition for food in northwest Atlantic right whales. Proceedings of the Canadian Society of Zoology Annual Meeting 1974:123-133.

Mitchell, E. 1975b. Preliminary report on Nova Scotia fishery for sei whales (*Balaenoptera borealis*). Report of the International Whaling Commission 25:218-225.

Mitchell, E. D., V. M. Kozicki, and R. R. Reeves. 1986. Sightings of right whales, *Eubalaena glacialis*, on the Scotian Shelf, 1966-1972. Report of the International Whaling Commission Special Issue SC/35/RW18 10:83-107.

Moore, A. B. M. 2012. Records of poorly known batoid fishes from the north-western Indian Ocean (Chondrichthyes: Rhynchobatidae, Rhinobatidae, Dasyatidae, Mobulidae). African Journal of Marine Science 34:297-301 doi 10.2989/1814232X.2012.675129

Morales Tirado, J. A. 2006. Sexual reproduction in the Caribbean coral genus Mycetophyllia, in La Parguera, Puerto Rico. Master's thesis. University of Puerto Rico, Mayaguez. https://www.aoml.noaa.gov/general/lib/CREWS/Cleo/PuertoRico/prpdfs/morales-sexual.pdf

Morgan, L. E. and R. Chuenpagdee. 2003. Shifting gears: addressing the collateral impacts of fishing methods in U.S. waters. Washington. 42 pp.

Mumby, P. J., C. P. Dahlgren, A. R. Harborne, C. V. Kappel, F. Micheli, D. R. Brumbaugh, K. E. Holmes, J. M. Mendes, K. Broad, J. N. Sanchirico, K. Buch, S. Box, R. W. Stoffle, and A. B. Gill. 2006. Fishing, trophic cascades, and the process of grazing on coral reefs. Science 311:98-101.

Murawski, S. A., and G. C. Matlock (editors). 2006. Ecosystem science capabilities required to support NOAA's mission in the year 2020, U.S. Dept. of Commerce, NOAA Tech. Memo. F/SPO-74, 97 p.

Musick, J. A. and C. J. Limpus. 1997. Habitat utilization and migration in juvenile sea turtles. Pages 137-163 in P. L. Lutz, and J. A. Musick, editors. The Biology of Sea Turtles. CRC Press, New York, New York.

Nasu, K. 1966. Fishery oceanographic study on the baleen whaling grounds. Scientific Reports of the Whales Research Institute Tokyo 20:157-210.

Nemeth, R. S., T. B. Smith, J. Blondeau, E. Kadison, J. M. Calnan, and J. Gass. 2008. Characterization of deep water reef communities within the Marine Conservation District, St. Thomas, US Virgin Islands. Final report submitted to the Caribbean Fisheries Management Council.

Nemoto, T., and A. Kawamura. 1977. Characteristics of food habits and distribution of baleen whales with special reference to the abundance of North Pacific sei and Bryde's whales. Report of the International Whaling Commission (Special Issue 1):80-87.

NMFS (National Marine Fisheries Service). 2010. Recovery plan for the sperm whale (*Physeter macrocephalus*). National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Silver Spring, Maryland.

NMFS (National Marine Fisheries Service). 2011a. Endangered Species Act – Section 7 Consultation on the Continued Authorization of Reef Fish Fishing Managed under the Reef Fish Fishery Management Plan (FMP) of Puerto Rico and the U.S. Virgin Islands (CRFFMP). Biological Opinion, October 4. 260 pp.

NMFS (National Marine Fisheries Service). 2011b. Endangered Species Act – Section 7 Consultation Continued Authorization of Spiny Lobster Fishing Managed under the Spiny

Lobster Fishery Management Plan of Puerto Rico and the U.S. Virgin Islands (SLFMP). Biological Opinion, December 12. 182 pp.

NMFS (National Marine Fisheries Service). 2012. Amendment 4 to the 2006 Consolidated Highly Migratory Species Fishery Management Plan: Caribbean Fishery Management Measures, including Final Environmental Assessment.

NMFS (National Marine Fisheries Service). 2014. Environmental assessment for the development of island-based fishery management plans in the U.S. Caribbean- Transition from U.S. Caribbean-wide FMPs to island-Based FMPs. November 2014.

NMFS (National Marine Fisheries Service). 2017. Fisheries of the United States, 2016. U.S. Department of Commerce, NOAA Current Fishery Statistics No. 2016. Available at: https://www.fisheries.noaa.gov/resource/document/fisheries-united-states-2016-report

NMFS (National Marine Fisheries Service) and USFWS (U.S. Fish and Wildlife Service). 2007. Green Sea Turtle (*Chelonia mydas*) 5-year review: Summary and Evaluation. National Marine Fisheries Service, Silver Spring, Maryland.

North Carolina Division of Marine Fisheries. 1999. Shrimp and crab trawling in North Carolina's estuarine waters. North Carolina Department of Environment and Natural Resources, Morehead City, NC. 121 pp.

Olcott, P.G. 1999. Puerto Rico and the U.S. Virgin Islands. In Ground Water Atlas of the United States, Alaska, Hawaii, Puerto Rico and the U.S. Virgin Islands. USGS Rep. HA 730-N.

Olsen, D. A. and J. A. LaPlace. 1979. A study of Virgin Islands grouper fishery based on a breeding aggregation. Proceedings of the Gulf and Caribbean Fisheries Institute 31:130-144.

Olsen, D. A., D. W. Nellis, and R. S. Wood. 1984. Ciguatera in the eastern Caribbean. Mar Fish Rev 46:13–18.

Olsen, E., W. P. Budgell, E. Head, L. Kleivane, L. Nottestad, R. Prieto, M. A. Silva, H. Skov, G. Vikingsson, G. Waring, and N. Oien. 2009. First satellite-tracked long-distance movement of a sei whale (*Balaenoptera borealis*) in the North Atlantic. Aquatic Mammals 35(3):313-318.

Osgood, K. E. (editor). 2008. Climate Impacts on U.S. Living Marine Resources: National Marine Fisheries Service Concerns, Activities and Needs. U.S. Dep. Commerce, NOAA Tech. Memo. NMFSF/SPO-89, 118 p.

Overbey, M. 2016. Fisheries of St. Thomas and St. John: A profile of the social, cultural and economic environment. A report by Mary M. Overbey to ECS Federal, Inc. and NMFS SERO Social Science Branch, October 2016.

Oxenford, H. A., and W. Hunte. 1999. Feeding habits of the dolphinfish (*Coryphaena hippurus*) in the eastern Caribbean. Scientia Marina 63(3-4):303-315.

Palko, B. J, G. L. Beardsley, and W. J. Richards. 1982. Synopsis of the biological data on dolphinfishes, *Coryphaena hippurus* Linnaeus and *Coryphaena equiselis* Linnaeus. NOAA Tech. Rep., NMFS Circ., 443, 28 p.

Patrick, W. S., P. Spencer, O. Ormseth, J. Cope, J. Field, D. Kobayashi, T. Gedamke, E. Cortés, K. Bigelow, W. Overholtz, J. Link, and P. Lawson. 2009. Use of productivity and susceptibly indices to determine stock vulnerability, with example applications to six U.S. fisheries. NOAA Tech. Memo. NMFSF/SPO-101, 90 p.

Piercy, A. N., J. K. Carlson, J. A. Sulikowski, and G. Burgess. 2007. Age and growth of the scalloped hammerhead shark, *Sphyrna lewini*, in the north-west Atlantic Ocean and Gulf of Mexico. Marine and Freshwater Research 58:34-40.

Prena, J., P. Schwinghamer, T. W. Rowell, D. C. Gordon, Jr., K. D. Gilkinson, W .P. Vass, and D. L. McKeown. 1999. Experimental otter trawling on a sandy bottom ecosystem of the Grand Banks of Newfoundland: analysis of trawl bycatch and effect on epifauna. Marine Ecology Progress Series 181:107-124.

Randall, J. E. 1967. Food habits of reef fishes of the West Indies. Studies in Tropical Oceanography, Miami 5:665–847.

Rebel, T. P. 1974. Sea Turtles and the Turtle Industry of the West Indies, Florida and the Gulf of Mexico. University of Miami Press, Coral Gables, Florida.

Rester, J. K. 2000. Annotated bibliography of fishing impacts on habitat. Gulf States Marine Fisheries Commission. Number 73. Ocean Springs, Mississippi. 168 pp.

Rodrigues, J., D. Freitas, Í. Fernandes, and R. Lessa. 2015. Estrutura populacional do tubarao estrangeiro (*Carcharhinus longimanus*) no Atlantico Sul. 3.

Rogers, C. S., T. H. Suchanek, and F. A. Pecora. 1982. Effects of hurricanes David and Frederic (1979) on shallow Acropora palmata reef communities: St. Croix, U.S. Virgin Islands. Bulletin of Marine Science 32(2):532-548.

Rogers, C. S., L. N. McLain, and C. R. Tobias. 1991. Effects of Hurricane Hugo (1989) on a coral reef in St. John, USVI. Mar Ecol Prog Ser 78:189–199.

Rogers, C. S., V. Garrison, and R. Grober-Dunsmore. 1997. A fishy story about hurricanes and herbivory: Seven years of research on a reef in St. John, U.S. Virgin Islands. *In* " Proceedings of the 8th International Coral Reef Symposium" (H. A. Lessios and I. G. Macntyre, eds), Vol. I, pp. 555-560. Smithsonian Tropical Research Institute, Balboa, Republic of Panama.

Rogers, C. S., and V. H. Garrison. 2001. Ten years after the crime: lasting effects of damage from a cruise ship anchor on a coral reef in St. John, US Virgin Islands. Bulletin of Marine Science 69(2):793-803.

Rogers, C., W. Gladfelter, D. Hubbard, E. Gladfelter, J. Bythell, R. Dunsmore, C. Loomis, B. Devine, Z. Hillis-Starr, and B. Phillips. 2002. Acropora in the U.S. Virgin Islands: a wake or an awakening? A status report prepared for the National Oceanographic and Atmospheric Administration. Pages 99-122 in A. W. Bruckner, editor. Proceedings of the Caribbean Acropora workshop: potential application of the U.S. Endangered Species Act as a conservation strategy. NOAA Technical Memorandum NMFS-OPR-24, Silver Spring, MD.

Rubin, R., K. Kumli, and G. Chilcott. 2008. Dive characteristics and movement patterns of acoustic and satellite-tagged manta rays (*Manta birostris*) in the Revillagigedos Islands of Mexico. In: Joint Meeting of Ichthyologists and Herpetologists, Montreal, Canada. http://www.asih.org/meetingabstracts2008.

Sadovy, Y., and A. M. Eklund. 1999. Synopsis of biological information on the Nassau Grouper, *Epinephelus striatus* (Bloch, 1792), and the Jewfish, *E. itajara* (Lichtenstein, 1822). NOAA, 146, Seattle, WA.

SAFMC (South Atlantic Fishery Management Council). 1998. Amendment number 9, final supplemental environmental impact statement, initial regulatory flexibility analysis/regulatory impact review, and social impact assessment/fishery impact statement for the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region. South Atlantic Fishery Management Council, 1 Southpark Cir., Suite 306, Charleston, S.C. 29407-4699. 246 pp.

SAFMC (South Atlantic Fishery Management Council). 1999. Stock assessment and fishery evaluation report for dolphin and wahoo Fishery Management Plan for the Dolphin/wahoo fishery. May 1999. Available from the South Atlantic Fishery Management Council, 1 Southpark Circle, Suite 306, Charleston, South Carolina, 29407.

SAFMC (South Atlantic Fishery Management Council). 2003. Fishery Management Plan for the Dolphin and Wahoo Fishery of the Atlantic, Including a Final Environmental Impact Statement, Regulatory Impact Review, Initial Flexibility Analysis, and Social Impact Assessment/Fishery Impact Statement. South Atlantic Fishery Management Council, 1 Southpark Circle, Suite 306, Charleston, South Carolina, 29407-4699.

SAFMC (South Atlantic Fishery Management Council). 2010. Amendment 17A to the Fishery Management Plan for the Snapper Grouper Fishery of the South Atlantic Region with final environmental assessment, initial regulatory flexibility analysis, regulatory impact review, and social impact assessment/fishery impact statement. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Ste 201, Charleston, S.C. 29405. 385 pp. with appendices.

SAFMC (South Atlantic Fishery Management Council). 2011. Comprehensive annual catch limit amendment for the South Atlantic Region. Including a final environmental impact statement, regulatory flexibility act analysis, regulatory impact review, and social impact statement/Fishery Impact Statement.

Sanches, J. G. 1991. Catálogo dos principais peixes marinhos da República de Guiné-Bissau. Publicações avulsas do I.N.I.P. No. 16. 429 p as cited in Froese, R. and D. Pauly, Editors. 2000. FishBase 2000: concepts, design and data sources. ICLARM, Los Baños, Laguna, Philippines. 344 p.

Schärer, M. T., M. I. Nemeth, D. Mann, J. Locascio, R.S. Appeldoorn, and T.J. Rowell. 2012. Sound production and reproductive behavior of yellowfin grouper, *Mycteroperca venenosa* (Serranidae) at a spawning aggregation. Copeia 1:135-144.

Schärer, M. T. and R. Nemeth. 2015. Nassau grouper spawning aggregation research (Years 2013 & 2014). Final report submitted to the CFMC. 80 pp.

Schärer-Umpierre, M. T., D. Mateos-Molina, R. Apperldoorn, I. Bejarano, E. A. Hernández-Delgado, R. S. Nemeth, M. I. Nemeth, M. Valdés-Pizzini, and T. B. Smith. 2014. Marine managed areas and associated fisheries in the U.S. Caribbean. Advances in Marine Biology 69:129-152.

Schmied, R. L. and E. E. Burgess. 1987. Marine Recreational Fisheries in the Southeastern United States: An Overview. Marine Fisheries Review 49(2):2-7.

Schulze-Haugen, M., T. Corey, and N. E. Kohler. 2003. Guide to sharks, tunas, and billfishes of the U.S. Atlantic and Gulf of Mexico. Rhode Island Sea Grant, University of Rhode Island.

Seki, T., T. Taniuchi, H. Nakano, and M. Shimizu. 1998. Age, growth and reproduction of the oceanic whitetip shark from the Pacific Ocean. Fisheries Science 64:14-20.

Semmens, B. X., K. E. Luke, P. G. Bush, C. Pattengill-Semmens, B. Johnson, C. McCoy, and S. Heppell. 2007. Investigating the reproductive migration and spatial ecology of Nassau grouper (*Epinephelus striatus*) on Little Cayman Island using acoustic tags–an overview. Proceedings of the Gulf and Caribbean Fisheries Institute 58:191-198.

Sheridan, P., R. Hill and B. Kojis. 2006. Trap fishing in the U.S. Virgin Islands: how and where effort is exerted. Proceedings of the Gulf and Caribbean Fisheries Institute 57:175-188.

Shinn, E. 1963. Spur and groove formation on the Florida Reef Tract. Journal of Sedimentary Petrology 33(2):291-303.

Skov, H., T. Gunnlaugsson, W. P. Budgell, J. Horne, L. Nottestad, E. Olsen, H. Soiland, G. Vikingsson, and G. Waring. 2008. Small-scale spatial variability of sperm and sei whales in relation to oceanographic and topographic features along the Mid-Atlantic Ridge. Deep Sea Research Part II: Topical studies in Oceanography 55(1-2)254-268.

Smith, C. L. 1971. A revision of the American groupers: Epinephelus and allied genera. Bulletin of the American Museum of Natural History 146:69-241.

Smith, C. L. 1972. A spawning aggregation of Nassau grouper, *Epinephelus striatus* (Bloch). Transactions of the American Fisheries Society 101:257-261.

Smith, T. B. 2013. United States Virgin Island's response to the proposed listing or change in status of seven Caribbean coral species under the U.S. Endangered Species Act University of the Virgin Islands, Center for Marine and Environmental Studies.

Smith T. B., R. S. Nemeth, J. Blondeau, J. M. Calnan, E. Kadison, and S. Herzlieb. 2008. Assessing coral reef health across onshore to offshore stress gradients in the US Virgin Islands. Marine Pollution Bulletin 56(12):1983-91.

Smith, T. B., J. Blondeau, R. S. Nemeth, S. J. Pittman, J. M. Calnan, E. Kadison, and J. Gass. 2010. Benthic structure and cryptic mortality in a Caribbean mesophotic coral reef bank system, the Hind Bank Marine Conservation District, US Virgin Islands. Coral Reefs 29(2):289-308.

Standora, E.A., J.R. Spotila, J. A. Keinath, C. R. Shoop. 1984. Body temperatures, diving cycles, and movement of a subadult leatherback turtle, *Dermochelys coriacea*. Herpetologica 40:169-176.

Stevens, J. D., and J. M. Lyle. 1989. Biology of three hammerhead sharks (*Eusphyra blochii, Sphyrna mokarran* and *S. lewini*) from northern Australia. Australian Journal of Marine and Freshwater Research 40(2):129-146.

Stewart, J. D., E. M. Hoyos-Padilla, K. R. Kumli, and R. D. Rubin. 2016. Deep-water feeding and behavioral plasticity in *Manta birostris* revealed by archival tags and submersible observations. Zoology 119(5):406-413. https://doi.org/10.1016/j.zool.2016.05.010

Stoffle, B., J. Contillo, C. Grace, and D. Snodgrass. 2011. The Socio-economicSocio-economic Importance of Fishing in St. Thomas, USVI: An Examination of Fishing Community Designation. NOAA Technical Memorandum. NMFS-SEFSC-623.

Strasburg, D. W. 1958. Distribution, abundance, and habits of pelagic sharks in the central Pacific Ocean. Fisheries 1:2S.

Sutcliffe, W. H., and P. F. Brodie. 1977. Whale distributions in Nova Scotia waters. Bedford Institute of Oceanography, Technical Report No. 722, Dartmoth, Nova Scotia.

Szmant, A. M., and M. W. Miller. 2005. Settlement preferences and post-settlement mortality of laboratory cultured and settled larvae of the Caribbean hermatypic corals *Montastrea faveolata* and *Acropora palmata* in the Florida Keys, USA. Pages 43-49 in Proceedings of the10th International Coral Reef Symposium.

Taquet, M, L. Reynald, and M. Laurans. 2000. Do FADs influence the geographical distribution of dolphinfish (*Coryphaena hippurus*)? Pêche thonière et dispositifs de concentration de poissons, Caribbean-Martinique, 15-19 Oct 1999.

Theisen, T. C., B. W. Bowen, W. Lanier, and J. D. Baldwin. 2008. High connectivity on a global scale in the pelagic wahoo, *Acanthocybium solandri* (tuna family Scombridae). Molecular Ecology 17:4233-4247.

Toller, W., C. O'Sullivan, and R. Gomez. 2005. Survey of Fishing Tournaments in U.S. Virgin Islands, October 1, 2000 to September 30, 2005. F-8. U.S. Virgin Islands Recreational Fishery Assessment Project: Study 1. Activity Patterns in U.S. Virgin Islands Recreational Fisheries. Job 3. Survey of Fishing Tournaments. Division of Fish and Wildlife, Frederiksted, St. Croix, USVI and Division of Fish and Wildlife, St. Thomas, USVI. December 13, 2005.

Tomascik, T. 1990. Growth rates of two morphotypes of *Montastrea annularis* along an eutrophication gradient, Barbados, WI. Marine Pollution Bulletin 21(8):376-381.

U.S. Department of Commerce, Bureau of Economic Analysis (BEA). August 2013. News Release, BEA 13-37. http://www.bea.gov/newsreleases/general/terr/2013/vigdp_080213.pdf.

U.S. Department of Commerce, Bureau of Economic Analysis (BEA). December 2014. BEA Briefing. Territorial Economic Accounts for American Samoa, the Commonwealth of the Northern Mariana Islands, Guam, and the U.S. Virgin Islands. Obtained online on October 26, 2015, at http://www.bea.gov/scb/pdf/2014/12%20December/1214_territorial%20economic_accounts.pdf.

U.S. Department of Commerce, Bureau of Economic Analysis (BEA). December 2017. News Release BEA 17-164. GDP for U.S. Virgin Islands Increases in 2016. Obtained online on October 1, 2018, at https://www.bea.gov/system/files/2017-12/vigdp_120117.pdf.

U.S. Department of Commerce, Census Bureau (Census). 2007 and 2012 Economic Census.

U.S. Department of Energy. U.S. Energy Information Administration. April 16, 2015. U.S. Virgin Islands, Independent Statistics & Analysis. Obtained online on November 20, 2015, at https://www.eia.gov/state/analysis.cfm?sid=VQ.

U.S. Department of Labor. May 15, 2012. Accessed on line on September 29, 2015, at http://www.dol.gov/opa/media/press/eta/ETA20120936.htm.

U.S. Virgin Islands Department of Labor. 2014. USVI Bureau of Labor Statistics, Department of Labor. Government of the U.S. Virgin Islands.

U.S. Virgin Islands Bureau of Economic Research. August 2015. Economic Conditions. Accessed on line on October 27, 2015 at http://www.usviber.org/Economic%20Review%20August%202015.pdf

U.S. Virgin Islands Department of Labor. 2015. St Croix Local Area Unemployment Rates. Accessed online on September 28, 2015, at https://vidolviews.og/admin/gsipub/htmlarea/uploads/StCroix%20Unemployment.jpg.

U.S. Virgin Islands Department of Tourism. August 20, 2018. Testimony of the Commissioner of the Department of Tourism, Beverly Nicholson-Doty; Fiscal Year 2019 Budget Hearing.

U.S. Virgin Islands Department of Labor. Quarterly Census of Employment and Wages. Available at Virgin Islands Daily News. September 29, 2017. Passenger airline service resumes at King Airport. Accessed on line on September 6, 2018, at http://www.virginislandsdailynews.com/breaking/passenger-airline-service-resumes-at-king-airport/article_9cc5c30a-ec49-5d1c-a6db-dd720fe4ce8d.html.

Valdés-Pizzini, M., J. Agar, K. Kitner, C. Garcia Quijano, M. Tust, and F. Forrestal. 2010. Cruzan Fisheries: A Rapid Assessment of the Historical, Social, Cultural and Economic Processes that Shaped Coastal Communities' Dependence and Engagement in Fishing in the Island of St. Croix, USVI. NOAA Technical Memorandum. NMFS-SEFC-597.

Valdés-Pizzini, M. and M. Schärer-Umpierre. 2014. People, Habitats, Species, and Governance: An Assessment of the Social-Ecological System of La Parguera, Puerto Rico. Interdisciplinary Center for Coastal Studies, University of Puerto Rico, Mayaguez, Puerto Rico.

Van Dam, R. P., and C. E. Diez. 1997. Predation by hawksbill turtles on sponges at Mona Island, Puerto Rico. Pages 1421-1426 in Eighth International Coral Reef Symposium.

Villinski, J. T. 2003. Depth-independent reproductive characteristics for the Caribbean reef-building coral *Montastraea faveolata*. Marine Biology 142(6):1043-1053.

Virgin Islands Daily News. September 29, 2017. Passenger airline service resumes at King Airport. Accessed on line on September 6, 2018, at http://www.virginislandsdailynews.com/breaking/passenger-airline-service-resumes-at-king-airport/article_9cc5c30a-ec49-5d1c-a6db-dd720fe4ce8d.html.

Waddell, J. E. 2005. The state of coral reef ecosystems of the United States and Pacific Freely Associated States: 2005. NOAA Technical Memorandum NOS NCCOS 11, Silver Spring, MD.

Walker, T. A. 1994. Post-hatchling dispersal of sea turtles. Pages 79-94 in R. James, compiler. Proceedings of the Australian Marine Turtle Conservation Workshop held at Sea World Nara Resort, Gold Coast, 14-17 November 1990. Queensland Department of Environment and Heritage, and Australian Nature Conservation Agency, Canberra, Australia.

Yoshioka, P. M., G. P. Owen, and D. Pesante. 1985. Spatial and temporal variations in Caribbean zooplankton near Puerto Rico. Journal of Plankton Research 7(6):733-751.

Young, C. N., J. Carlson, M. Hutchinson, C. Hutt, D. Kobayashi, C. T. McCandless, and J. Wraith. 2016. Status review report: oceanic whitetip shark (*Carcharhinius longimanus*). Final Report to the National Marine Fisheries Service, Office of Protected Resources.

Appendices for the St. Thomas/St. John Fishery Management Plan

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Appendix A. National Environmental Policy Act Scoping Process and Outcomes from Scoping Hearings

The National Environmental Policy Act (NEPA) requires federal agencies to conduct an environmental review when proposing major federal actions. The environmental review is a multi-step process that involves (a) defining the proposed action, (b) determining the nature and significance of potential consequences of the action on the human environment, which guides the choice as to whether the action requires an Environmental Assessment (EA) or an Environmental Impact Statement (EIS), (c) completing an EA and publishing a Finding of No Significant Impact (FONSI), or (d) where there are the potential for significant impacts, meaning an EIS is required, publishing a Notice of Intent (NOI) to prepare an EIS, then (e) conducting initial scoping to determine relevant issues to be evaluated in the EIS, and (f) preparing the EIS. The EIS development process itself has two-steps, first requiring the preparation of a Draft EIS (DEIS) and the presentation of that DEIS to the public for comment, followed by a Final EIS (FEIS) that addresses, as appropriate, those public comments.

To initiate public discussion of the island-based approach to management in accordance with NOAA Administrative Order NAO 216-6 regarding compliance with NEPA[73], the Caribbean Fishery Management Council (Council) and National Marine Fisheries Service (NMFS) staff prepared a scoping document for consideration by the Council at their April 2012 meeting. The scoping document included draft language regarding the purpose and need for shifting from U.S. Caribbean-wide to island-based management, as well as alternative approaches to subdividing the island management zones (two, three, or four island approach) and other considerations for and implications of making the shift. The Council directed staff to conduct initial scoping hearings regarding the general concepts of island-based management throughout Puerto Rico and the U.S. Virgin Islands (USVI), during July 2012, and to inform the Council at their August 2012 meeting of the outcomes from those scoping hearings. Scoping hearings were held at various sites throughout Puerto Rico on July 23 (San Juan), July 24 (Naguabo), July 25 (Mayagüez) and July 26 (Ponce), and in the USVI on July 24 (St. Thomas) and July 25 (St. Croix).

At their August 2012 meeting, the Council was informed of perspectives and concerns regarding island-based management obtained at the July 2012 scoping hearings. There was consensus support for the management transition at all scoping hearings, and a clear preference for subdividing the islands into three management groups (Puerto Rico, St. Thomas/St. John, St. Croix) as opposed to the two island (Puerto Rico/St. Thomas/St. John, St. Croix) or four island (Puerto Rico, St. Thomas, St. John, St. Croix) options. Based on that public response, the

[73] On April 22, 2016, NOAA issued NAO 216-6A, which supersedes NAO 216-6 and, together with the Companion Manual to NAO 216-6A, provides NOAA's policies and procedures for compliance with NEPA. The scoping document was prepared before NOAA updated its NEPA policies and procedures.

Council directed staff to prepare an EA titled: *Development of Island-Based FMPs in the U.S. Caribbean: Transition from Species Based FMPs to Island Based FMPs* (NMFS 2014) to thoroughly analyze the issues associated with transitioning from U.S. Caribbean-wide to island-based management, to evaluate the impact of incorporating most current regulations under the Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs into each of the FMPs for Puerto Rico, St. Thomas/St. John, and St. Croix, and to provide the public with a full and formal evaluation of the impacts of such a shift in federal fisheries management in the U.S. Caribbean region. The Council and NMFS provided an opportunity to submit verbal or written comments on the proposed action. Soliciting public comment ensured the public was provided a thorough and transparent opportunity to comment on the basic concept of an island-based management approach prior to committing Council and NMFS resources to the substantial job of preparing the requisite EISs and FMPs. A draft EA was presented to the Council at their March 2013 meeting. At that meeting, the Council formally decided to initiate the transition from U.S. Caribbean-wide fisheries management to island-based fisheries management.

As a first step in developing the island-based FMPs, at their March 2013 meeting, the Council directed staff to prepare three island-specific scoping documents and to hold a second round of scoping hearings in summer 2013 to receive public feedback on possible actions and alternatives to consider while developing each of the Puerto Rico, St. Thomas/St. John, and St. Croix FMPs. The pertinent scoping document was presented at scoping hearings throughout Puerto Rico (Vieques on July 8, San Juan on July 9, Naguabo on July 11, Arecibo on July 12, Mayagüez on August 5, and Ponce on August 6), on St. Croix (July 9), and on St. Thomas (August 5). Of the roughly 150 total attendees across these eight hearings, only one attendee expressed any opposition to the proposed alternative approaches to development of island-based management. Though supportive of the approach, the attendees provided numerous suggestions as to how fishery management in the U.S. Caribbean EEZ could be enhanced. Ideas ranged from better use of marine protected areas to better management of recreational fisheries.

Coincident with the 2013 scoping hearings, and to ensure broad and substantial public input on this proposed change in U.S. Caribbean fisheries management, NMFS published an initial NOI to prepare an EIS evaluating alternative approaches to developing island-based management of U.S. Caribbean fisheries. The NOI published in June 2013 with a 30-day comment period, during which nine written comments were received. All expressed general support for transitioning from U.S. Caribbean-wide to island-based management.

In response to public comments submitted at the July 2013 scoping hearings and via written response to the initial NOI, the Council at their December 2013 meeting reviewed and approved a preliminary list of actions and alternatives designed to form the foundation of the shift to island-based management. The Council then directed staff to hold a third round of scoping hearings during spring 2014 to obtain comments on this more robust set of actions and alternatives. Scoping hearings were held in the Puerto Rico municipalities of Hatillo (April 7), Mayaguez (April 8), Naguabo (April 9), San Juan (April 10) and Ponce (April 11), and on both St. Thomas (April 7) and St. Croix (April 8). Much of the input received at these hearings was outside the scope of the island-based FMP development process. Pertinent comments focused on the need to enhance management of recreational fisheries, add species such as octopus and sea urchins to the management regime, and manage Puerto Rico by coast rather than as a single entity.

A Supplemental NOI was published contemporaneous with the 2014 scoping hearings, once again to ensure broad and substantial public input on the complex topic of island-based fishery management. Four comments were received during the 30-day comment period, including one comment requesting that a longer comment period be provided. In response to that comment, a second Supplemental NOI was published in May 2014. Fourteen written comments were submitted during the 90-day comment period. The majority of the 18 total written comments supported island-based management, although some comments disagreed with the approach. Most of the comments in disagreement opined that stocks should be managed at a species rather than stock level, but such comments represented a minority of the total. Supportive comments noted that island-based management would provide an opportunity to implement an ecosystem-based fishery management approach, and offered suggestions for improving on island-based management, including developing and relying on better data and better science and more effectively using local knowledge.

Since March 2013, the Council has been developing a *Comprehensive Fishery Management Plan for the St. Thomas/St. John Exclusive Economic Zone* (St. Thomas/St. John FMP) to implement island-based fishery management in St. Thomas/St. John. At the same time, the Council and NMFS developed a NEPA document to describe alternative solutions and compare the direct, indirect, and cumulative environmental impacts of those alternative approaches proposed for inclusion in the St. Thomas/St. John FMP, on the physical, biological, ecological, economic, social, and administrative environments. The new St. Thomas/St. John FMP would then apply the Council's preferred solution, applying the best available scientific information regarding the management of fisheries in St. Thomas/St. John EEZ waters, within the context of federal fisheries management in the U.S. Caribbean.

In April 2019, NMFS reassessed the actions in each FMP relative to NEPA and its requirements and preliminarily determined that the proposed actions would not significantly affect the quality of the human environment, and that draft EISs previously developed were not required. As a result of this determination, NMFS, in collaboration with the Council, would develop a draft EA for each new FMP rather than proceeding with the development of draft EISs. This information was provided in a Notice published in the *Federal Register* (84 FR 14096, April 9, 2019), which aslo informed the public of the withdrawl of the previous NOI and supplemental NOIs.

On April 3, 2019, the Council held a public hearing on St. Thomas to provide an overview of the most complete draft of the St. Thomas/St. John FMP. The audience was provided with the time and opportunity to comment on the plan. A total of 24 persons participated in these hearings. In general, deponents at the hearings emphasized their support for specific actions. For example, support was expressed for Action 2 (Stocks managed under the Thomas/St. John FMP) and the Council's use of ecological, economic, and social considerations to decide in a stepwise fashion (Preferred Alternative 2) which species should be managed under the new FMP. Additional information about the public hearings can be found at the Council's website. At their April 23-24, 2019 regular meeting, the Council voted to submit each of the island-based FMPs to the Secretary of Commerce for approval.

Appendix B. Other Applicable Law

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1801 et seq.) provides the authority for fishery management in federal waters of the exclusive economic zone. However, fishery management decision-making is also affected by a number of other federal statutes designed to protect the biological and human components of U.S. fisheries, as well as the ecosystems that support those fisheries. Major laws affecting federal fishery management decision-making are summarized below.

Administrative Procedures Act (APA)
All federal rulemaking is governed under the provisions of the APA (5 U.S.C. Subchapter II), which establishes a "notice and comment" procedure to enable public participation in the rulemaking process. Under the APA, the National Marine Fisheries Service (NMFS) is required to publish notification of proposed rules in the *Federal Register* and to solicit, consider and respond to public comment on those rules before they are finalized. The APA also establishes a 30-day wait period from the time a final rule is published until it takes effect.

Coastal Zone Management Act (CZMA)
The CZMA of 1972 (16 U.S.C. 1451 et seq.) encourages state and federal cooperation in the development of plans that manage the use of natural coastal habitats, as well as the fish and wildlife those habitats support. When proposing an action determined to directly affect coastal resources managed under an approved coastal zone management program, NMFS is required to provide the relevant State agency with a determination that the proposed action is consistent with the enforceable policies of the approved program to the maximum extent practicable at least 90 days before taking final action. NMFS may presume State agency concurrence if the State agency's response is not received within 60 days from receipt of the agency's consistency determination and supporting information as required by 15 C.F.R. §930.41(a).

Data Quality Act
The Data Quality Act (Public Law 106-443), which took effect October 1, 2002, requires the government for the first time to set standards for the quality of scientific information and statistics used and disseminated by federal agencies. Information includes any communication or representation of knowledge such as facts or data, in any medium or form, including textual, numerical, cartographic, narrative, or audiovisual forms (includes web dissemination, but not hyperlinks to information that others disseminate; does not include clearly stated opinions). Specifically, the Act directs the Office of Management and Budget (OMB) to issue government wide guidelines that "provide policy and procedural guidance to federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information disseminated by federal agencies." Such guidelines have been issued, directing all federal agencies to create and issue agency-specific standards to: 1) Ensure information quality and develop a pre-

dissemination review process; 2) establish administrative mechanisms allowing affected persons to seek and obtain correction of information; and 3) report periodically to OMB on the number and nature of complaints received.

Scientific information and data are key components of fishery management plans (FMP) and amendments and the use of best scientific information available is the second national standard under the Magnuson-Stevens Act. With respect to original data generated for FMPs and amendments, it is important to ensure that the data are collected according to documented procedures or in a manner that reflects standard practices accepted by the relevant scientific and technical communities. Data will also undergo quality control prior to being used by the agency and a pre-dissemination review.

Endangered Species Act (ESA)

The ESA of 1973 (16 U.S.C. Section 1531 et seq.) requires federal agencies to ensure actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of threatened or endangered species or the habitat designated as critical to their survival and recovery. The ESA requires federal agencies to consult with the appropriate administrative agency (NMFS for most marine species, and the U.S. Fish and Wildlife Service for all remaining species) when proposing an action that may jeopardize the continued existence of threatened or endangered species or destroy or adversely modify critical habitat. Consultations are necessary to determine the potential impacts of the proposed action. They are concluded informally when proposed actions may affect but are "not likely to adversely affect" threatened or endangered species or designated critical habitat. Formal consultations, resulting in a biological opinion, are required when proposed actions may affect and are "likely to adversely affect" threatened or endangered species or designated critical habitat.

The St. Thomas/St. John FMP will subsume some of the activities currently managed under the Reef Fish FMP of Puerto Rico and the U.S. Virgin Islands (USVI) (Reef Fish FMP), the Queen Conch FMP of Puerto Rico and the USVI (Queen Conch FMP), the Corals and Reef Associated Plants and Invertebrates FMP of Puerto Rico and the USVI (Coral FMP), and the Spiny Lobster FMP of Puerto Rico and the USVI (Spiny Lobster FMP). Fishing activities authorized under the St. Thomas/St. John FMP may affect ESA-listed species or designated critical habitat that occur in the St. Thomas/St. John management area. A formal consultation (i.e., biological opinion) is currently in process to comprehensively package all analyses for all actions under the St. Thomas/St. John FMP into one document and update information/analyses as appropriate. This biological opinion would also outline any expected take, and its effect to populations, and determine whether the FMP jeopardizes the continued existence of any ESA-listed species, or destroys or adversely modifies designated critical habitat.

Marine Mammal Protection Act (MMPA)

The MMPA established a moratorium, with certain exceptions, on the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas. It also prohibits the importing of marine mammals and marine mammal products into the United States. Under the MMPA, the Secretary of Commerce (authority delegated to NMFS) is responsible for the conservation and management of cetaceans and pinnipeds (other than walruses). The Secretary of the Interior is responsible for walruses, sea otters, polar bears, manatees, and dugongs.

In 1994, Congress amended the MMPA, to govern the taking of marine mammals incidental to commercial fishing operations. The MMPA requires a commercial fishery to be placed in one of three categories, based on the relative frequency of incidental serious injuries and mortalities of marine mammals. Category I designates fisheries with frequent serious injuries and mortalities incidental to commercial fishing; Category II designates fisheries with occasional serious injuries and mortalities; Category III designates fisheries with a remote likelihood or no known serious injuries or mortalities. To legally fish in a Category I and/or II fishery, a fisherman must obtain a marine mammal authorization certificate by registering with the Marine Mammal Authorization Program (50 CFR 229.4) and accommodate an observer if requested (50 CFR 229.7(c)) and they must comply with any applicable take reduction plans.

NMFS has determined that fishing activities conducted under this FMP will have no adverse impact on marine mammals. In the 2019 List of Fisheries published by NMFS, all gear (dive, hand/mechanical collection fisheries) used in the St. Thomas/St. John fisheries are considered Category III (84 FR 22051). This classification indicates the annual mortality and serious injury of a marine mammal stock resulting from any fishery is less than or equal to one percent of the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock, while allowing that stock to reach or maintain its optimum sustainable population. This FMP does not change the list of authorized gear and will not alter this determination.

Paperwork Reduction Act

The Paperwork Reduction Act (PRA) of 1995 (44 U.S.C. 3501 et seq.) regulates the collection of public information by federal agencies to ensure that the public is not overburdened with information requests, that the federal government's information collection procedures are efficient, and that federal agencies adhere to appropriate rules governing the confidentiality of such information. The PRA requires NMFS to obtain approval from the Office of Management and Budget before requesting most types of fishery information from the public. This action does not contain a collection-of-information requirement for purposes of the PRA.

Small Business Act

The Small Business Act of 1953, as amended, Section 8(a), 15 U.S.C. 634(b)(6), 636(j), 637(a) and (d); Public Laws 95-507 and 99-661, Section 1207; and Public Laws 100-656 and 101-37 are administered by the Small Business Administration. The objectives of the act are to foster business ownership by individuals who are both socially and economically disadvantaged; and to promote the competitive viability of such firms by providing business development assistance including, but not limited to, management and technical assistance, access to capital and other forms of financial assistance, business training and counseling, and access to sole source and limited competition federal contract opportunities, to help the firms to achieve competitive viability. Because most businesses associated with fishing are considered small businesses, NMFS, in implementing regulations, must assess how those regulations will affect small businesses.

Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) Provisions

The Magnuson-Stevens Act includes EFH requirements, and as such, each existing, and any new FMPs must describe and identify EFH for the fishery, minimize to the extent practicable adverse effects on that EFH caused by fishing, and identify other actions to encourage the conservation and enhancement of that EFH.

The areas affected by the proposed action have been identified as EFH for queen conch, spiny lobster, coral reef resources, and fish. As specified in the Magnuson-Stevens Act, EFH consultation is required for federal actions which may adversely affect EFH. Any required consultation requirements will be completed prior to implementation of any new management measures.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 et seq.) requires federal agencies to consider the environmental and social consequences of proposed major actions, as well as alternatives to those actions, and to provide this information for public consideration and comment before selecting a final course of action. This document contains an Environmental Assessment to satisfy the NEPA requirements. The Purpose and Need can be found in Section 1.4, Alternatives are found in Chapter 2, the Environmental Consequences are found in Chapter 4, the List of Preparers is in Chapter 9, and a list of the agencies/persons consulted is found in Chapter 10.

Regulatory Flexibility Act (RFA)

The purpose of the Regulatory Flexibility Act (RFA 1980, 5 U.S.C. 601 et seq.) is to ensure that federal agencies consider the economic impact of their regulatory proposals on small entities, analyze effective alternatives that minimize the economic impacts on small entities, and make their analyses available for public comment. The RFA does not seek preferential treatment for small entities, require agencies to adopt regulations that impose the least burden on small entities, or mandate exemptions for small entities. Rather, it requires agencies to examine public policy issues using an analytical process that identifies, among other things, barriers to small business competitiveness and seeks a level playing field for small entities, not an unfair advantage.

After an agency determines that the RFA applies, it must decide whether to conduct a full regulatory flexibility analysis (Initial Regulatory Flexibility Analysis [IRFA] and Final Regulatory Flexibility Analysis [FRFA]) or to certify that the proposed rule will not "have a significant economic impact on a substantial number of small entities." In order to make this determination, the agency conducts a threshold analysis, which has the following 5 parts: (1) Description of small entities regulated by the proposed action, which includes the SBA size standard(s), or those approved by the Office of Advocacy, for purposes of the analysis and size variations among these small entities; (2) descriptions and estimates of the economic impacts of compliance requirements on the small entities, which include reporting and recordkeeping burdens and variations of impacts among size groupings of small entities; (3) criteria used to determine if the economic impact is significant or not; (4) criteria used to determine if the number of small entities that experience a significant economic impact is substantial or not; and (5) descriptions of assumptions and uncertainties, including data used in the analysis. If the threshold analysis indicates that there will not be a significant economic impact on a substantial number of small entities, the agency can so certify. See the RFA analysis in Chapter 8 for more information.

Executive Orders

E.O. 12630: Takings

The Executive Order on Government Actions and Interference with Constitutionally Protected Property Rights, which became effective March 18, 1988, requires that each federal agency prepare a Takings Implication Assessment for any of its administrative, regulatory, and legislative policies and actions that affect, or may affect, the use of any real or personal property. Clearance of a regulatory action must include a takings statement and, if appropriate, a Takings Implication Assessment. The NOAA Office of General Counsel will determine whether a Takings Implication Assessment is necessary for this FMP.

E.O. 12866: Regulatory Planning and Review

Executive Order 12866, signed in 1993, requires federal agencies to assess the costs and benefits of their proposed regulations, including distributional impacts, and to select alternatives that maximize net benefits to society. To comply with E.O. 12866, NMFS prepares a Regulatory Impact Review (RIR) for all fishery regulatory actions that either implement a new fishery management plan or significantly amend an existing plan. RIRs provide a comprehensive analysis of the costs and benefits to society associated with proposed regulatory actions, the problems and policy objectives prompting the regulatory proposals, and the major alternatives that could be used to solve the problems. The reviews also serve as the basis for the agency's determinations as to whether proposed regulations are a "significant regulatory action" under the criteria provided in E.O. 12866 and whether proposed regulations will have a significant economic impact on a substantial number of small entities in compliance with the Regulatory Flexibility Act analysis. See Chapter 7 (RIR) for more information.

E.O. 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations

This Executive Order mandates that each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions. See Section 3.5.10 for Environmental Justice considerations as they relate to this FMP.

E.O. 12962: Recreational Fisheries

This Executive Order requires federal agencies, in cooperation with States and Tribes, to improve the quantity, function, sustainable productivity, and distribution of U.S. aquatic resources for increased recreational fishing opportunities through a variety of methods including, but not limited to, developing joint partnerships; promoting the restoration of recreational fishing areas that are limited by water quality and habitat degradation; fostering sound aquatic conservation and restoration endeavors; and evaluating the effects of federally-funded, permitted, or authorized actions on aquatic systems and recreational fisheries, and documenting those effects.

Additionally, it establishes a seven-member National Recreational Fisheries Coordination Council responsible for, among other things, ensuring that social and economic values of healthy aquatic systems that support recreational fisheries are considered by federal agencies in the course of their actions, sharing the latest resource information and management technologies, and reducing duplicative and cost-inefficient programs among federal agencies involved in conserving or managing recreational fisheries. The Council also is responsible for developing, in cooperation with federal agencies, States and Tribes, a Recreational Fishery Resource Conservation Plan - to include a five-year agenda. Finally, the Order requires NMFS and the U.S. Fish and Wildlife Service to develop a joint agency policy for administering the ESA.

E.O. 13089: Coral Reef Protection

The Executive Order on Coral Reef Protection (June 11, 1998) requires federal agencies whose actions may affect U.S. coral reef ecosystems to identify those actions, utilize their programs and authorities to protect and enhance the conditions of such ecosystems; and, to the extent permitted by law, ensure that actions they authorize, fund or carry out not degrade the condition of that ecosystem. By definition, a U.S. coral reef ecosystem means those species, habitats, and other national resources associated with coral reefs in all maritime areas and zones subject to the jurisdiction or control of the United States (e.g., federal, state, territorial, or commonwealth waters).

The actions in this FMP would have no direct impacts on coral reefs, and positive indirect impacts could be expected from the prohibition of harvest on all species of corals, sea cucumbers, and sea urchins in the St. Thomas/St. John EEZ. The U.S. Caribbean-wide FMPs managed many species of corals, sea cucumbers, and sea urchins, and prohibited harvest of corals. The St. Thomas/St. John FMP manages all species of corals, sea cucumbers, and sea urchins that occur within the St. Thomas/St. John EEZ, prohibiting the harvest of all of these species, and thus the harvest prohibition is more extensive than the prohibition under the U.S. Caribbean-wide FMPs, and will provide additional benefits. These actions aim to prevent overfishing of coral reef resources, which contain species that play important roles on coral reef ecosystems of the U.S. Caribbean.

E.O. 13132: Federalism

The Executive Order on Federalism requires agencies, when formulating and implementing policies, to be guided by the fundamental Federalism principles. The Order serves to guarantee the division of governmental responsibilities between the national government and the states that was intended by the framers of the Constitution. Federalism is rooted in the belief that issues not national in scope or significance are most appropriately addressed by the level of government closest to the people. This Order is relevant to FMPs and amendments given the overlapping authorities of NMFS, the states, and local authorities in managing coastal resources, including fisheries, and the need for a clear definition of responsibilities. It is important to recognize those components of the ecosystem over which fishery managers have no direct control and to develop strategies to address them in conjunction with appropriate international, State, Tribal, and local entities. No Federalism issues have been identified relative to the action proposed in this regulatory amendment. Therefore, consultation with state officials under Executive Order 13132 is not necessary.

E.O. 13112: Invasive Species

This Executive Order requires agencies to use their authority to prevent introduction of invasive species, respond to and control invasions in a cost effective and environmentally sound manner, and to provide for restoration of native species and habitat conditions in ecosystems that have been invaded. Further, agencies shall not authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere unless a determination is made that the benefits of such actions clearly outweigh the potential harm; and that all feasible and prudent measures to minimize the risk of harm will be taken in conjunction with the actions. The actions undertaken in this FMP will not introduce, authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere.

E.O. 13158: Marine Protected Areas (MPAs)

Executive Order 13158 (May 26, 2000) requires federal agencies to consider whether their proposed action(s) will affect any area of the marine environment that has been reserved by Federal, State, territorial, Tribal, or local laws or regulations to provide lasting protection for part or all of the natural or cultural resource within the protected area. This action is not expected to affect any MPAs in federal waters off St. Thomas/St. John.

Appendix C. History of Federal Fisheries Management

Tables C.1-C.4 summarize actions in the Caribbean Fishery Management Council's (Council) four U.S. Caribbean-wide fishery management plans (FMP): FMP for the Reef Fish Fishery of Puerto Rico and the U.S. Virgin Islands (USVI) (Reef Fish FMP), FMP for the Spiny Lobster Fishery of Puerto Rico and the USVI (Spiny Lobster FMP), FMP for the Queen Conch Resources of Puerto Rico and the USVI (Queen Conch FMP), and the FMP for Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the USVI (Coral FMP), and their respective amendments. Not all details are included in the tables. Please refer to the respective proposed and final rules to obtain more information. The St. Thomas/St. John FMP contained in this document replaces these plans as they applied to the St. Thomas/St. John EEZ.

C.1 Reef Fish FMP

Table C.1. History of management for the Reef Fish FMP and subsequent amendments and regulatory actions.

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
FMP for the Shallow-water Reef Fish Fishery (1985)	9/22/1985; except 669.24(a)(1) effective on 9/22/1986	Final Rule (FR): 50 FR 34850 (8/28/1985)	- Identified the fishery management unit (FMU) to include 64 shallow water reef fish distributed among 14 families as the most commonly landed species in Puerto Rico and the USVI. These 64 species accounted for 60% of the total finfish landings in the area extending from shoreline to the edge of the insular platform; - Identified the maximum sustainable yield (MSY) and the optimum yield (OY) to be 7.7 million pounds (mp) for the entire shallow-water reef fish FMU; - Concluded that local fishermen were harvesting 100% of the OY. Therefore, there was no remaining harvest identified for foreign fishing; - Established a minimum mesh size for fish traps of 1 ¼ to allow for the escape of juvenile fish; - Required a self-destruct panel (not smaller than the funnel opening of the trap) and/or self-destruct door fastening in fish traps; - Required owner identification and marking of traps, buoys, and boats in the EEZ. Marking/identification systems required by the Puerto Rico and USVI management agencies can

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			be used by fishermen of those states to meet the federal marking requirements; - If the state(s) eliminates the marking system or a fisherman will fish only in the U.S. Caribbean EEZ, an identification number and color code will be assigned by the NMFS Southeast Regional Director upon application; - Prohibited the hauling or tampering of another person's traps without the owner's written permission, except by authorized enforcement officer to alleviate the theft of fish traps. - Prohibited the use of poisons, drugs, other chemicals, and explosives for fishing in the management area as these practices do not discriminate between species or species sizes and are detrimental to the environment; - Required a minimum size for yellowtail snapper of eight inches total length (TL) the first year following implementation, increasing one inch per year until reaching 12 inches TL; - Required a minimum size for Nassau grouper of 12 inches TL the first year following implementation, increasing one inch per year until reaching 24 inches TL; - Established a closed season for Nassau grouper to protect their spawning aggregations. Landings were prohibited from January 1 to March 31 of each calendar year; fish of this species caught during the closed season had to be returned to the sea immediately with minimum injury in such a manner as to ensure maximum probability of survival; - Increased the collection of catch/effort and length/frequency data, as well as any necessary biological information, through improvement of the existing state-federal agreements formulated by NMFS/Puerto Rico (PR)/USVI and/or Council's own data gathering program; - Described the characteristics of the habitat used by the stocks in the shallow water reef fish FMU. - *669.24 - Fish traps must have a minimum mesh size of 1 ¼ inches in the smallest dimension of the opening.
Emergency Interim Rule			- To close fishing in area in St. Thomas

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
Amendment #1	11/29/1990; except 669.24(a)(1) effective on 9/14/1991	FR: 55FR 46214	- Increased the minimum mesh size from 1 ¼ in to 2 in to further reduce bycatch of juveniles and herbivorous fish essential to the maintenance of the reef ecosystem balance; - Prohibited the harvest and possession of Nassau grouper due to low abundance; - Revised the data collection efforts to include the collection of socio-economicsocio-economic information on the different managed fisheries; - Per request of the St. Thomas and St. John fishermen, the Council established an annual December 1 through February 28 closed area (Hind Bank) southwest of St. Thomas where the use of any fishing gear capable of capturing reef fish, such as fish traps, hook and line, and spear is prohibited during this time[74]. - Defined overfishing (OF) and overfished conditions for shallow water reef fish; - Established management measures, which the Council could implement via the framework process.
Regulatory Amendment #1	9/20/1991; except 669.24(a)(3) effective 09/20/1991 through 09/13/1993	FR: 56 FR 48755	- Modified the minimum mesh size and degradable panel requirements for fish traps: Minimum allowable mesh sizes for fish traps: ▪ 1.5 inches (3.8 centimeters) for hexagonal mesh; ▪ 1.5 inches for square mesh through September 13, 1993; and ▪ 2.0 inches (5.1 centimeters) for square mesh, effective September 14, 1993. - Added more specific requirements for degradable panel on fish traps.
Amendment #2	11/15/1993	FR: 58 FR 53145	- Expanded the existing FMU to include the following deep-water reef fish to address their decline in landings: tiger grouper, black snapper, queen snapper, blackfin snapper, silk snapper, wenchman, vermilion snapper, yellowedge grouper, red grouper, misty grouper, tiger grouper, greater amberjack, almaco jack, blackline tilefish, and sand tilefish; - Extended protection to the aquarium trade finfish species (included them in the FMU);

[74] The Hind Bank Marine Conservation District was established through Amendment 1 to the Coral FMP in 1999. This amendment established the current fishing (all) and anchoring prohibitions year-round.

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			- Prohibited the use of chemical substances or other destructive devices to harvest aquarium trade species, limited gear to hand-held dip nets and slurp guns; - Prohibited the harvest and possession of certain aquarium trade species: ▪ Live red hind (*Epinephelus guttatus*) and mutton snapper (*Lutjanus analis*) juveniles to allow for the recovery of these rebuilding species; ▪ Seahorses (*Hippocampu*s spp.) and basslets (*Liopropom*a) due to their scarcity; ▪ Coney (*Epinephelus fulvus*) and queen triggerfish (*Balistes vetula*) juveniles to avoid over harvest and user conflict as these were important species both commercially and recreationally; ▪ Foureye butterflyfish (*Chaetodon capistratus*), banded butterflyfish (*C. striatus*) longsnout butterlfyfish (*C. aculeatus*), due to their high mortality in captivity; ▪ Certain species of wrasses, basslets, and angelfishes notably *Thalassoma bifasciatum*, *Bodianus rufus*, *Gamma loreto*, and *Pomacanthus paru* due to their impotance to the reef ecosystem. - Recommended continued assessments of heavily fished aquarium trade species such as royal gramma (*Gramma loreto)*, rock beauty (*Holacanthus tricolor)*, yellowhead jawfish (*Opistognathus aurifrons)*, french angelfish (*Pomacanthus paru)*, queen angelfish *(Holacanthus ciliaris)*, pygmy angelfish *Centropyge argi)*, bluehead wrasse *(Thalassoma bifasciatum)*, puddingwife wrasse Halichoeres radiatus), blue chromis (*Chromis cyanea)*, and redlip blenny (*Ophioblennius atlanticus)*. - Retitled the FMP from the Shallow Water Reef Fish FMP to the FMP for the Reef Fish Fishery of Puerto Rico and the USVI; - Applied existing definitions of MSY and OY to all reef fish within the revised FMU, with the exception of marine aquarium finfish. The MSY and OY of marine aquarium finfish remained undefined;

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			- Required that the fish traps be constructed as follows: ▪ Basic construction material must be 1.5-in hexagonal mesh wire or 2.0-in square mesh wire; ▪ Escape openings in the trap must be at least 8x8 in and located on any two sides (except top, bottom, or side containing the funnel); ▪ Access door may serve as an escape opening provided it meets all the requirements for size and location, and is fastened in such a manner that the door will fall open when the fasteners degrade; ▪ Panels covering escape openings must be of a mesh at least as large as the mesh used in constructing the trap, and fastened with untreated jute twine 1/8-in or less in diameter when traps are fitted with zinc anodes; or fastened with 18-gauge ungalvanized wire or 1/8-in untreated just twine (maximum diameter) if anodes are not used; - Prohibited the harvest of Goliath grouper in the U.S. Caribbean EEZ; - Established prohibitions on red hind harvest to protect spawning aggregations from December 1 through February 28 each year within the Tourmaline Bank area off the west coast of Puerto Rico and the Lang Bank area off the east coast of St. Croix; - Prohibited all fishing from March 1 through June 30 of each year within the Mutton Snapper Spawning Aggregation Area southwest of St. Croix.
Technical Amendment	3/11/1994	59 FR 11560	- Modified the regulations regarding minimum allowable mesh size to be the distance between the centers of strands rather than the smallest dimension of the opening, consistent with industry standards.
Regulatory Amendment #2	January 1997	61 FR 64485	- Reduced the size of the Tourmaline Bank closed area originally implemented in 1993; - Established seasonal closures in two additional areas off the west coast of Puerto Rico (Abrir La Sierra Bank and Bajo de Sico); - Closed the EEZ portions in three areas to all fishing between December 1 and February 28, each year:

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			▪ 1.5 mile radius centered around a buoy to be deployed in the area known as Bajo de Sico; ▪ 1.5 mile radius around Buoy 8 at Tourmaline Bank (this is part of the area already closed but it allows for the use of the sandy area where red hind are not found); ▪ 1.5 mile radius around Buoy 6 at Abrir La Sierra Bank.
Amendment #3 ***Caribbean Sustainable Fisheries Act (SFA) Amendment***	11/28/2005	PR:70 FR 53979 FR:70 FR 62073	- Amended current requirements for trap construction such that only one escape panel is required, which could be the trap door (modifying the regulation implemented through Regulatory Amendment 1, which required that each fish trap contained two degradable (escape) panels in addition to a self-destruct door fastening); ▪ The degradable panel must be at least 8 x 8 in and with mesh not smaller than the mesh of the trap; - Individual traps or pots must have at least one buoy attached that floats on the surface; - Required that traps or pots tied together in a trap line have at least one buoy that floats at the surface at each end of the trap line; - Prohibited the use of gillnets and trammel nets in the EEZ, with the exception of those nets used for catching ballyhoo, gar, and flying fish. Nets used for the harvest of these species must be tended at all times; - Prohibited the use of bottom tending gear (traps, pots, gillnets, trammel nets, bottom longlines) in the seasonally closed areas of Tourmaline, Bajo de Sico, Abrir la Sierra, Lang Bank, the Mutton Snapper Spawning Aggregation Area, and Grammanik Bank. - Required an anchor retrieval system for anyone fishing for or possessing reef fish species; - Prohibited the filleting of fish at sea; - Established a seasonal closure in the area known as Grammanik Bank south of St. Thomas prohibiting all fishing from February 1 – April 30 of each year - Established seasonal closures (no fishing or possession), every year during the specified months, for:

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			▪ Silk, black, blackfin and vermillion snapper from October 1 through December 31; ▪ Tiger, yellowfin, yellowedge, red and black from February 1 through April 30; ▪ Red hind from December 1 through the last day of February; ▪ Lane and mutton snapper from April 1 through June 30. - In the absence of MSY estimates, the proxy for MSY was derived from recent average catch (C), and from estimates of the current biomass (B_{CURR}/B_{MSY}) and fishing mortality (F_{CURR}/F_{MSY}) ratios as: MSY = $C/[(F_{CURR}/F_{MSY}) \times (B_{CURR}/B_{MSY})]$; where C was calculated based on commercial landings for the years 1997-2001 for Puerto Rico and 1994-2002 for the USVI, and on recreational landings for the years 2000-2001. - For each FMU sub-unit for which B_{CURR}/B_{MSY} and F_{CURR}/F_{MSY} had not been estimated through a stock assessment or other scientific exercise (i.e., stock status unknown), the following estimates were used for the B_{CURR}/B_{MSY} and F_{CURR}/F_{MSY} proxies: 1) For species believed not to be "at risk" based on the best scientific information available, the F_{CURR}/F_{MSY} proxy was estimated as 0.75 and the B_{CURR}/B_{MSY} proxy estimated as 1.25; 2) For species for which no positive or negative determination could be made on the status of their condition, the default proxies for F_{CURR}/F_{MSY} and B_{CURR}/B_{MSY} were estimated as 1.00; and 3) For species that were believed to be "at risk" based on the best scientific information available, the F_{CURR}/F_{MSY} proxy was estimated as 1.50 and the B_{CURR}/B_{MSY} proxy estimated as 0.75. - Defined OY equal to the average yield associated with fishing on a continuing basis at F_{OY}; where $F_{OY} = 0.75F_{MSY}$. - Defined MSST = $B_{MSY}(1\text{-}c)$; where c = the natural mortality rate (M) or 0.50, whichever is smaller. - Specified an MSY control rule to define ABC = $F_{MSY}(B)$. When the data needed to determine F_{MSY} were not available, use natural mortality (M) as a proxy for F_{MSY}. - Specified an OY control rule to define target catch limits such that they equal $F_{OY}(B)$.

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			- In the case of a sub-unit with multiple M values, the lowest documented M value would be used in this formula to reduce the risk that the most vulnerable species in a particular sub-unit would be overexploited. The specific MSST values that would be defined by this alternative in accordance with the preferred MSY alternatives are presented for each stock or complex; - Rebuild Nassau grouper to B_{MSY} in 25 years, using the formula T_{MIN} (10 years) + one generation (15 years) = 25 years. - Rebuild Goliath grouper to B_{MSY} in 30 years, using the formula T_{MIN} (10 years) + one generation (20 years) = 30 years. - Rebuild grouper unit 4 to B_{MSY} in 10 years; - Eliminated existing regulations defining a marine aquarium fish as "a Caribbean reef fish that is smaller than 5.5 inches (14.0 cm) TL" and restricting the harvest gear for marine aquarium fish to hand-held dip nets or hand-held slurp guns (50 CFR 622.41§(b)); - Eliminated the regulation prohibiting the harvest and possession of butterflyfish and seahorses from federal waters of the U.S. Caribbean (50 CFR §622.32(b)(1)(ii)); - Described and identified essential fish habitat (EFH) according to functional relationships between life history stages of Council managed species and Caribbean marine and estuarine habitats; - Designated habitat areas of particular concern (HAPCs) in the Reef Fish FMP based on confirmed spawning locations and on areas or sites identified as having particular ecological importance to managed species.
Amendment #4	Postponed	NOI:72 FR 57307	N/A
Regulatory Amendment #3	12/2/2010	PR: 75 FR 44209 (7/28/2010) FR: 75 FR 67247	- Extended the original length of the yearly seasonal closure for Bajo de Sico from December 1 through February 28 (3-months) to October 1 through March 31 (6-months); - Prohibited fishing for or possession of Council-managed reef fish species in Bajo de Sico; - Prohibited anchoring year-round within the Bajo de Sico closed area. Fishing for highly migratory

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			species (HMS), coastal migratory pelagics (dolphin, wahoo, jacks, and mackerel) and spiny lobster would be allowed all year. - *The final rule added spear to the list of allowable gear in the commercial sector of the Caribbean reef fish fishery and revised the title of the FMP in the list of authorized fisheries and gear. - The Final rule included other management measures not part of the amendment.
Amendment #5 ***2010 Caribbean ACL Amendment***	1/30/2012	PR: 76 FR 66675 FR: 76 FR 82404	- Prohibited harvest of midnight, blue, and rainbow parrotfish to address potential overharvest of these species due to their combination of large body size, a high susceptibility to spear gear and fish traps, relatively low resilience in comparison with other Caribbean parrotfish species, and lack of abundance compared with most parrotfish occupying U.S. Caribbean waters; - Amended the stock complexes in the Reef Fish FMUs: ▪ Separated grouper unit (GU) 4 into GU4 (yellowfin, red, tiger [black grouper was added to GU4]) and GU5 (yellowedge, misty). ▪ Removed creole fish from GU3 and fisheries management ▪ Modified the snapper FMU by adding cardinal snapper to snapper unit (SU) 2 and moved wenchman to SU1; - Specified ACLs and accountability measures (AMs) for species undergoing overfishing (snappers, groupers, parrotfish, and queen conch) to end and prevent overfishing of species considered overfished or undergoing overfishing. - Established or redefined management reference points, including a proxy for maximum sustainable yield (MSY proxy) and an estimate of OY, OFLs, for species undergoing overfishing (snappers, groupers, queen conch, parrotfish). Established ABCs for parrotfish and queen conch. - Modified existing management measures as needed to constrain harvest to specified ACLs. - Specified separate commercial and recreational ACLs in Puerto Rico based on the preferred management reference point time series; - Allocated the ACLs in the U.S. Caribbean EEZ by island groups (i.e. Puerto Rico, St. Thomas/St.

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			John, and St. Croix) according to the subzones established in the 2010 Caribbean ACL amendment; - Established a recreational aggregate bag limit for snapper, grouper, and parrotfish of five per fisher per day including not more than two parrotfish per fisher per day. A vessel limit was also established, limiting recreational harvest to an aggregate of 15 snapper, grouper, and parrotfish per day of which no more than six can be parrotfish; - Modified framework measures for the Reef Fish FMP established in Amendment 1.
Amendment #6 ***2011 Caribbean ACL Amendment***	1/30/2012	PR: 76 FR 68711 FR: 76 FR 82414	- For the reef fish species that were not determined to be undergoing overfishing and therefore not included in Amendment 5, redefined management reference points, including MSY, OFL, ABC, and established ACLs and AMs. - For those species included in Amendment 6, allocated ACLs among island management areas; - Established aggregate recreational bag limits for angelfish, boxfish, goatfish, grunts, wrasses, jacks, scups and porgies, squirrelfish, triggerfish and filefish, tilefish: ▪ 5 fish per person/day or, if 3 or more persons are aboard, 15 fish from aggregate per vessel/day, but not to exceed: 1 surgeonfish per person/day or 4 surgeonfish per vessel/day. - Redefined management reference points, including MSY, OFL, ABC, ACL, AMs; - Allocated the ACLs for the 2011 species by each island's subzone; - Aquarium trade species listed in both the Coral FMP and the Reef Fish FMP into a new FMP specific to aquarium trade species would be moved into a new FMP, however this is still pending.
Regulatory Amendment #4	8/29/2013	PR:78 FR 15338 FR:78 FR 45894	- Established a commercial and recreational minimum size limit for parrotfish harvest in the federal waters off St. Croix, USVI: ▪ Minimum size limit of 8 inches (20.3 cm), fork length, for redband parrotfish (*Sparisoma aurofrenatum*) ▪ Minimum size limit of 9 inches (22.9 cm), fork length, for all other parrotfish: princess, queen, striped, redtail, stoplight, redfin.

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			- The current harvest prohibition for midnight, blue, and rainbow parrotfish remains in effect.
Amendment #7	06/10/2016	NOA: 81 FR 5978 PR: 81 FR 9800 FR: 81 FR 29166	- Revised language within the Reef Fish FMP to be consistent with language in the implementing regulations at 50 CFR Part 622 describing the application of AMs in the U.S. Caribbean EEZ.
Amendment #8	06/08/2017	NOA: 82 FR 1308 PR: 82 FR 10324 FR: 82 FR 21475	- Modified the date for implementation of an AM-based closure in the event of an ACL overage for a species/species group managed by the Council in Puerto Rico, St. Thomas/St. John, and St. Croix under the Reef Fish, Coral, and Spiny Lobster FMPs. An AM-based closure will be implemented from September 30 of the closure year backward, toward the beginning of the fishing year, for the number of days necessary to achieve the reduction in landings required to ensure landings do not exceed the applicable ACL. - Required that the Council revisit using September 30 as the end date for AM-based closures no longer than 2 years from the implementation of the amendment and no longer than every 2 years thereafter.
Regulatory Amendment #6	1/2/2018	PR: 82 FR 43733 FR: 82 FR 56917	- Applies only to reef fish stocks and stock complexes in the EEZ off Puerto Rico, as these are the only stocks/stock complexes currently managed by separate commercial and recreational sector ACLs in U.S. Caribbean federal waters. - Revised method used to trigger the application. Required application of an AM to either the recreational or commercial sector of a stock/stock complex only if NMFS determines that both the sector-specific ACL and the total (combined recreational and commercial) ACL were exceeded, and the exceedance is not the result of enhanced data collection and monitoring efforts. - The purpose of this final rule is to increase the likelihood that OY is achieved on a continuing basis and to minimize, to the extent practicable, adverse socio-economicsocio-economic effects of AM-based closures.

C.2 Spiny Lobster FMP

Table C.2. History of management for the Spiny Lobster FMP and subsequent amendments and regulatory actions.

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
Spiny Lobster FMP (1981)	1/1985	FR: 49 FR 50049 (12/26/1984)	- Defined the Caribbean spiny lobster fishery management unit (FMU) to include *Panulirus argus*, described objectives for the management of the spiny lobster fishery, and established management measures to achieve those objectives. - Defined the maximum sustainable yield (MSY) for the spiny lobster fishery at 830,000 pounds (lbs) per year, which is the greatest amount or yield that can be sustainably harvested under prevailing environmental conditions; - Defined the U.S. Caribbean-wide optimum yield (OY) as "all the non-egg-bearing spiny lobsters in the management area having a carapace length (CL) of 3.5 inches (in) or greater, that can be harvested on an annual basis;" - Established a domestic annual harvest under the proposed CL of 3.5 in; - Size and harvest requirements included: ▪ Land lobster whole and with a CL equal or larger than 3.5 in; ▪ No retention of egg-bearing (berried) lobsters (berried female lobsters may be kept in pots or traps until the eggs are shed), no stripping or removing the eggs from a lobster, undersized lobster may be kept in the fish pots as attractors but may not be harvested; - Gear requirements included: ▪ Include a self-destruct panel and/or self-destruct door fastenings on traps and pots to eliminate "ghost traps;" ▪ Identify and mark traps, pots, buoys, and boat; ▪ Prohibit the use of poisons, drugs, or other chemicals, and use of spears, hooks, explosives, or similar devices to take spiny lobsters, reducing injury to lobsters that if landed would be illegal to retain; ▪ Report catch and effort information through improvement of the existing data collection systems.

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			- Defined the U.S. Caribbean spiny lobster stock, although the question of whether or not biologically distinct sub-stocks of *P. argus* may be identified was not resolved. For the purpose of the Spiny Lobster FMP, three biological assessments areas (distinguished by their user groups and geography) were assumed: (1) Puerto Rico, (2) St. Thomas and St. John, and (3) St. Croix. A single OY was established.
Amendment #1	May 1991	FR: 56 FR 19098	- Implemented definitions for overfished and overfishing, outlined framework actions that could be taken by the Council should overfishing occur, and better described the habitat for the spiny lobster; - Defined "overfished" as a biomass level below 20 percent of the spawning potential ratio (SPR) and defined "overfishing" as a harvest rate that is not consistent with a program implemented to rebuild the stock to the 20% SPR. - Established management measures to halt overfishing should overfishing occur.
Amendment #2 ***Caribbean SFA Act Amendment***	11/28/2005	PR: 70 FR 53979 FR: 70 FR 62073	- Redefined the MSY from 830,000 lbs to 547,000 lbs per year; OY to 513,000 lbs, ABC/MFMT = 547,000 lbs, defined the MSST = $B_{MSY}(1\text{-}c)$; where c = the natural mortality rate (M) or 0.50, whichever is smaller. - Minimized bycatch and bycatch mortality to the extent practicable; - Described and identified essential fish habitat (EFH) and habitat areas of particular concern for the spiny lobster; - Established modifications to anchoring techniques, modified construction specifications for pots/traps, and closed areas to certain recreational and commercial fishing gear (i.e., pots /traps, gill/trammel nets, bottom longlines) to prevent, mitigate, or minimize adverse fishing impacts to EFH in the U.S. Caribbean EEZ. Including: ▪ Require at least one buoy that floats on the surface on all individual traps/pots; ▪ Require at least one buoy at each end of trap lines linking traps/pots, for all fishing vessels that fish for or possess spiny lobster (or reef fish species) in or from the EEZ;

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			▪ Require an anchor retrieval system that ensures the anchor is recovered by its crown in order to prevent the anchor from dragging along the bottom during recovery. - Prohibited the use of pots/traps, gill/trammel nets, and bottom longlines on coral or hard bottom habitat year-round in the existing seasonally closed areas and Grammanik Bank in the U.S. Caribbean EEZ under the Spiny Lobster (and Reef Fish FMPs).
Amendment #3	Postponed	N/A NOI: 72 FR 57307	N/A
Amendment #4	2/11/2009	NOA: 73 FR 61015 PR: 73 FR 64295 FR: 74 FR 1148	- Restricted spiny lobster imports into the U.S.; - Established conservation standards to achieve an increase in spawning stock biomass and increase the long-term yield of the fishery; - Prohibited any person from importing spiny lobster less than 6.0 ounces tail weight to Puerto Rico or the USVI.
Amendment #5 ***2011 Caribbean ACL Amendment***	1/30/2012	NOA: 76 FR 59377 PR: 76 FR 68711 FR: 76 FR 82414	- Revised the management reference points and status determination criteria established in Amendment 2 (i.e, SFA Amendment); - Established ACLs and accountability measures (AMs) for spiny lobster; - Allocated spiny lobster ACLs among island management areas: PR ACL (all sectors) = 327,920; St. Croix ACL (all sectors) = 107,307; St. Thomas/St. John ACL = 104,199. - Established recreational bag limits for spiny lobster of 3 spiny lobsters per fisher/day, and no more than 10 spiny lobsters per vessel/day. - Revised framework procedures for the spiny lobster.
Amendment #6	6/10/2016	NOA: 81 FR 5978 PR: 81 FR 9800 FR: 81 FR 29166	- Revised language within the FMP to be consistent with language in the implementing regulations at 50 CFR Part 622 describing the application of AMs in the U.S. Caribbean EEZ. - Clarified that any AM-based closure would only apply for the fishing year for which it was implemented, consistent with the Council's intent. - The final rule (not included in the amendment) clarified that: ▪ The spiny lobster ACL in Puerto Rico management area is applied as a single ACL for

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			both the commercial and recreational sectors, consistent with the Council's intent. If the AM is triggered due to an ACL overage, the commercial and recreational fishing seasons are reduced. During such a closure, spiny lobster may not be harvested, possessed, purchased, or sold, and the bag and possession limits for spiny lobster would be zero. ▪ For spiny lobster in the St. Croix and St. Thomas/St. John island management areas, if AMs are triggered due to an ACL overage and the fishing season is reduced, spiny lobster in or from the applicable management area may not be harvested, possessed, purchased, or sold, and the bag and possession limits would be zero.
Amendment #7	6/08/2017	NOA: 82 FR 1308 PR: 82 FR 10324 FR: 82 FR 21475	- Modified the implementation date for AM-based closures. Specifically: ▪ Instead of using December 31st as the implementation date, an AM-based closure will be implemented from September 30 of the closure year backward, toward the beginning of the fishing year, for the number of days necessary to achieve the reduction in landings required to ensure landings do not exceed the applicable ACL. ▪ If the length of the required fishing season reduction exceeds the period of January 1-September 30, any additional reduction required will be applied from October 1 forward, toward the December 31. - Requires that the Council revisit the use of September 30th as the end date for AM-based closures no longer than 2 years from implementation of the amendment and no longer than every 2 years thereafter.

C.3 Queen Conch FMP

Table C.3. History of management for the Queen Conch FMP and subsequent amendments and regulatory actions.

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
Queen Conch FMP (1996)	1/13/1997	PR: 61 FR 45395 FR: 61 FR 65481 (12/13/1996)	- Defined the maximum sustainable yield (MSY) of queen conch as 738,000 lbs per year; - Defined the optimum yield (OY) as "all queen conch commercially and recreationally harvested from the exclusive economic zone (EEZ) and landed consistent with the management measures set forth in this FMP under a goal of allowing 20% of the spawning stock biomass to remain intact;" - Required that all conch species in the fishery management unit be landed in the shell; - Prohibited the sale of undersized queen conch and queen conch shells; - Implemented a recreational bag limit of three queen conch per day, not to exceed 12 per boat; - Prohibited the possession of queen conch that measured less than 9 in total length or that have a shell lip thickness of less than 3/8 in; - Implemented a commercial catch limit of 150 queen conch per day: ▪ The commercial fishermen' daily quota will be lowered to one hundred (100) queen conch for the second year and to seventy-five (75) the third year; ▪ The quota reduction is subject to review upon receipt of empirical information on which to base the decisions for new limits; - All conch harvested under these provisions must conform to minimum size specifications and be landed still attached to the shell; - Implemented an annual spawning season closure that extended from July 1 through September 30; - Prohibited the use of hookah gear to harvest queen conch; - Established the following framework measures: ▪ Establish closed areas, and address significant changes in fishing practices or environmental disasters;

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			▪ Other available framework adjustments include changes to the Fishery Management Unit (FMU), harvest limitations (including quotas, trip or daily landing limits), gear restrictions, and closed seasons or areas.
Amendment #1 *Caribbean SFA Amendment*	11/28/2005	NOA: 70 FR 35053 PR: 70 FR 53979 FR: 70 FR 62073	- Established a new FMU for the queen conch by removing the Caribbean helmet (*Cassis tuberosa*), Caribbean vase (*Vasum muricatum*), flame helmet (*Cassis flammea*), and whelk (West Indian top shell, *Cittarium pica*); - Nine species remained in the FMU; - Prohibited commercial and recreational catch and possession of queen conch in federal waters of the U.S. Caribbean, with the exception of Lang Bank east of St. Croix. Lang Bank consists of federal waters east of 64° 34' W longitude; - Where fishing was allowed in the EEZ, conch must be maintained intact and all other regulations of bag limits, gear restrictions, and minimum size apply; - Moved all species in the Caribbean conch resource FMU, with the exception of queen conch, to a data collection only category (removed all species except queen conch from federal regulation); ▪ Consequently, existing regulations requiring that all species in the Caribbean conch resource FMU taken from the U.S. EEZ be maintained with meat and shell intact (50 CFR §622.38(f)) would no longer apply to these species, and would instead only apply to queen conch; ▪ Inclusion in a data collection only category would result in no specification of MSY, OY, or other stock status determination criteria for these species
Regulatory Amendment #1	5/31/2011	PR: 76 FR 3596 FR: 76 FR 23907	Established a quota and seasonal closures compatible with the USVI: ▪ Modified the Lang Bank seasonal closure from the previous yearly closure of July 1 through September 30 (3-months), to the new closure of June 1 through October 31 (5-months). ▪ Prohibited fishing for and possession of queen conch in or from the Caribbean EEZ east of

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			64°34′ W. longitude, which includes Lang Bank east of St. Croix, USVI, when harvest and possession of queen conch is prohibited in St. Croix territorial waters as a result of a territorial quota closure.
Amendment #2 ***2010 Caribbean ACL Amendment***	1/30/2012	NOA: 76 FR 59375 PR: 76 FR 66675 FR: 76 FR 82404	- Revised the management reference points (i.e., MSY, overfishing limit (OFL), OY, acceptable biological catch (ABC)) for the queen conch FMU previously established in the 2005 Caribbean SFA Amendment (i.e. Amendment 1 to the Queen Conch FMP); - Redefined the management reference points or proxies for queen conch based on the longest time series of pre-Caribbean SFA Amendment landings data considered consistently reliable across all islands. - Established the MSY proxy based on the average annual commercial landings from 1999-2005 for Puerto Rico and St. Croix and from 2000-2005 for St. Thomas/St. John; ▪ Established the OFL equal to the MSY proxy with overfishing occurring when annual catches exceed the OFL, unless NMFS' Southeast Fisheries Science Center (SEFSC) (in consultation with the Council and its Scientific and Statistical Committee (SSC)) determined the overage occurred because data collection/monitoring improved, rather than because catches actually increased. ▪ The SSC recommended an ACL of 50,000 lbs equal to OY and ABC.
Amendment #3 ***2011 Caribbean ACL Amendment***	1/30/2012	NOA: 76 FR 53977 PR: 76 FR 68711 FR: 76 FR 82414	- Removed eight conch species from the Queen Conch FMU: Milk conch (*Strombus costatus),* West Indian Fighting Conch *(S. pugilis),* Roostertail Conch (*S. gallus),* Hawkwing Conch (*S. raninus),* True Tulip (*Fasciolaria tulipa),* Atlantic Triton's Trumpet (*Charonia variegate),* Cameo Helmet (*Cassis madagascarensis),* and Green Start Shell (*Astrea tuber).* The queen conch, *Strombus gigas* is the only species in the FMU.
Amendment #4	06/10/2016	NOA: 81 FR 5978 PR: 81 FR 9800 FR: 81 FR 29166	- Revised language within the FMP to be consistent with language in the implementing

FMP or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			regulations at 50 CFR Part 622 describing the application of AMs in the U.S. Caribbean EEZ.

C.4 Coral FMP

Table C.4. History of management for the Coral FMP and subsequent amendments and regulatory actions.

Fishery Management Plan or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
Coral FMP (1995)	Effective 12/27/1995, except for §670.23(b) (Restrictions on sale or purchase), which became effective 3/1/1996	PR: 60 FR 46806 FR: 60 FR 58221 (11/27/1995)	- Prohibited the take or possession, whether dead or alive, of gorgonians, stony corals, and any species in the fishery management unit (FMU) if attached or existing upon live rock; - Prohibited the sale or possession of any prohibited coral unless fully documented as to point of origin; - Prohibited the use of chemicals, plants, or plant-derived toxins, and explosives to take species in the coral FMU; - Required that dip nets, slurp guns, hands, and other non-habitat destructive gear types be used to harvest allowable corals; - Required that harvesters of allowable corals obtain a permit from the local or federal government; Framework measures allowed NMFS Southeast Regional Administrator (RA) to modify management measures, including the establishment of marine conservation districts, changes to the list of prohibited species, changes to the FMU, harvest limitations, including quotas, trip or daily landing limits, and gear restrictions.
Amendment #1 to the Coral FMP establishing a Marine Conservation District (MCD) (1999)	12/6/1999	PR: 64 FR 42068 FR: 64 FR 60132	Established a no-take MCD in the U.S. exclusive economic zone (EEZ) southwest of St. Thomas, USVI, including: - No anchoring by fishing vessels, no fishing of any kind (including no bottom fishing and no spear

Fishery Management Plan or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			fishing), and no removal of any organism in the MCD (including, but not limited to, those organisms listed in the FMUs of the Coral FMP, Reef Fish FMP, Queen Conch FMP, and Spiny Lobster FMP). Scientific research would be allowed as long as it fits under the proper definition and guidance of "scientific research" under the Magnuson Stevens Act.
Amendment #2 to the Coral FMP (2005) (Part of the Caribbean Sustainable Fisheries Act Amendment)	11/28/2005	PR: 70 FR 53979 FR: 70 FR 62073	- Moved the aquarium trade species in both the Reef Fish and Coral FMPs into a 'data collection only' category. Inclusion in the data collection only category resulted in no specification of maximum sustainable yield (MSY), optimum yield (OY), or other stock status determination criteria (i.e., fishing mortality, biomass, minimum stock size threshold, maximum fishing mortality threshold) for these species due to no real need for federal conservation and management of these species. Consequently, existing regulations defining a marine aquarium fish as "a Caribbean reef fish that is smaller than 5.5 inches (14.0 cm) total length" and restricting the harvest of a marine aquarium fish to hand-held dip nets or hand-held slurp guns (50 CFR 622.41§(b)) were eliminated. Described and identified essential fish habitat (EFH) according to functional relationships between life history stages of federally managed species and Caribbean marine and estuarine habitats. The EFH for the coral fishery in the U.S. Caribbean consists of all waters from mean low water to the outer boundary of the EEZ – habitats used by larvae – and coral and hard bottom substrates

Fishery Management Plan or Amendment	Final Rule Effective Date	Federal Register Notice	Major Actions
			from mean low water to 100 fathoms depth – used by other life stages.
Amendment #3 to the Coral FMP (2011) (Part of the 2011 Caribbean Annual Catch Limit Amendment)	1/30/2012	PR: 76 FR 68711 FR: 76 FR 82414	- Established management reference points, ACLs, and accountability measures (AMs) for species in the Coral FMP, including aquarium trade species, which were not determined to be undergoing overfishing. The ACL for aquarium trade species is a U.S. Caribbean-wide ACL. The U.S. Caribbean-wide ACL for the aquarium trade species was established using landings data from the Puerto Rico commercial and recreational sectors. Established framework measures for species in the Coral FMP.
Amendment #4 to the Coral FMP: Seagrass Management (2013)	7/5/2013	PR: 78 FR 14503 FR: 78 FR 33255	Removed seagrass species from the Coral FMP as there was no known targeted or indirect harvest of any seagrass species from the EEZ or from Puerto Rico or USVI state waters, and future harvest was not anticipated.
Amendment #5 to the Coral FMP (2015) (Part of the Comprehensive Amendment to the U.S. Caribbean Fishery Management Plans: Application of Accountability Measures)	6/10/2016	NOA: 81 FR 5978 PR: 81 FR 9800 FR: 81 FR 29166	- Revised language within the FMP to be consistent with language in the implementing regulations at 50 CFR Part 622 describing the application of AMs in the U.S. Caribbean EEZ. Clarified that any AM-based closure would only apply for the fishing year for which it was implemented, consistent with the Council's intent.

Appendix D. Universe of Species Considered for the St. Thomas/St. John Fishery Management Plan

List of species considered by the Caribbean Fishery Management Council for inclusion in the St. Thomas/St. John Fishery Management Plan (FMP) and the applicable selection criterion under Action 2, Preferred Alternative 2 (Table D.1). Comparison of stock complex organization under the U.S. Caribbean-wide Reef Fish FMP and the St. Thomas/St. John FMP as organized under Action 3, Preferred Alternative 3 is shown in Table D.2. Stock organization under the Spiny Lobster and Queen Conch FMPs would be the same as under the St. Thomas/St. John FMP, as these two stocks would continue to be managed individually. All coral species managed under the Coral FMP (Table D.1) would be managed in a Corals stock complex under the St. Thomas/St. John FMP, although additional coral species (see Appendix E) would be added to that stock complex. Similarly, all sea urchin and sea cucumber species that were previously managed in the Aquarium Trade Invertebrates stock complex under the Coral FMP (Table D.1) would be managed in either the Sea urchins stock complex or the Sea cucumbers stock complex under the St. Thomas/St. John FMP along with additional sea urchin and sea cucumber species that occur within the St. Thomas/St. John management area (see Appendix E).

Table D.1. Species considered for management in the St. Thomas/St. John FMP including species that were previously managed in the U.S. Caribbean Reef Fish, Spiny Lobster, Queen Conch, and Coral FMPs and species that were not previously managed, but that were reported in St. Thomas/St. John landings data.

Group	Scientific name	Common name	Previously Managed	Applicable Criterion
Lobster	*Panulirus argus*	Caribbean spiny lobster	Yes	A
Conch	*Lobatus gigas*	Queen conch	Yes	A
Angelfishes	*Holacanthus ciliaris*	Queen angelfish	Yes	C
Angelfishes	*Pomacanthus arcuatus*	Gray angelfish	Yes	C
Angelfishes	*Pomacanthus paru*	French angelfish	Yes	C
Boxfishes	*Acanthostracion polygonius*	Honeycomb cowfish	Yes	B
Boxfishes	*Acanthostracion quadricornis*	Scrawled cowfish	Yes	B
Boxfishes	*Lactophrys trigonus*	Trunkfish	Yes	B
Boxfishes	*Lactophrys bicaudalis*	Spotted trunkfish	Yes	B
Boxfishes	*Lactophrys triqueter*	Smooth trunkfish	Yes	B
Filefishes	*Aluterus scriptus*	Scrawled filefish	Yes	B
Filefishes	*Cantherhines macrocerus*	Whitespotted filefish	Yes	B
Goatfishes	*Pseudupeneus maculatus*	Spotted goatfish	Yes	B
Goatfishes	*Mulloidichthys martinicus*	Yellow goatfish	Yes	B
Groupers	*Epinephelus striatus*	Nassau Grouper	Yes	A
Groupers	*Epinephelus itajara*	Goliath grouper	Yes	A
Groupers	*Cephalopholis fulva*	Coney	Yes	C
Groupers	*Cephalopholis cruentata*	Graysby	Yes	B
Groupers	*Epinephelus guttatus*	Red hind	Yes	A
Groupers	*Epinephelus adscensionis*	Rock hind	Yes	B
Groupers	*Mycteroperca bonaci*	Black grouper	Yes	A

Group	Scientific name	Common name	Previously Managed	Applicable Criterion
Groupers	*Epinephelus morio*	Red grouper	Yes	A
Groupers	*Mycteroperca tigris*	Tiger grouper	Yes	A
Groupers	*Mycteroperca venenosa*	Yellowfin grouper	Yes	A
Groupers	*Hyporthodus mystacinus*	Misty grouper	Yes	C
Groupers	*Hyporthodus flavolimbatus*	Yellowedge grouper	Yes	A
Grunts	*Haemulon plumieri*	White grunt	Yes	C
Grunts	*Haemulon album*	Margate	Yes	C
Grunts	*Haemulon aurolineatum*	Tomtate	Yes	B
Grunts	*Haemulon sciurus*	Bluestriped grunt	Yes	C
Grunts	*Haemulon flavolineatum*	French grunt	Yes	B
Grunts	*Anisotremus virginicus*	Porkfish	Yes	B
Jacks	*Caranx crysos*	Blue runner	Yes	D
Jacks	*Caranx latus*	Horse-eye jack	Yes	B
Jacks	*Caranx lugubris*	Black jack	Yes	B
Jacks	*Seriola rivoliana*	Almaco jack	Yes	B
Jacks	*Caranx ruber*	Bar jack	Yes	B
Jacks	*Seriola dumerili*	Greater amberjack	Yes	B
Jacks	*Caranx bartholomaei*	Yellow jack	Yes	B
Parrotfishes	*Scarus coeruleus*	Blue parrotfish	Yes	A
Parrotfishes	*Scarus coelestinus*	Midnight parrotfish	Yes	A
Parrotfishes	*Scarus taeniopterus*	Rainbow parrotfish	Yes	A
Parrotfishes	*Scarus vetula*	Queen parrotfish	Yes	C
Parrotfishes	*Scarus guacamaia*	Princess parrotfish	Yes	C
Parrotfishes	*Sparisoma rubripinne*	Redfin parrotfish	Yes	C
Parrotfishes	*Sparisoma chrysopterum*	Redtail parrotfish	Yes	C
Parrotfishes	*Sparisoma viride*	Stoplight parrotfish	Yes	C
Parrotfishes	*Sparisoma aurofrenatum*	Redband parrotfish	Yes	C
Parrotfishes	*Scarus iseri*	Striped parrotfish	Yes	C
Porgies	*Calamus bajonado*	Jolthead porgy	Yes	C
Porgies	*Archosargus rhomboidalis*	Sea bream	Yes	C
Porgies	*Calamus penna*	Sheepshead porgy	Yes	C
Porgies	*Calamus pennatula*	Pluma	**	-
Snappers	*Apsilus dentatus*	Black snapper	Yes	A
Snappers	*Lutjanus buccanella*	Blackfin snapper	Yes	A
Snappers	*Lutjanus vivanus*	Silk snapper	Yes	A
Snappers	*Rhomboplites aurorubens*	Vermilion snapper	Yes	A
Snappers	*Pristipomoides aquilonaris*	Wenchman	Yes	B
Snappers	*Pristipomoides macrophthalmus*	Cardinal snapper	Yes	B
Snappers	*Etelis oculatus*	Queen snapper	Yes	D
Snappers	*Lutjanus griseus*	Gray snapper	Yes	B
Snappers	*Lutjanus synagris*	Lane snapper	Yes	A
Snappers	*Lutjanus analis*	Mutton snapper	Yes	A
Snappers	*Lutjanus jocu*	Dog snapper	Yes	B
Snappers	*Lutjanus apodus*	Schoolmaster	Yes	B
Snappers	*Lutjanus mahogani*	Mahogany snapper	Yes	B
Snappers	*Ocyurus chrysurus*	Yellowtail snapper	Yes	A
Squirrelfishes	*Myripristis jacobus*	Blackbar soldierfish	Yes	B
Squirrelfishes	*Priacanthus arenatus*	Bigeye	Yes	B
Squirrelfishes	*Holocentrus rufus*	Longspine squirrelfish	Yes	***
Squirrelfishes	*Holocentrus adscensionis*	Squirrelfish	Yes	B
Surgeonfishes	*Acanthurus coeruleus*	Blue tang	Yes	C

Group	Scientific name	Common name	Previously Managed	Applicable Criterion
Surgeonfishes	*Acanthurus bahianus*	Ocean surgeonfish	Yes	C
Surgeonfishes	*Acanthurus chirurgus*	Doctorfish	Yes	C
Tilefishes	*Caulolatilus cyanops*	Blackline tilefish	Yes	B
Tilefishes	*Malacanthus plumieri*	Sand tilefish	Yes	B
Triggerfishes	*Canthidermis sufflamen*	Ocean triggerfish	Yes	B
Triggerfishes	*Balistes vetula*	Queen triggerfish	Yes	D
Triggerfishes	*Xanthichthys rigens*	Sargassum triggerfish	Yes	B
Triggerfishes	*Melichthys niger*	Black durgon[75]	Yes	B
Wrasses	*Lachnolaimus maximus*	Hogfish	Yes	C
Wrasses	*Halichoeres radiatus*	Puddingwife	Yes	B
Wrasses	*Bodianus rufus*	Spanish hogfish	Yes	B
Aquarium Trade Reef Fish	*Antennarius spp.*	Frogfish	Yes	B
Aquarium Trade Reef Fish	*Apogon maculatus*	Flamefish	Yes	B
Aquarium Trade Reef Fish	*Astrapogen stellatus*	Conchfish	Yes	B
Aquarium Trade Reef Fish	*Ophioblennius atlanticus*	Redlip blenny	Yes	B
Aquarium Trade Reef Fish	*Bothus lunatus*	Peacock flounder	Yes	B
Aquarium Trade Reef Fish	*Chaetodon aculeatus*	Longsnout butterflyfish	Yes	B
Aquarium Trade Reef Fish	*Chaetodon capistratus*	Foureye butterflyfish	Yes	B
Aquarium Trade Reef Fish	*Chaetodon ocellatus*	Spotfin butterflyfish	Yes	B
Aquarium Trade Reef Fish	*Chaetodon striatus*	Banded butterflyfish	Yes	B
Aquarium Trade Reef Fish	*Amblycirrhitus pinos*	Redspotted hawkfish	Yes	B
Aquarium Trade Reef Fish	*Dactylopterus volitans*	Flying gurnard	Yes	B
Aquarium Trade Reef Fish	*Chaetodipterus faber*	Atlantic spadefish	Yes	B
Aquarium Trade Reef Fish	*Gobiosoma oceanops*	Neon goby	Yes	B
Aquarium Trade Reef Fish	*Priolepis hipoliti*	Rusty goby	Yes	B
Aquarium Trade Reef Fish	*Gramma loreto*	Royal gramma	Yes	B
Aquarium Trade Reef Fish	*Clepticus parrae*	Creole wrasse	Yes	B
Aquarium Trade Reef Fish	*Halichoeres cyanocephalus*	Yellowcheek wrasse	Yes	B
Aquarium Trade Reef Fish	*Halichoeres garnoti*	Yellowhead wrasse	Yes	B
Aquarium Trade Reef Fish	*Halichoeres maculipinna*	Clown wrasse	Yes	B

[75] Black durgon was previously listed incorrectly as a filefish in the species table in Appendix A to Part 622 (Caribbean Reef Fish).

Group	Scientific name	Common name	Previously Managed	Applicable Criterion
Aquarium Trade Reef Fish	*Hemipteronotus novacula*	Pearly razorfish	Yes	B
Aquarium Trade Reef Fish	*Hemipteronotus splendens*	Green razorfish	Yes	B
Aquarium Trade Reef Fish	*Thalassoma bifasciatum*	Bluehead wrasse	Yes	B
Aquarium Trade Reef Fish	*Echidna catenata*	Chain moray	Yes	B
Aquarium Trade Reef Fish	*Gymnothorax funebris*	Green moray	Yes	B
Aquarium Trade Reef Fish	*Gymnothorax miliaris*	Goldentail moray	Yes	B
Aquarium Trade Reef Fish	*Ogcocepahalus spp.*	Batfish	Yes	B
Aquarium Trade Reef Fish	*Myrichthys ocellatus*	Goldspotted eel	Yes	B
Aquarium Trade Reef Fish	*Opistognathus aurifrons*	Yellowhead jawfish	Yes	B
Aquarium Trade Reef Fish	*Opistognathus whitehursti*	Dusky jawfish	Yes	B
Aquarium Trade Reef Fish	*Centropyge argi*	Cherubfish	Yes	B
Aquarium Trade Reef Fish	*Holacanthus tricolor*	Rock beauty	Yes	B
Aquarium Trade Reef Fish	*Abudefduf saxatilis*	Sergeant major	Yes	B
Aquarium Trade Reef Fish	*Chromis cyanea*	Blue chromis	Yes	B
Aquarium Trade Reef Fish	*Chromis insolata*	Sunshinefish	Yes	B
Aquarium Trade Reef Fish	*Microspathodon chrysurus*	Yellowtail damselfish	Yes	B
Aquarium Trade Reef Fish	*Pomacentrus fuscus*	Dusky damselfish	Yes	B
Aquarium Trade Reef Fish	*Pomacentrus leucostictus*	Beaugregory	Yes	B
Aquarium Trade Reef Fish	*Pomacentrus partitus*	Bicolor damselfish	Yes	B
Aquarium Trade Reef Fish	*Pomacentrus planifrons*	Threespot damselfish	Yes	B
Aquarium Trade Reef Fish	*Priacanthus cruentatus*	Glasseye snapper	Yes	B
Aquarium Trade Reef Fish	*Equetus acuminatus*	High-hat	Yes	B
Aquarium Trade Reef Fish	*Equetus lanceolatus*	Jackknife-fish	Yes	B
Aquarium Trade Reef Fish	*Equetus punctatus*	Spotted drum	Yes	B
Aquarium Trade Reef Fish	*Scorpaenidae*	Scorpionfishes	Yes	B
Aquarium Trade Reef Fish	*Hypoplectrus unicolor*	Butter hamlet	Yes	B

Group	Scientific name	Common name	Previously Managed	Applicable Criterion
Aquarium Trade Reef Fish	*Liopropoma rubre*	Swissguard basslet	Yes	B
Aquarium Trade Reef Fish	*Rypticus saponaceus*	Greater soapfish	Yes	B
Aquarium Trade Reef Fish	*Serranus annularis*	Orangeback bass	Yes	B
Aquarium Trade Reef Fish	*Serranus baldwini*	Lantern bass	Yes	B
Aquarium Trade Reef Fish	*Serranus tabacarius*	Tobaccofish	Yes	B
Aquarium Trade Reef Fish	*Serranus tigrinus*	Harlequin bass	Yes	B
Aquarium Trade Reef Fish	*Serranus tortugarum*	Chalk bass	Yes	B
Aquarium Trade Reef Fish	*Symphurus arawak*	Caribbean tonguefish	Yes	B
Aquarium Trade Reef Fish	*Hippocampus spp.*	Seahorses	Yes	B
Aquarium Trade Reef Fish	*Syngnathus spp.*	Pipefishes	Yes	B
Aquarium Trade Reef Fish	*Synodus intermedius*	Sand diver	Yes	B
Aquarium Trade Reef Fish	*Canthigaster rostrata*	Sharpnose puffer	Yes	B
Aquarium Trade Reef Fish	*Diodon hystrix*	Porcupinefish	Yes	B
Hydrocorals	*Millepora* spp.	Fire corals	Yes	A
Hydrocorals	*Stylaster roseus*	Rose lace corals	Yes	A
Soft corals	*Erythropodium caribaeorum*	Encrusting gorgonian	Yes	A
Soft corals	*Iciligorgia schrammi*	Deepwater sea fan	Yes	A
Soft corals	*Briareum asbestinum*	Corky sea finger	Yes	A
Soft corals	*Carijoa riisei*	Snowflake coral	Yes	A
Soft corals	*Telesto* spp.	-	Yes	A
Gorgonian corals	*Ellisella* spp.	Sea whips	Yes	A
Gorgonian corals	*Gorgonia flabellum*	Venus sea fan	Yes	A
Gorgonian corals	*G. mariae*	Venus sea fan	Yes	A
Gorgonian corals	*G. ventalina*	Common sea fan	Yes	A
Gorgonian corals	*Pseudopterogorgia acerosa*	Venus sea fan	Yes	A
Gorgonian corals	*P. albatrossae*	-	Yes	A
Gorgonian corals	*P. americana*	Slimy sea plume	Yes	A
Gorgonian corals	*P. bipinnata*	Bipinnate plume	Yes	A
Gorgonian corals	*P. rigida*	-	Yes	A

Group	Scientific name	Common name	Previously Managed	Applicable Criterion
Gorgonian corals	*Pterogorgia anceps*	Angular sea whip	Yes	A
Gorgonian corals	*P. citrina*	Yellow sea whip	Yes	A
Gorgonian corals	*Eunicea calyculata*	Warty sea rod	Yes	A
Gorgonian corals	*E. clavigera*	Knobby candelabra	Yes	A
Gorgonian corals	*E. fusca*	Doughnut sea rod	Yes	A
Gorgonian corals	*E. knighti*	Knight's flexible sea rod	Yes	A
Gorgonian corals	*E. laciniata*	Black sausage coral	Yes	A
Gorgonian corals	*E. laxispica*	Tube-knob candelabrum	Yes	A
Gorgonian corals	*E. mammosa*	Swollen-knob	Yes	A
Gorgonian corals	*E. succinea*	Shelf-knob sea rod	Yes	A
Gorgonian corals	*E. touneforti*	-	Yes	A
Gorgonian corals	*Muricea atlantica*	-	Yes	A
Gorgonian corals	*M. elongata*	Orange spiny rod	Yes	A
Gorgonian corals	*M. laxa*	Delicate spiny rod	Yes	A
Gorgonian corals	*M. muricata*	Spiny sea fan	Yes	A
Gorgonian corals	*M. pinnata*	Long spine sea fan	Yes	A
Gorgonian corals	*Muriceopsis* spp.	-	Yes	A
Gorgonian corals	*M. flavida*	Rough sea plume	Yes	A
Gorgonian corals	*M. sulphurea*	Spiny Gorgonian, Sulfur soft coral	Yes	A
Gorgonian corals	*Plexaura flexuosa*	Bent sea rod	Yes	A
Gorgonian corals	*P. homomalla*	Black sea rod	Yes	A
Gorgonian corals	*Plexaurella dichotoma*	Slit-pore sea rod	Yes	A
Gorgonian corals	*P. fusifera*	Sea rod	Yes	A
Gorgonian corals	*P. grandiflora*	Slit-pore sea rod	Yes	A
Gorgonian corals	*P. grisea*	Gray sea rod	Yes	A
Gorgonian corals	*P. nutans*	Giant slit-pore	Yes	A

Group	Scientific name	Common name	Previously Managed	Applicable Criterion
Gorgonian corals	*Pseudoplexaura crucis*	False cross plexaura	Yes	A
Gorgonian corals	*P. flagellosa*	-	Yes	A
Gorgonian corals	*P. porosa*	Porous sea rod	Yes	A
Gorgonian corals	*P. wagenaari*	-	Yes	A
Hard corals	*Acropora cervicornis*	Staghorn coral	Yes	A
Hard corals	*A. palmata*	Elkhorn coral	Yes	A
Hard corals	*A. prolifera*	Fused staghorn	Yes	A
Hard corals	*Agaricia agaricities*	Lettuce leaf coral	Yes	A
Hard corals	*A. fragilis*	Fragile saucer	Yes	A
Hard corals	*A. lamarcki*	Lamarck's sheet	Yes	A
Hard corals	*A. tenuifolia*	Thin leaf lettuce	Yes	A
Hard corals	*Leptoseris cucullata*	Sunray lettuce	Yes	A
Hard corals	*Stephanocoenia michelinii*	Blushing star	Yes	A
Hard corals	*Eusmilia fastigiata*	Flower coral	Yes	A
Hard corals	*Tubastrea aurea*	Cup coral	Yes	A
Hard corals	*Cladocora arbuscula*	Tube coral	Yes	A
Hard corals	*Colpophyllia natans*	Boulder coral	Yes	A
Hard corals	*Diploria clivosa*	Knobby brain coral	Yes	A
Hard corals	*D. labyrinthiformis*	Grooved brain	Yes	A
Hard corals	*D. strigosa*	Symmetrical brain	Yes	A
Hard corals	*Favia fragum*	Golfball coral	Yes	A
Hard corals	*Manicina areolata*	Rose coral	Yes	A
Hard corals	*M. mayori*	Tortugas rose coral	Yes	A
Hard corals	*Montastrea annularis*	Boulder star coral	Yes	A
Hard corals	*M. cavernosa*	Great star coral	Yes	A
Hard corals	*Solenastrea bournoni*	Smooth star coral	Yes	A
Hard corals	*Dendrogyra cylindrus*	Pillar coral	Yes	A
Hard corals	*Dichocoenia stellaris*	Pancake star	Yes	A
Hard corals	*D. stokesi*	Elliptical star	Yes	A
Hard corals	*Meandrina meandrites*	Maze coral	Yes	A
Hard corals	*Isophyllastrea rigida*	Rough star coral	Yes	A
Hard corals	*Isophyllia sinuosa*	Sinuous cactus	Yes	A
Hard corals	*Mussa angulosa*	Large flower coral	Yes	A
Hard corals	*Mycetophyllia aliciae*	Thin fungus coral	Yes	A
Hard corals	*M. danae*	Fat fungus coral	Yes	A
Hard corals	*M. ferox*	Grooved fungus	Yes	A
Hard corals	*M. lamarckiana*	Fungus coral	Yes	A
Hard corals	*Scolymia cubensis*	Artichoke coral	Yes	A
Hard corals	*S. lacera*	Solitary disk	Yes	A
Hard corals	*Oculina diffusa*	Ivory bush coral	Yes	A
Hard corals	*Madracis decactis*	Ten-ray star coral	Yes	A
Hard corals	*M. mirabilis*	Yellow pencil	Yes	A
Hard corals	*Porites astreoides*	Mustard hill coral	Yes	A
Hard corals	*P. branneri*	Blue crust coral	Yes	A
Hard corals	*P. divaricata*	Small finger coral	Yes	A
Hard corals	*P. porites*	Finger coral	Yes	A
Hard corals	*Astrangia solitaria*	Dwarf cup coral	Yes	A
Hard corals	*Phyllangia americana*	Hidden cup coral	Yes	A

Group	Scientific name	Common name	Previously Managed	Applicable Criterion
Hard corals	*Siderastrea radians*	Lesser starlet	Yes	A
Hard corals	*S. siderea*	Massive starlet	Yes	A
Black corals	*Antipathes spp.*	Bushy black coral	Yes	A
Black corals	*Stichopathes spp.*	Wire coral	Yes	A
Aquarium Trade Invertebrates	*Aphimedon compressa*	Erect rope sponge	Yes	B
Aquarium Trade Invertebrates	*Chondrilla nucula*	Chicken liver sponge	Yes	B
Aquarium Trade Invertebrates	*Cynachirella alloclada*	-	Yes	B
Aquarium Trade Invertebrates	*Geodia neptuni*	Potato sponge	Yes	B
Aquarium Trade Invertebrates	*Haliclona* spp.	Finger sponge	Yes	B
Aquarium Trade Invertebrates	*Myriastra* spp.	-	Yes	B
Aquarium Trade Invertebrates	*Niphates digitalis*	Pink vase sponge	Yes	B
Aquarium Trade Invertebrates	*N. erecta*	Lavender rope sponge	Yes	B
Aquarium Trade Invertebrates	*Spinosella policifera*	-	Yes	B
Aquarium Trade Invertebrates	*S. vaginalis*	Branching vase sponge	Yes	B
Aquarium Trade Invertebrates	*Tethya crypta*	-	Yes	B
Aquarium Trade Invertebrates	*Aiptasia tagetes*	Pale anemone	Yes	B
Aquarium Trade Invertebrates	*Bartholomea annulata*	Corkscrew anemone	Yes	B
Aquarium Trade Invertebrates	*Condylactis gigantea*	Giant pink-tipped anemone	Yes	B
Aquarium Trade Invertebrates	*Hereractis lucida*	Knobby anemone	Yes	B
Aquarium Trade Invertebrates	*Lebrunia* spp.	Staghorn anemone	Yes	B
Aquarium Trade Invertebrates	*Stichodactyla helianthus*	Sun anemone	Yes	B
Aquarium Trade Invertebrates	*Zoanthus* spp.	Sea mat	Yes	B
Aquarium Trade Invertebrates	*Discosoma* spp. (formerly Rhodactis)	False coral	Yes	B
Aquarium Trade Invertebrates	*Ricordia florida*	Florida false coral	Yes	B
Aquarium Trade Invertebrates	*Sabellastarte* spp.	Tube worms	Yes	B
Aquarium Trade Invertebrates	*S. magnifica*	Magnificent duster	Yes	B
Aquarium Trade Invertebrates	*Spirobranchus giganteus*	Christmas tree worm	Yes	B
Aquarium Trade Invertebrates	*Tridachia crispata*	Lettuce sea slug	Yes	B

Group	Scientific name	Common name	Previously Managed	Applicable Criterion
Aquarium Trade Invertebrates	*Oliva reticularis*	Netted olive	Yes	B
Aquarium Trade Invertebrates	*Cyphoma gibbosum*	Flamingo tongue	Yes	B
Aquarium Trade Invertebrates	*Lima* spp.	Fileclams	Yes	B
Aquarium Trade Invertebrates	*L. scabra*	Rough fileclam	Yes	B
Aquarium Trade Invertebrates	*Spondylus americanus*	Atlantic thorny oyster	Yes	B
Aquarium Trade Invertebrates	*Octopus* spp. (except O.vulgaris)	-	Yes	B
Aquarium Trade Invertebrates	*Alpheaus armatus*	Snapping shrimp	Yes	B
Aquarium Trade Invertebrates	*Paguristes* spp.	Hermit crabs	Yes	B
Aquarium Trade Invertebrates	*P. cadenati*	Red reef hermit	Yes	B
Aquarium Trade Invertebrates	*Percnon gibbesi*	Nimble spray crab	Yes	B
Aquarium Trade Invertebrates	*Lysmata* spp.	Peppermint shrimp	Yes	B
Aquarium Trade Invertebrates	*Thor amboinensis*	Anemone shrimp	Yes	B
Aquarium Trade Invertebrates	*Mithrax* spp.	Clinging crabs	Yes	B
Aquarium Trade Invertebrates	*M. cinctimanus*	Banded clinging	Yes	B
Aquarium Trade Invertebrates	*M. sculptus*	Green clinging	Yes	B
Aquarium Trade Invertebrates	*Stenorhynchus seticornis*	Yellowline arrow	Yes	B
Aquarium Trade Invertebrates	*Periclimenes* spp.	Cleaner shrimp	Yes	B
Aquarium Trade Invertebrates	*Gonodactylus* spp.	-	Yes	B
Aquarium Trade Invertebrates	*Lysiosquilla* spp.	-	Yes	B
Aquarium Trade Invertebrates	*Stenopus hispidus*	Banded shrimp	Yes	B
Aquarium Trade Invertebrates	*S. scutellatus*	Golden shrimp	Yes	B
Aquarium Trade Invertebrates	*Analcidometra armata*	Swimming crinoid	Yes	B
Aquarium Trade Invertebrates	*Davidaster* spp.	Crinoids	Yes	B
Aquarium Trade Invertebrates	*Nemaster* spp.	Crinoids	Yes	B
Aquarium Trade Invertebrates	*Astropecten* spp.	Sand stars	Yes	B
Aquarium Trade Invertebrates	*Linckia guildingii*	Common comet star	Yes	B

Group	Scientific name	Common name	Previously Managed	Applicable Criterion
Aquarium Trade Invertebrates	*Ophidiaster guildingii*	Comet star	Yes	B
Aquarium Trade Invertebrates	*Oreaster reticulatus*	Cushion sea star	Yes	B
Aquarium Trade Invertebrates	*Astrophyton muricatum*	Giant basket star	Yes	B
Aquarium Trade Invertebrates	*Ophiocoma* spp.	Brittlestars	Yes	B
Aquarium Trade Invertebrates	*Ophioderma* spp.	Brittlestars	Yes	B
Aquarium Trade Invertebrates	*O. rubicundum*	Ruby brittlestar	Yes	B
Aquarium Trade Invertebrates	*Diadema antillarum*	Long-spined urchin	Yes	E
Aquarium Trade Invertebrates	*Echinometra* spp.	Purple urchin	Yes	E
Aquarium Trade Invertebrates	*Eucidaris tribuloides*	Pencil urchin	Yes	E
Aquarium Trade Invertebrates	*Lytechinu*s spp.	Pin cushion urchin	Yes	E
Aquarium Trade Invertebrates	*Tripneustes ventricosus*	Sea egg	Yes	E
Aquarium Trade Invertebrates	*Holothuria* spp.	Sea cucumbers	Yes	E
Aquarium Trade Invertebrates	Subphylum Urochordata	Tunicates	Yes	B
Barracuda	*Sphyraena barracuda*	Great barracuda	No	B
Dolphinfish	*Coryphaena hippurus*	Dolphin	No	D
Groupers	*Mycteroperca interstitialis*	Yellowmouth grouper	No	C
Grunts	*Haemulon melanurum*	Cottonwick	No	-
Jacks	*Caranx hippos*	Crevalle jack	No	B
Jacks	*Elagatis bipinnulata*	Rainbow runner	No	B
Mullet	*Mugil curema*	White mullet	No	-
Porgies	*Calamus calamus*	Saucereye porgy	**	C
Sharks	*Galeocerdo cuvier*	Tiger shark	No	-
Sharks	*Carcharhinus perezii*	Reef shark	No	-
Sharks	*Negaprion brevirostris*	Lemon shark	No	-
Sharks	*Sphyrna mokarran*	Great hammerhead shark	No	-
Shellfish	*Cittarium pica*	West Indian topsnail	No	-
Swordfish	*Xiphias gladius*	Swordfish	No	-
Tunas and Mackerels	*Euthynnus pelamis*	Skipjack tuna	No	-
Tunas and Mackerels	*Euthynnus alletteratus*	Little tunny	No	B
Tunas and Mackerels	*Thunnus albacares*	Yellowfin tuna	No	-
Tunas and Mackerels	*Thunnus atlanticus*	Blackfin tuna	No	B
Tunas and Mackerels	*Thunnus obesus*	Bigeye tuna	No	-
Tunas and Mackerels	*Scomberomorus cavalla*	King mackerel	No	B

Group	Scientific name	Common name	Previously Managed	Applicable Criterion
Tunas and Mackerels	*Scomberomorus regalis*	Cero mackerel	No	B
Tunas and Mackerels	*Acanthocybium solandri*	Wahoo	No	D

**Under the Reef Fish FMP, which was incorporated into the St. Thomas/St. John FMP under action 1, the Council managed pluma porgy in the Scups & Porgies stock complex with jolthead, sea bream, and sheepshead. Landings for the porgies were previously reported by the stock complex, and most landings were recorded as pluma porgy. Following the changes to USVI data reporting forms, where the porgies were reported by species, landings were recorded as saucereye. Though pluma porgy and saucereye porgy are different species, it was assumed that fishers were landing the same species. Therefore, saucereye porgy was not considered a species new to management. Pluma porgy will not be managed, but rather was assumed to be the saucereye porgy.
***During their 153rd regular meeting in August 2015, the Council determined that longspine squirrelfish did not require conservation and management because it was not targeted, was not highly susceptible to fishing pressure, and was not at risk of overfishing.

Table D.2. Stocks and stock complex organization under the St. Thomas/St. John FMP compared to the stock/stock complex organization under the U.S. Caribbean-wide Reef Fish FMP.

Scientific name	Common name	Reef Fish FMP	St. Thomas/St. John FMP
Apsilus dentatus	Black snapper	Snapper Unit 1	Snapper 1
Lutjanus buccanella	Blackfin snapper	Snapper Unit 1	Snapper 1
Lutjanus vivanus	Silk snapper	Snapper Unit 1	Snapper 1
Rhomboplites aurorubens	Vermilion snapper	Snapper Unit 1	Snapper 1
Pristipomoides aquilonaris	Wenchman	Snapper Unit 1	removed
Pristipomoides macrophthalmus	Cardinal snapper	Snapper Unit 2	removed
Etelis oculatus	Queen snapper	Snapper Unit 2	Snapper 2
Lutjanus synagris	Lane snapper	Snapper Unit 3	Snapper 3
Lutjanus analis	Mutton snapper	Snapper Unit 3	Snapper 3
Lutjanus griseus	Gray snapper	Snapper Unit 3	removed
Lutjanus jocu	Dog snapper	Snapper Unit 3	removed
Lutjanus apodus	Schoolmaster	Snapper Unit 3	removed
Lutjanus mahogani	Mahogany snapper	Snapper Unit 3	removed
Ocyurus chrysurus	Yellowtail snapper	Snapper Unit 4	Snapper 4
Epinephelus striatus	Nassau Grouper	Grouper Unit 1	Grouper 1
Epinephelus itajara	Goliath grouper	Grouper Unit 2	Grouper 2
Cephalopholis fulva	Coney	Grouper Unit 3	Grouper 3
Cephalopholis cruentata	Graysby	Grouper Unit 3	removed
Epinephelus guttatus	Red hind	Grouper Unit 3	Grouper 3
Epinephelus adscensionis	Rock hind	Grouper Unit 3	removed
Mycteroperca bonaci	Black grouper	Grouper Unit 4	Grouper 4

Scientific name	Common name	Reef Fish FMP	St. Thomas/St. John FMP
Epinephelus morio	Red grouper	Grouper Unit 4	Grouper 4
Mycteroperca tigris	Tiger grouper	Grouper Unit 4	Grouper 4
Mycteroperca venenosa	Yellowfin grouper	Grouper Unit 4	Grouper 4
Hyporthodus mystacinus	Misty grouper	Grouper Unit 5	Grouper 5
Epinephelus flavolimbatus	Yellowedge grouper	Grouper Unit 5	Grouper 5
Mycteroperca interstitialis	Yellowmouth grouper	not managed	Grouper 5
Scarus coeruleus	Blue parrotfish	Parrotfish	Parrotfish 1
Scarus coelestinus	Midnight parrotfish	Parrotfish	Parrotfish 1
Scarus guacamaia	Rainbow parrotfish	Parrotfish	Parrotfish 1
Scarus taeniopterus	Princess parrotfish	Parrotfish	Parrotfish 2
Scarus vetula	Queen parrotfish	Parrotfish	Parrotfish 2
Sparisoma rubripinne	Redfin parrotfish	Parrotfish	Parrotfish 2
Sparisoma chrysopterum	Redtail parrotfish	Parrotfish	Parrotfish 2
Sparisoma viride	Stoplight parrotfish	Parrotfish	Parrotfish 2
Sparisoma aurofrenatum	Redband parrotfish	Parrotfish	Parrotfish 2
Scarus iseri	Striped parrotfish	Parrotfish	Parrotfish 2
Holacanthus ciliaris	Queen angelfish	Angelfish	Angelfish
Pomacanthus arcuatus	Gray angelfish	Angelfish	Angelfish
Pomacanthus paru	French angelfish	Angelfish	Angelfish
Acanthurus coeruleus	Blue tang	Surgeonfish	Surgeonfish
Acanthurus bahianus	Ocean surgeonfish	Surgeonfish	Surgeonfish
Acanthurus chirurgus	Doctorfish	Surgeonfish	Surgeonfish
Haemulon plumieri	White grunt	Grunts	Grunts 1
Haemulon sciurus	Bluestriped grunt	Grunts	Grunts 1
Haemulon album	Margate	Grunts	Grunts 2
Haemulon aurolineatum	Tomtate	Grunts	removed
Haemulon flavolineatum	French grunt	Grunts	removed
Anisotremus virginicus	Porkfish	Grunts	removed
Canthidermis sufflamen	Ocean triggerfish	Triggerfish	removed
Balistes vetula	Queen triggerfish	Triggerfish	Triggerfish
Xanthichthys rigens	Sargassum triggerfish	Triggerfish	removed
Melichthys niger	Black durgon	Triggerfish*	removed
Lachnolaimus maximus	Hogfish	Wrasses	Wrasses
Halichoeres radiatus	Puddingwife	Wrasses	removed
Bodianus rufus	Spanish hogfish	Wrasses	removed
Caranx crysos	Blue runner	Jacks	Jacks
Caranx latus	Horse-eye jack	Jacks	removed
Caranx lugubris	Black jack	Jacks	removed

Scientific name	Common name	Reef Fish FMP	St. Thomas/St. John FMP
Seriola rivoliana	Almaco jack	Jacks	removed
Caranx ruber	Bar jack	Jacks	removed
Seriola dumerili	Greater amberjack	Jacks	removed
Caranx bartholomaei	Yellow jack	Jacks	removed
Calamus bajonado	Jolthead porgy	Porgies	Porgies
Archosargus rhomboidalis	Sea bream	Porgies	Porgies
Calamus penna	Sheepshead porgy	Porgies	Porgies
Calamus pennatula	Pluma	Porgies	removed
Calamus calamus	Saucereye porgy	not managed	Porgies
Myripristis jacobus	Blackbar soldierfish	Squirrelfish	removed
Priacanthus arenatus	Bigeye	Squirrelfish	removed
Holocentrus rufus	Longspine squirrelfish	Squirrelfish	removed
Holocentrus adscensionis	Squirrelfish	Squirrelfish	removed
Acanthostracion polygonius	Honeycomb cowfish	Boxfish	removed
Acanthostracion quadricornis	Scrawled cowfish	Boxfish	removed
Lactophrys trigonus	Trunkfish	Boxfish	removed
Lactophrys bicaudalis	Spotted trunkfish	Boxfish	removed
Lactophrys triqueter	Smooth trunkfish	Boxfish	removed
Aluterus scriptus	Scrawled filefish	Filefish	removed
Cantherhines macrocerus	Whitespotted filefish	Filefish	removed
Pseudupeneus maculatus	Spotted goatfish	Goatfish	removed
Mulloidichthys martinicus	Yellow goatfish	Goatfish	removed
Caulolatilus cyanops	Blackline tilefish	Tilefish	removed
Malacanthus plumieri	Sand tilefish	Tilefish	removed
Coryphaena hippurus	Dolphin	not managed	Dolphin
Acanthocybium solandri	Wahoo	not managed	Wahoo

Appendix E. Partial List of Coral and Echinoderm Species Included in the St. Thomas/St. John Fishery Management Plan

The following species are known to occur in the St. Thomas/St. John exclusive economic zone, and thus would be included for management in the St. Thomas/St. John FMP. This list is not exhaustive, as newly discovered species, or species newly documented in St. Thomas/St. John EEZ, may be not included at this time.

The Council intends to manage all species of corals, whether identified on this list or not. Corals included in the St. Thomas/St. John FMP include the phylum Cnidaria (formerly Coelenterata) 1) Class Hydrozoa: Subclass Hydroidolina - Order Anthoathecata - Family Milleporidae and Family Stylasteridae; 2) Class Anthozoa: Subclass Octocorallia (soft corals, gorgonians, sea pansies, sea pens) - Order Alcyonacea (soft corals), and Order Pennatulacea (sea pens); Subclass Hexacorallia - Order Scleractinia (stony corals), and Order Anthipatharia (black corals).

I. Phylum Cnidaria

A. Class Hydrozoa (hydrocorals)
1. Order Anthoathecata (hydroids)
a. Family Milleporidae
Millepora alcicornis
Millepora spp., Fire corals
b. . Family Stylasteridae
Stylaster roseus,
Rose lace corals

B1. Class Anthozoa (Anthozoans)

Subclass Octocorallia

1. Order Alcyonacea (soft corals)
a. Family Acanthogorgiidae
Acanthogorgia aspera
b. Family Anthothelidae
Erythropodium caribaeorum,
Encrusting gorgonian
Iciligorgia schrammi,
Deepwater sea fan
c. Family Briareidae
Briareum asbestinum, Corky sea finger
d. Family Chrysogorgiidae
Chalcogorgia spp.
Chrysogorgia desbonni
Chrysogorgia spp.
Iridogorgia spp.
Metalogorgia spp.
Pleurogorgia spp.
Radicipes spp.
Trichogorgia spp.
e. Family Clavulariidae
Carijoa riisei
Stereotelesto corallina
Telesto corallina
T. sanguinea
f. Family Ellisellidae
Ellisella elongata
E. schmitti
Nicella goreaui
g. Family Gorgoniidae
Antillogorgia acerosa,
Sea plume
A. albatrossae
A. americana, Slimy sea plume
A. bipinnata, Bipinnate plume

A. hystrix
A. rigida
A. elisanethae
Gorgonia flabellum, Venus sea fan
G. mariae, Wide-mesh sea fan
G. ventalina, Common sea fan
Leptogorgia barbadensis
L. cardinalis
L. medusa
L. punicea
L. stheno
L. virgulata
Olindagorgia gracilis
Pterogorgia anceps, Angular sea whip
P. citrina, Yellow sea whip

h. Family Keroeididae
Lignella richardi

i. Family Nephtheidae
Pseudodrifa nigra
Stereonephthya portoricensis

j. Family Nidaliidae
Nidalia occidentalis

k. Family Plexauridae
Eunicea calyculata, Warty sea rod
E. clavigera
E. flexuosa, Bent sea rod
E. fusca, Doughnut sea rod
E. knighti
E. laciniata
E. laxispica
E. mammosa, Swollen-knob
E. pinta
E. succinea, Shelf-knob sea rod
E. touneforti
Heterogorgia uatumani
Muricea atlantica
M. elongata, Orange spiny rod
M. laxa, Delicate spiny rod
M. muricata, Spiny sea fan
M. pinnata, Long spine sea fan
Muriceopsis flavida, Rough sea plume
M. petila
M. sulphurea
Paramuricea hirsuta
Plexaura. homomalla, Black sea rod
Plexaurella dichotoma, Slit-pore sea rod
P. grandiflora
P. grisea
P. nutans, Giant slit-pore
Pseudoplexaura crucis
P. flagellosa
P. porosa, Porous sea rod
P. wagenaari
Swiftia exserta
Thesea nivea

l. Family Primnoidae
Callogorgia gracilis
C. americana Americana

m. Family Spongiodermidae
Diodogorgia nodulifera
Titanideum frauenfeldii

2. Order Pennatulacea (sea pens)

a. Family Renillidae
Renilla mulleri
R. reniformis

b. Family Virgulariidae
Stylatula antillarum
S. brasiliensis
S. diadema
S. elegans
Virgularia presbytes

B2. Class Anthozoa

Subclass Hexacorallia

1. Order Scleractinia (stony corals)

a. Family Acroporidae
Acropora cervicornis, Staghorn coral
A. palmata, Elkhorn coral

A. prolifera, Fused staghorn

b. Family Agariciidae

Agaricia agaricites, Lettuce leaf coral

A. fragilis, Fragile saucer

A. grahamae

A. lamarcki, Lamarck's sheet

A. tenuifolia, Thin leaf lettuce

Helioseris cucullata, Sunray lettuce

Leptoseris cailleti

c. Family Astrocoeniidae

Stephanocoenia intersepta, Blushing star

d. Family Caryophylliidae

Phyllangia americana, Hidden cup coral

e. Family Dendrophylliidae

Tubastreacoccinea, Cup coral

f. Family Faviidae

Cladocora arbuscula, Tube coral

Colpophyllia natans, Boulder coral

Diploria clivosa, Knobby brain coral

D. labyrinthiformis, Grooved brain

Favia fragum, Golfball coral

Isophyllia rigida, Rough star coral

I. sinuosa, Sinuous cactus

Manicina areolata, Rose coral

Mussa angulosa, Large flower coral

Pseudodiploria strigosa, Symmetrical brain

Solenastrea bournoni, Smooth star coral

Mycetophyllia aliciae, Thin fungus coral

M.danaana, Fat fungus coral

M. ferox, Grooved fungus

M. lamarckiana, Fungus coral

Scolymia cubensis, Artichoke coral

S. lacera, Solitary disk

g. Family Meandrinidae

Dendrogyra cylindrus, Pillar coral

Dichocoenia stokesii, Elliptical star

Eusmilia fastigiata, Flower coral

Meandrina brasiliensis

M. meandrites, Maze coral

h. Family Merulinidae

Orbicella annularis, Lobed star coral

O. faveolata, Mountainous star coral

O. franksi, Boulder star coral

i. Family Montastraeidae

Montastraea cavernosa, Great star coral

j. Family Oculinidae

Oculina diffusa, Ivory bush coral

O. varicosa

k. Family Pocilloporidae

Madracis decactis, Ten-ray star coral

M. auretenra, Yellow pencil

l. Family Poritidae

Porites astreoides, Mustard hill coral

P. branneri, Blue crust coral

P. divaricata, Small finger coral

P. porites, Finger coral

m. Family Rhizangiidae

Astrangia solitaria, Dwarf cup coral

n. Family Siderastreidae

Siderastrea radians, Lesser starlet

S. siderea, Massive starlet.

2. Order Antipatharia (black corals)

a. Family Antipathidae

Antipathes atlantica
A. caribbeana
A. columnaris
A. furcata
A. gracilis
A. hirta
A. pennacea
A. rigida
A. salix
A. tanacetum
Stichopathes luetkeni
Stichopathes spp., Wire coral

b. Family Aphanipathidae

Aphanipathes abietina
A. filix
A. humilis
A. thyoides

c. Family Schizopathidae

Bathypathes patula
Parantipathes tetrasticha

d. Family Leiopathidae

Leiopathes glaberrima

II. Phylum Echinodermata (echinoderms)

A1. Class Echinoidea (sea urchins)

Subclass Euechinoidea

1. Order Cassiduloida

a. Family Cassidulidae

Cassidulus caribaearum

2. Order Echinolampadoida

a. Family Echinolampadidae

Conolampas sigsbei
Echinolampas depressa

3. Order Spatangoida

a. Family Brissidae

Brissopsis atlantica

b. Family Paleopneustina

Heterobrissus hystrix

c. Family Prenasteridae

Agassizia excentrica

4. Order Diadematoida

a. Family Diadematidae

Diadema antillarum, Long-spined urchin

5. Order Echinothurioida

a. Family Echinothuriidae

Araeosoma belli
A. fenestratum

6. Order Pedinoida

a. Family Pedinidae

Caenopedina cubensis

7. Order Arbacioida

a. Family Arbaciidae

Arbacia punctulata

8. Order Salenioida

a. Family Saleniidae

Salenocidaris profundi
S. varispina

9. Order Camarodonta

a. Family Echinometridae

Echinometra lucunter
E. viridis

b. Family Toxopneustidae

Lytechinus callipeplus
L. euerces
L. variegatus
Tripneustes ventricosus, Sea egg

10. Order Echinoneoida

a. Family Echinoneidae

Echinoneus cyclostomus

A2. Class Echinoidea (sea urchins)

Subclass Perischoechinoidea

1. Order Cidaroida

a. Family Cidaridae

Cidaris rugosa
Eucidaris tribuloides, Pencil urchin
Stylocidaris lineata

Tretocidaris bartletti

B. Class Holothuroidea (sea cucumbers)

1. Order Apodida
   a. Synaptidae
      Euapta lappa

2. Order Dendrochirotida
   a. Family Cucumariidae
      Aslia pygmaea
   b. Family Sclerodactylidae
      Pseudothyone belli,
         Hidden sea cucumber

3. Order Elasipodida
   a. Family Elpidiidae
      Scotoplanes globosa, sea pig
   b. Family Pelagothuriidae
      Enypniastes eximia

4. Order Holothuriida
   a. Family Holothuriidae
      Actinopyga agassizii
      Holothuria spp.
      Holothuria arenicola
      H. floridana,
         Florida sea cucumber
      H. glaberrima
      H. grisea
      H. mexicana,
         Donkey dung sea cucumber
      H. impatiens
      H. parvula
      H. surinamensis
      H. thomasi, Tiger tail sea
         cucumber

5. Order Synallactida
   a. Family Stichopodidae
      Astichopus multifidus,
         Furry sea cucumber
      Isostichopus badionotus,
         Three-rowed sea cucumber
      Eostichopus arnesoni,
         Conical sea cucumber

Appendix F. Alternatives Considered but Rejected

The Caribbean Fishery Management Council (Council) often considers a number of alternatives for a particular purpose and need. Some of these alternatives could be considered reasonable while others are unlikely to accomplish the stated purpose and need. The Council on Environmental Quality guidelines state that if alternatives are eliminated from further analysis, then the supporting document, i.e. this environmental assessment, should briefly discuss the reasons for their elimination (40 CFR 1502.14(a)).

In Action 2 (Stocks Managed under the St. Thomas/St. John Fishery Management Plan [FMP]), the Council rejected a complete alternative as well as a component of two alternatives:

1) As mentioned in the Action 2 discussion, Criterion E was originally considered under **Preferred Alternative 2** (and **Alternative 3**, but this alternative was ultimately also considered but rejected as discussed below) as the final criterion for selecting stocks for inclusion in the St. Thomas/St. John FMP. This criterion would exclude from management species with a level of landings considered to be *de minimis*[76]. No stocks were excluded from management under this criterion during the stock selection process or during subsequent meetings.

Rejected:
Criterion E in Action 2, Preferred Alternative 2 and Alternative 3, would remove from management any stocks for which the total of average reported landings (recreational and commercial) during a pre-defined reporting period were less than X[77] pounds, indicating the fishery is "*de minimis*", unless conservation and management is otherwise required because of the factors identified in Criterion A. Stocks identified for removal under Criterion E would instead be classified as Ecosystem Component species.

Rationale:
At the 163rd Council meeting in August 2018, NMFS staff recommended to the Council that they consider but reject Criterion E described above. The Council's Scientific and Statistical Committee and National Marine Fisheries Service were not ready at that time to define that X level of landings, especially for stocks new to management. Defining that *de minimis* landings level, and ensuring the level was not indicative of a stock or stock complex in need of conservation and management, would require substantial analysis of landings and socio-economic data. The Council would therefore not address *de minimis* landings until the new FMPs are in place and allowed to perform for a period of time adequate to determine that level of

[76] As defined in the Merriam-Webster online dictionary, *de minimis* refers to a quantity lacking significance or importance, or so minor as to merit disregard.
[77] Threshold of landings yet to be determined below which the fishery for stock or stock complex was considered to be *de minimis.*

landings. At the same meeting, the Council added a new Criterion E that would allow the Council to manage any species not identified through the stepwise process in **Alternative 2** that it determines are in need of conservation and management.

2) In Action 2 (Stocks Managed under the St. Thomas/St. John FMP), the Council rejected **Alternative 3** as explained below.

<u>Rejected</u>:
Alternative 3 wouldidentify species to be managed by the Council in waters of the EEZ off St. Thomas/St. John using, in any order, some or all of the criteria presented in **Preferred Alternative 2**. For those species for which landings data are available, the Council would choose a subset (possibly including all) of the **Preferred Alternative 2** criteria and apply those criteria in a pre-defined order to determine if a species should be managed under the St. Thomas/St. John FMP. The criteria under consideration were the same listed for **Preferred Alternative 2**. Briefly, the criteria included (A) the status of the stock and/or if it currently has a harvest prohibition, size limit, or seasonal closure in federal waters, (B) the degree to which the species occurs in state rather than in federal waters and can therefore be affected by federal management, (C) the ecological importance of a species within the coral reef ecosystem, (D) the extent of harvest relative to a pre-established threshold, and (E) other species that the Council determines are in need of conservation and management. Before applying the criteria, the Council would determine the order of consideration. Although the order of criteria application would be pre-defined, it would not necessarily match the order used in **Preferred Alternative 2**. **Alternative 3** presents 325 alternative criteria combinations, from which the Council could choose any approach ranging from a single combination of criteria and order to be applied to all stocks to a different combination of criteria and order to be applied to each stock.

Rationale:
Without guidance from the Council regarding which criteria would be included when applying **Alternative 3**, it is not practically possible to compare all of the alternative outcomes. The Council considered **Alternative 3** and decided not to move forward with the alternative. Therefore, **Alternative 3** was eliminated from further detailed study.

Appendix G. Process and Rationale for the Acceptable Biological Catch (ABC) Control Rule (CR) in Action 4, Preferred Alternative 2

G.1 Process and Rationale for Applying Tier 4 of the Acceptable Biological Catch (ABC) Control Rule

Tier 4 of the ABC CR defines an maximum sustainable yield (MSY) proxy along with maximum fishing mortality threshold (MFMT) and minimum stock size threshold (MSST), with respect to assumptions about fishing mortality rate and biomass, but these measures cannot be quantified due to data limitations. Reflecting the data-limited nature of stocks assigned to Tier 4, the Caribbean Fishery Management Council's (Council) Scientific and Statistical Committee (SSC) chose to specify a sustainable yield level (SYL) for these stocks. The SYL represents a level of catch or yield that the Council's SSC has confidence a stock can sustain through time based on historical trends in catch and the SSC's evaluation of the best scientific information available, including life history information and analysis of the susceptibility of the stock to fishing pressure. Thus, the SYL is similar to the MSY, in that both are measures of catch that can be sustainably taken over the long-term.

The overfishing limit (OFL) is a non-equilibrium (short-term) quantity defined as the annual amount of catch that corresponds to the estimate of the MFMT applied to a stock's abundance. The value of OFL thus increases or decreases in accordance with the abundance of the stock, and MSY is the long-term average of such catches. OFLs are set accounting for this variation and are intended to represent the annual metric that corresponds to MSY. The SYL, though based on long-term landings, accounts for the potential variability in annual landings. To calculate SYL, the control rule allows a scalar to be applied to the landings during the reference period, which accounts for variability around the long-term landings. Thus, SYL is similar to an OFL. In addition, in the absence of better information, it can be considered to be a minimum estimate of MSY. In fact, the SYL was developed to ensure a stock is maintained at a sustainable level until the stock's status relative to formal stock assessment-based MSY-related reference points can be determined. For this reason, the SYL forms the basis for the SSC's ABC recommendation where ABC = buffer * SYL, where the buffer must be ≤ 0.9 based on the SSC's determination of scientific uncertainty. The SYL and ABC reference points specified by Tier 4 would inform the Council's specification of ACLs. The ABC and ACL would be set below the SYL, based on consideration of scientific and management uncertainty. Setting the ABC and ACL below the SYL would hold the management system accountable to ensure the fishery's ability to sustain catches and associated economic and ecological benefits, on a long-term basis, and to prevent or rectify incidents of overfishing.

The Council believes the Tier 4 approach is consistent with the Magnuson-Stevens Fishery Conservation and Management Act's (Magnuson-Stevens Act) intent to ensure fisheries are managed to prevent overfishing while achieving, on a continuing basis, the optimum yield (OY) from each fishery (16 U.S.C. 1851(a)(1)). Fishery monitoring data demonstrate that St. Thomas/St. John's fishery has produced a sustainable yield over a long period of time. The SYL and ABC specified by Tier 4 of the Council's ABC CR are designed to ensure their continued ability to do so. Because catch levels that exceed the SYL may not be sustainable, the Council and its SSC would evaluate the cause of any repeated SYL exceedances (e.g., increased effort, high recruitment, change in the size of the catch) to understand whether overfishing may be occurring and to identify any resulting impacts on stock biomass (e.g., overfished status), and to take appropriate action. Landings are not expected to exceed the SYL, though, since the ABC and ACL are generally set at 50 percent of the SYL and accountability measures (AM) are in place to prevent the ACLs from being continuously exceeded. Thus, relying on the SYL as the OFL proxy, and using it as a basis for the ABC and ACL, should promote the long-term sustainability of the stock.

To meet the data and analytical demands required to operate within Tiers 1, 2, and 3 of the ABC CR, the National Marime Fisheries Serive (NMFS) is working with the U.S Virgin Islands (USVI) Department of Planning and Natural Resources (DPNR) and others to achieve three important goals. Those three goals include: (1) developing a modeling toolbox suitable for application in data-limited situations; (2) ensuring the continued delivery of accurate and comprehensive commercial fishery data, and; (3) developing a recreational fishery data collection program. Data and analytical improvements resulting from achievement of these three goals would serve to inform which of Tiers 1-3 can be applied. However, those data and analytical refinements are not yet complete. As a result, available data with which to assess stock status and assign values for MSY and associated status determination criteria (SDC) are currently inadequate for any of the Tier 1, 2, or 3 reference point assignment processes. Thus, all of the federally managed stocks/stock complexes in the St. Thomas/St. John FMP fall into Tier 4 of the Council's ABC CR, which applies to data-limited stocks where no accepted assessment is available.

Data limitations for stocks managed by the Council in the St. Thomas/St. John exclusive economic zone (EEZ) go beyond even those constraints typical of data-limited stocks throughout the nation. The USVI DPNR collects commercial landings data through their commercial catch report (CCR) program. However, the CCR forms do not provide an opportunity to contribute biological data (e.g., fish length) information. Instead, obtaining biological information from commercial fishermen depends on dockside sampling (i.e., the Trip Intercept Program), which historically has been inadequately effected due to budget and resultant personnel limitations (McCarthy and Gedamke 2008).

The Southeast Data Assessment and Review (SEDAR) program supervises stock assessments throughout the NOAA NMFS Southeast Region. Under SEDAR auspices, U.S. Caribbean-specific assessments have been conducted for deepwater species (SEDAR 4), yellowtail snapper and spiny lobster (SEDAR 8), yellowfin grouper, mutton snapper, and queen conch (SEDAR 14), queen snapper, silk snapper, and redtail parrotfish (SEDAR 26), blue tang and queen triggerfish (SEDAR 30), and red hind (SEDAR 35). This list includes some of the most ubiquitous, commonly targeted, and economically valuable stocks in the region. Yet, none of these assessment efforts has produced quantitative management advice such as MSY, SDC, or OFL. Each report cited data deficiency as a fundamental problem, along with lack of basic life history data and poor understanding of the quantity and identity of fish discarded at sea. In combination, these systemic data deficiencies render St. Thomas/St. John specifically and the U.S. Caribbean region generally as not just data-limited but substantially data-deficient. Until these data deficiencies are addressed, a Tier 4 approach to management is unavoidable and quantitative MSY, SDC, and OFL would remain unknown.

G.2. Description of the Three-Step Process to Establish Status Determination Criteria (SDC) and Allowable Harvest Levels in Action 4, Preferred Alternative 2

Preferred Alternative 2 would define a *three-step process* to establish SDC and allowable harvest levels (i.e., ACLs) for managed stocks caught in the St. Thomas/St. John EEZ. In *Step 1*, the Council's ABC CR, composed of four tiers designed to respond to different levels of data availability, results in quantitative reference point estimates culminating in an ABC for each managed stock. *Step 2* establishes a proxy to use when F_{MSY} cannot be determined under the control rule in Step 1. *Step 3* then applies a reduction factor, which reflects the Council's estimate of management uncertainty and is specific to each stock or stock complex, to the resultant ABC to establish the ACL for that stock or stock complex.

Preferred Alternative 2, Step 1:
Tiers 1-3 of the ABC CR each require inputs from a quantitative assessment of stock status. Tier 1 is applicable in a data-rich environment that supports a full stage-structured stock assessment dependent on the availability of reliable time series of catch, stage composition, and index of abundance. Inputs to the ABC CR, from the stage-structured assessment, include MSST, MFMT, and the probability density function (PDF) of the OFL. Both OFL and ABC are derived by applying assessment outcomes within the ABC CR process, tempered by consideration of scientific uncertainty and a Council-defined risk of overfishing. Tier 1 outcomes are characterized by a minimal level of parameter uncertainty relative to the following tiers. Tier 2 is applicable in a data-moderate environment where two of the three time series described above are deemed informative. The approach and outcomes are the same as for the Tier 1 approach,

but a higher level of parameter uncertainty is associated with those outcomes. Tier 3 is applicable in a data-limited environment that remains supportive of a quantitative assessment, but may also be applicable in the case of an out-of-date assessment. The data-limited assessment is expected to provide MFMT but it is likely MSST would be unknown. The OFL remains a quantitative output, but the ABC is more strongly constrained by application of conservative estimates of scientific uncertainty and risk of overfishing as determined by the Council. Tier 3 of the ABC CR results in a higher level of parameter uncertainty relative to Tiers 1 and 2. Note that for each of Tiers 1-3, MSY also may be quantified from the assessment, assuming the spawner-recruit relationship is well estimated, but is not a necessary requirement of the ABC CR process to produce OFL and ABC estimates.

Tier 4 is applicable in situations where an accepted quantitative assessment is not available, which is the present case for all stocks proposed for management in the St. Thomas/St. John FMP. Defining reference points within this tier instead relies on landings data, ancillary information on the species in question such as life history traits and characteristics of the fishery, and expert opinion. Two sub-tiers are defined within Tier 4. Tier 4a is applicable when the Council's SSC determines the stock has a relatively low or moderate vulnerability to fishing pressure. A stock's vulnerability to fishing pressure reflects a combination of its biological productivity and its susceptibility to the fishery (Patrick et al. 2009). Tier 4b is applied when the Council's SSC determines the stock has relatively high vulnerability to fishing pressure or when SSC consensus (= 2/3 or more members concur) cannot be reached on the use of Tier 4a. "Vulnerability to fishing pressure" is defined based on a combination of 10 productivity attributes (Table G.1) and 12 susceptibility attributes (Table G.2). Productivity provides an estimate of the capacity of the stock to recover if depleted, whereas, susceptibility relates to the potential of the stock to be impacted by the fishery. Note that not all attributes are used for each stock, dependent on availability of stock-specific data for each attribute. Based on published research and expert knowledge, and using the attributes in Tables G.1 and G.2 as guidelines, the SSC at their July 2017 meeting assigned a productivity score and a susceptibility score to each stock selected for management in the St. Thomas/St. John FMP.

The SSC's intent when using Tier 4a is to allow expansion of the fishery for those stocks with a relatively low vulnerability to fishing pressure, suggesting the stock may be able to sustain a higher rate of exploitation relative to average landings during the reference period. Similarly, for those stocks with a moderate vulnerability to fishing pressure, the intent of the SSC when applying Tier 4a is to hold ABC at or near average landings during the reference period. The SSC's intent when using Tier 4b is to address those situations when the stock has relatively high vulnerability to fishing pressure in order to ensure those stocks are more conservatively managed and thus minimize the likelihood of depleting the stock. For those Tier 4b stocks for which harvest is deemed by the SSC to be sustainable, the ABC would be held at or below average reference period landings. For those stocks for which even that level of harvest places the stock at risk of depletion, the ABC would be set still lower, including as appropriate a prohibition on all harvest.

Table G.1. Attributes and scoring ranges for components of productivity.

Productivity Attributes	High (3)	Moderate (2)	Low (1)
r	>0.5	0.5-0.16 (mid-pint 0.10)	<0.16
Maximum Age	< 10 years	10 - 30 years (mid-point 20)	> 30 years
Maximum Size	< 60 cm	60-150 cm (mid-point 105)	> 150 cm
von Bertalanffy Growth Coefficient (k)	> 0.25	0.15-0.25 (mid-point 0.20)	< 0.15
Estimated Natural Mortality	> 0.40	0.20-0.40 (mid-point 0.30)	< 0.20
Measured Fecundity	> 10e4	10e2-10e3	< 10e2
Breeding Strategy	0	between 1 and 3	≥4
Recruitment Pattern	highly frequent recruitment success (> 75% of year classes are successful)	moderately frequent recruitment success (between 10% and 75% of year classes are successful)	infrequent recruitment success (< 10% of year classes are successful)
Age at Maturity	< 2 years	2-4 years (mid-point 3.0)	> 4 years
Mean Trophic Level	<2.5	2.5-3.5 (mid-point 3)	>3.5

Table G.2. Attributes and scoring ranges for components of susceptibility.

Susceptibility Attributes	Low (1)	Moderate (2)	High (3)
Management Strategy	Targeted stocks have catch limits and proactive accountability measures; Non-target stocks are closely monitored.	Targeted stocks have catch limits and reactive accountability measures	Targeted stocks do not have catch limits or accountability measures; Non-target stocks are not closely monitored.
Areal Overlap	< 25% of stock occurs in the area fished	Between 25% and 50% of the stock occurs in the area fished	> 50% of stock occurs in the area fished
Geographic Concentration	stock is distributed in > 50% of its total range	stock is distributed in 25% to 50% of its total range	stock is distributed in < 25% of its total range
Vertical Overlap	< 25% of stock occurs in the depths fished	Between 25% and 50% of the stock occurs in the depths fished	> 50% of stock occurs in the depths fished
Fishing rate relative to M	<0.5	0.5 - 1.0	>1
Biomass of Spawners (SSB) or other proxies	B is > 40% of B0 (or maximum observed	B is between 25% and 40% of B0 (or	B is < 25% of B0 (or maximum observed

Susceptibility Attributes	Low (1)	Moderate (2)	High (3)
	from time series of biomass estimates)	maximum observed from time series of biomass estimates)	from time series of biomass estimates)
Seasonal Migrations	Seasonal migrations decrease overlap with the fishery	Seasonal migrations do not substantially affect the overlap with the fishery	Seasonal migrations increase overlap with the fishery
Schooling/Aggregation and Other Behavioral Responses	Behavioral responses decrease the catchability of the gear	Behavioral responses do not substantially affect the catchability of the gear	Behavioral responses increase the catchability of the gear [*i.e.*, hyperstability of CPUE with schooling behavior]
Morphology Affecting Capture	Species shows low selectivity to the fishing gear.	Species shows moderate selectivity to the fishing gear.	Species shows high selectivity to the fishing gear.
Survival After Capture and Release	Probability of survival > 67%	33% < probability of survival < 67%	Probability of survival < 33%
Desirability/Value of the Fishery	stock is not highly valued or desired by the fishery	stock is moderately valued or desired by the fishery	stock is highly valued or desired by the fishery
Fishery Impact to EFH or Habitat in General for Non-targets	Adverse effects absent, minimal or temporary	Adverse effects more than minimal or temporary but are mitigated	Adverse effects more than minimal or temporary and are not mitigated

To derive the ABC recommendation for Tier 4 stocks, the SSC first estimated the SYL. For Tier 4a stocks, the SYL is the product of the *75th percentile* of landings during the landings reference period and a scaling factor (i.e., scalar) specific to each stock. For Tier 4b stocks, the SYL is the product of the *mean* landings during the landings reference period and a stock-specific scalar. For both Tier 4a and Tier 4b stocks, the scalar is the product of a variability adjustment factor (VAF) and the susceptibility of the stock to the fishery (Table G.2). The methods used to establish the landings reference period and to quantify the scalar, for each stock, are described in turn below.

<u>Reference Period Landings</u>: Establishing the SYL requires defining a reference period of landings that, for each stock, reflects stability in the fishery. Because that period of relative stability differs among stocks, the year sequence chosen by the Council (in consultation with the SSC and the Southeast Fisheries Science Center [SEFSC]) was specified separately for each stock. However, several features of the landings data were common to all stocks, resulting in common year-sequence decisions as follows:

1) Prior to 2000, commercial landings data collected by the USVI DPNR were allocated by gear type rather than by species. Those data could not be confidently reallocated to species due to a lack of historic information on catch composition and therefore could not be applied to determination of stock or stock complex reference points. As a result, the first year of landings data availability for St. Thomas/St. John is 2000;

2) St. Thomas/St. John commercial catch reporting forms remained relatively stable from 2000 through the first half of 2011. However, beginning July 1, 2011, revised forms were implemented. Those changes responded to the Council's proposed changes to federal fishery management discussed herein, particularly changes in the stocks proposed for management. USVI DPNR staff ensured all stocks proposed for management in the St. Thomas/St. John FMP were included on the reporting forms. For those stocks newly added to the reporting form, including some stocks previously included in the federal fishery management regimen as well as stocks newly added to management, the landings reference period includes no years prior to 2012. For those stocks added to the reporting forms beginning in July 2011, landings from 2011 are not included in the data sequence because only six months of 2011 landings data were available for those stocks;

3) Those 2000-2010 landings, originally reported only at the group level (e.g., snapper, parrotfish, grouper), were allocated to the individual stocks based on the proportional contribution of the known landings of each stock to the group total during 2012-2016, when more stocks were included on the USVI commercial reporting form and stock-specific landings data were therefore more available;

4) For species that were not on the data reporting forms during the historical period, but were listed by species on the reporting form during the recent period (e.g., angelfishes), the SSC recommended using the species-specific landings data from 2012 – 2016; and

5) The SSC determined that zeroes in the commercial landings data were not informative of the fishery, because those zeroes provide no insight regarding the dynamics of the stock or the capacity of the stock to support the fishery. The SSC therefore recommended zeroes be removed from the applicable commercial landings data for all stocks prior to calculating the 75th percentile or mean landings for use in SYL determinations.

Based on these caveats, the year sequences presented in Table G.3 were chosen for use in the ABC CR Tiers 4a and 4b when calculating SYLs and ABCs for each stock/stock complex proposed in Action 4, Preferred Alternative 2 for inclusion in the St. Thomas/St. John FMP.

Table G.3. Year sequences selected for stocks/stock complexes to be included in the St. Thomas/St. John FMP.

Year Sequence	Stocks/Stock Complexes
2000 – 2010	Spiny Lobster; Queen Conch; Snappers; Groupers; Parrotfish; Grunts; Porgies; Jacks; Triggerfish; Surgeonfish; Sea cucumbers; Sea urchins; Corals
2012 – 2016	Angelfish and Wrasses
2000 – 2016	Dolphin and Wahoo

75th Percentile: The 75th percentile of landings is simply that level of landings below which 75 percent of the landings during the reference period fall. For example, if there are 100 years in the annual landings reference period and they are ordered from smallest to largest, the 75th percentile of those landings would be that level of landings below which 75 of the ordered landings fall. In the event that the 75th percentile falls between two values, the value would be inferred using simple interpolation. As an example, consider five years of hypothetical landings data:

Year 1	Year 2	Year 3	Year 4	Year 5
5000	12000	8000	22000	14000

Ordering the landings data from smallest to largest = 5000, 8000, 12000, 14000, 22000.

The smallest number would be the zero percentile, because no numbers are smaller. Next would be the 25th percentile = 8000, then the 50th percentile (*i.e.*, median) = 12000, the 75th percentile = 14000 and the 100th percentile = 22000. The average (*i.e.*, mean) landings during this hypothetical 5-year period would be 12200, very similar to the median of 12000.

With normally distributed data, it is expected that the mean (average of all included years) and the median (= 50th percentile) would be similar although rarely the same. Thus, with normally distributed data, the 75th percentile would be larger than the mean. However, in those cases where the data are not normally distributed, this relationship would not necessarily hold. In the case of non-normal data, the 75th percentile may be less than the mean, and in some cases may be zero. For fisheries landings data, and particularly for landings of the less common or less targeted species such as angelfish, a 75th percentile less than the mean may occur because there are many years where no landings were reported.

Variability Adjustment Factor: The VAF is derived from the relationship between the maximum allowed susceptibility score (maximum = 3), which was assigned to each individual stock by the SSC, and the coefficient of variation (CV) determined from the landings data during the chosen year sequence.

As previously discussed, the susceptibility score reflects the stock's potential to be impacted by the fishery. Attributes of the susceptibility score are described in Table G.2. The SSC assigned low (1), medium (2) and high (3) susceptibility scores to each stock, but they realized that in order to use the susceptibility score as a factor for calculating the VAF, it would be necessary to use the inverted susceptibility score (*i.e.*, a score of three changes to a score of one). In this way, susceptibility scores ranged from three for stocks determined to be least susceptible to the fishery, to one for those stocks with a high susceptibility to the fishery. Generally, stocks with a high vulnerability (productivity * susceptibility) to fishing pressure were assigned to Tier 4b and had an inverted susceptibility score as low as one.

The CV = standard deviation (SD)/mean and serves to standardize variation relative to the magnitude of the mean. Without this standardization, *i.e.*, if simply using the SD, the product of any multiplication involving the SD would become increasingly large as the numbers being measured increase, even though the variability relative to the mean is not changing. Standardization controls for that, ensuring the measure of variation does not change whether the numbers being collected are small or large. For example, if small fish and large fish are being measured, the small fish may average 10 inches in length and the SD around that average might be 2, whereas, the average size of the large fish may be 200 inches and the SD around that average might be 40. Multiplying by 40 rather than 2 would result in a much larger product, even though the relationship between the mean and the SD, when standardized, is the same. Thus, the CV for the small fish is 2/10 = 0.2 and the CV for the large fish is 40/200 = 0.2.

The VAF is then calculated using the equation VAF = (max score – CV)/max score. As noted above, the maximum susceptibility score for both Tier 4a and Tier 4b stocks is 3. Following through on the simple example above, the VAF for both of those fish species would be (3-0.2)/3 = 0.9333.

A characteristic of the VAF calculation is that, for normally distributed data, an increasing CV translates into a higher ABC relative to the mean reference period landings when the other factors employed in the calculations are held constant. Based on simulated outcomes (Figure G.1), if the CV is 0.1 and a susceptibility score of 2.5 is applied along with a buffer of 0.5 (discussed below), the resultant ABC would be 29 percent higher than the mean landings for the reference period. In contrast, with the same scalar and susceptibility score but a CV of 1.0, the resultant ABC would be 40 percent higher than the mean landings for the reference period.

However, this relationship no longer holds when the CV > 1.0 (Figure G.2). As in Figure G.1, the percent increase of the ABC relative to the mean landings for the reference period remains at 40 percent when all else remains the same (Figure G.2), but rather than continuing to increase when the CV = 2.0, the resultant ABC instead is 2 percent less than the mean landings for the reference period.

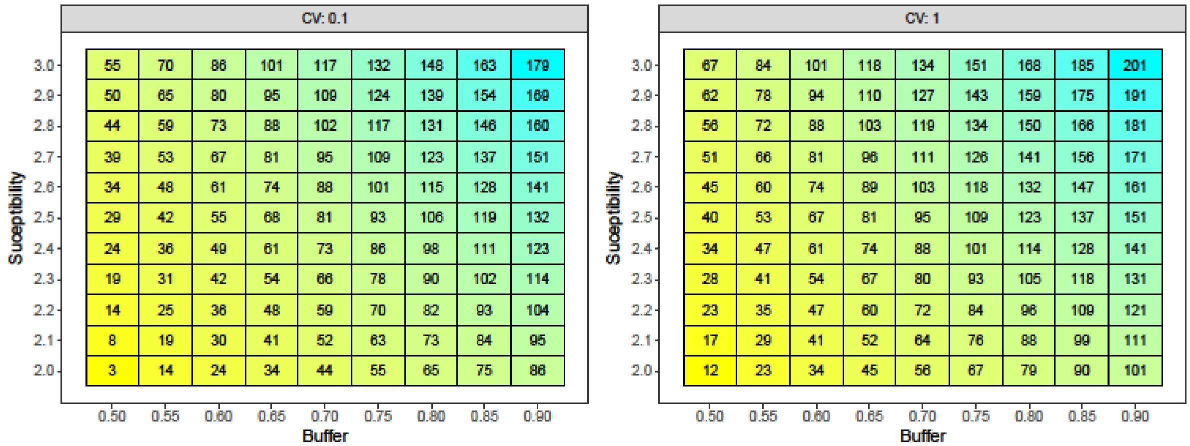

Figure G.1. Percent change in the ABC relative to the mean landings used in the equation, when the CV = 0.1 (left) and when the CV = 1.0 (right). The y-axis values represent the susceptibility score used in the scalar equation to calculate SYL and the x-axis values represent the buffer used in the equation to calculate ABC from SYL.

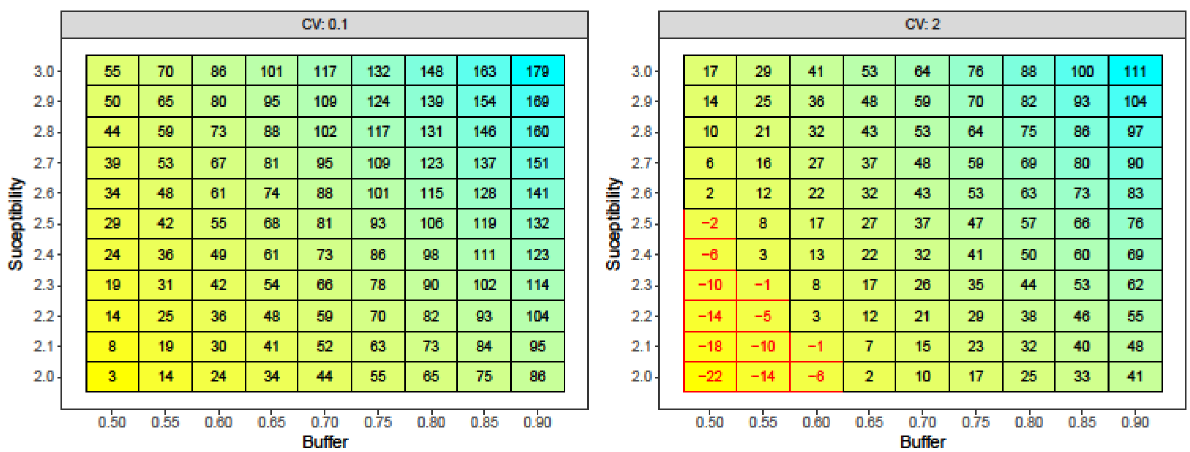

Figure G.2. Percent change in the ABC relative to the mean landings used in the equation, when the CV = 0.1 (left) and when the CV = 2.0 (right). The y-axis values represent the susceptibility score used in the scalar equation to calculate SYL and the x-axis values represent the buffer used in the equation to calculate ABC from SYL.

To correct for this decrease in the ABC relative to mean reference period landings when the CV exceeds 1.0, the SSC chose to put a cap on the CV at 1.0. If the actual CV derived from the relationship between the mean and the SD for the reference year sequence was > 1.0, the CV was set at 1.0 for purposes of the VAF calculation. This ensures, as relative variability continues to increase above the 1.0 breakpoint, that the variability alone does not continue to push the resultant ABC steadily downward. The SSC carefully considered the concept of capping the CV at 1.0, including a review of the landings data for each stock with a CV > 1.0. The SSC determined that instances where the CV exceeded 1.0 reflected stocks with no or very low landings during most years, interspersed with one or a few years with relatively high landings. However, the SSC found no instances where the low landings would have been due to some high level of fishing that would have driven the population down to such a state where recruitment could have been compromised. The SSC determined capping the CV at 1.0 served their intent for Tier 4a stocks to allow expansion of the fishery for those stocks with a relatively low vulnerability to fishing pressure, and to hold ABC at or near average landings during the reference period for those stocks with a moderate vulnerability to fishing pressure. Similarly for Tier 4b stocks, capping the CV at 1.0 served to ensure stocks with a relatively high vulnerability to fishing pressure were more conservatively managed to minimize the likelihood of depleting the stock.

Scalar: The scalar was calculated as the product of the VAF and the (inverted) susceptibility score. Thus, the scalar is derived from the characteristics of the fishery for each stock as captured by the factors composing susceptibility (Table G.2), combined with the inter-annual variability in harvest of the stock as captured by the CV. The VAF coefficient in the scalar equation serves to standardize the magnitude of the scalar relative to the extent of variation in the data. The susceptibility coefficient in the scalar equation serves to constrain the scalar (a multiplication factor in the SYL equation described below) as appropriate to reflect a stocks exposure to fishing activities. As a result, moderate susceptibility to fishing pressure leads to a harvest level that is similar or only marginally increased from average landings during the reference period, whereas a high susceptibility score (= low susceptibility to fishing pressure) results in an increase in allowable harvest relative to average landings during the reference period. This approach enabled the SSC to ground the scalar for a stock/stock complex within the context of the vulnerability analysis while simultaneously accounting for inherent variability in the landings data.

In our simple example, for a stock with low susceptibility to the fishery (inverted susceptibility score = 3), the scalar = VAF x susceptibility score = 0.9333 x 3 = 2.7999. Conversely, for a stock with a high susceptibility to the fishery (inverted susceptibility score = 1), the scalar = VAF x susceptibility score = 0.9333 x 1 = 0.9333.

SYL: The SYL for Tier 4a stocks results from multiplying the 75th percentile by the scalar. For our simple example of a stock with low susceptibility to the fishery:

75th percentile = 14000
Scalar = 2.7999
SYL = 14000 x 2.7999 = 39,199

For a Tier 4b stock, the same process would be followed except the mean of landings during the reference period (rather than the 75th percentile) would be used in the calculation.

<u>ABC</u>: Following establishment of the SYL for each stock, a reduction factor (*i.e*., buffer) accounting for scientific uncertainty in the data is applied to the SYL to arrive at the ABC. Scientific uncertainty would take into account the deficiencies in and vagaries of reporting, which includes potential biases (over reporting, underreporting, trends), changes in reporting forms, changes in fisher behavior, the contribution of unspecified landings, availability of ancillary data, and life history parameters (e.g., Table G.1). The SSC was concerned that these issues created uncertainty in what the data showed and what information could be understood from the available data. Scientific uncertainty was determined based on expert input from the SSC members and user-group representatives. The latter provided input primarily through the St. Thomas/St. John District Advisory Panel (DAP), with outcomes provided to the SSC by St. Thomas/St. John's DAP Chair. Most Tier 4 stocks were assigned a scientific uncertainty factor of 0.50, although the factor was larger (*i.e*., the reduction less) for spiny lobster (0.60) and red hind (0.55). However, in instances when landings data could not be confidently assigned at the species level, that created uncertainty in the landings data, which the SSC addressed through the scientific uncertainty buffer. The SSC assigned additional reductions to the baseline buffers in cases where unspecified landings reported at the family or genus level were distributed among the stocks constituting a complex at the species level, as follows:

- Use 2012-2016 year sequence and stock-specific landings for angelfish and wrasses and do not apply any additional buffer reductions;
- Use total annual landings during 2000-2010 for parrotfish, porgies, and triggerfish, but do not apply additional buffer reductions. This is because either the indicator, or the group selected for management going forward, made up more than 99% of the 2012-2016 catch; and
- For all remaining stocks/stock complexes previously managed, use the 2012-2016 proportions to back calculate landings during 2000-2010 and apply an additional buffer reduction of 0.12.

Applying the ABC Control rule using the reference periods and reduction buffers specified above would result in the SYLs and ABCs listed in Table G.4. Stocks/complexes for which the SSC set ad hoc ABCs equal to 0 are not included in the table and include: Grouper 1 (Nassau grouper), Grouper 2 (goliath grouper), Parrotfish 1 (midnight, blue and rainbow parrotfish), Queen Conch, Sea Cucumbers, Sea Urchins, and Corals.

Table G4. Calculated SYL and ABC for each stock/stock complex to be managed under the St. Thomas/St. John FMP.

Stock/Stock Complex	Reference Period	Tier*	Mean Landings (lbs)	SYL (lbs)	ABC (lbs)
Spiny Lobster	2000-2010	4a	115,657	367,035	220,221
Queen Conch	2000-2010	4b	1,706	3,359	0
Snapper 1	2000-2010	4a	17,999	55,651	21,147
Snapper 2	2000-2010	4a	509	1,574	598
Snapper 3	2000-2010	4a	27,580	85,274	32,404
Snapper 4	2000-2010	4a	95,634	246,406	93,634
Grouper 1	2000-2010	4b	NA	NA	0
Grouper 1	2000-2010	4b	NA	NA	0
Grouper 3	2000-2010	4a	50,963	159,194	68,453
Grouper 4	2000-2010	4a	3,264	6,244	2,373
Grouper 5	2000-2010	4a	347	1,083	411
Parrotfish 1	2000-2010	4b	NA	NA	0
Parrotfish 2	2000-2010	4a	44,011	141,237	70,619
Grunts 1	2000-2010	4a	32,570	84,711	32,190
Grunts 2	2000-2010	4a	2,470	6,425	2,441
Porgies	2000-2010	4a	23,662	61,133	30,567
Jacks	2000-2010	4a	45,314	123,727	47,016
Surgeonfish	2000-2010	4a	33,862	70,061	26,623
Wrasses	2012-2016	4a	2,239	6,212	3,106
Angelfish	2012-2016	4a	16,143	43,051	21,526
Triggerfish	2000-2010	4a	82,149	205,621	102,810
Dolphin	2000-2016	4a	6,904	20,585	10,293
Wahoo	2000-2016	4a	4,302	14,482	7,241
Sea cucumbers (all species)	NA	4b	NA	NA	0
Sea urchins (all species)	NA	4b	NA	NA	0
Corals (all species)	NA	4b	NA	NA	0

* For Tier 4a stocks and stock complexes, the SYL was calculated using the 75th percentile of landings during the reference period. For Tier 4b, the SYL was calculated using the mean landings during the reference period.
Stocks/stock complexes with the Mean Landings and SYL listed as NA, landings data were not available, thus the ABC CR was not able to calculate SYL for those stocks/stock complexes. In those instances, the SSC set the ABC equal to zero.

Continuing with our example, multiplying the SYL (39,199) by the most commonly assigned scientific uncertainty reduction buffer (0.50) gives:

ABC = 39,199 x 0.5 = 19,600

Generally for St. Thomas/St. John landings data, the units associated with the ABC value would be pounds whole weight.

Preferred Alternative 2, Step 2:

Step 2 addresses data limitations that prevent establishment of an MSY based on outcomes from a valid quantitative assessment. Instead, Step 2 provides three sub-alternatives for setting an F_{MSY} proxy based on various fishing mortality rates. Sub-alternative 2a establishes a fishing mortality rate equivalent to F_{MAX}, whereas Sub-alternative 2b equates F_{MSY} to the fishing mortality rate at a 40% SPR and Sub-alternative 2c sets that rate at a 30% SPR.

Preferred Alternative 2, Step 3:

Step 3 provides six sub-alternatives for establishing the ACL as discussed in Section 2.4.2. The ACL would be reduced from ABC based on the Council's choice of buffer reduction to account for management uncertainty. The OY would be set equal to the ACL.

The Council chose **Preferred Sub-alternative 2e** for all managed stocks except angelfish, parrotfish and surgeonfish, which would specify an ACL equal to the ABC x 0.95. For angelfish, parrotfish, and surgeonfish, the Council chose **Preferred Sub-alternative 2g**, which would specify an ACL equal to the ABC x 0.85. Table G.5 shows the values that would result from each of the sub-alternatives proposed under **Preferred Alternative 2**.

Table G.5. Annual catch limits for each stock and stock complex in the St. Thomas/St. John FMP, based on Preferred Alternative 2, Sub-alternatives 2d-2h. All ACLs under Sub-alternative 2i would be equal to zero, and were not included in the table. Values in bold represent the ACL (=OY) resulting from the preferred sub-alternative selected by the Council.

Stock/Complex	Sub-alt 2d ACL=ABC	Sub-alt 2e ACL=ABC*0.95	Sub-alt 2f ACL=ABC*0.90	Sub-alt 2g. ACL=ABC*0.85	Sub-alt 2h ACL=ABC*0.75
Spiny Lobsters	220,221	**209,210**	198,199	187,188	165,166
Snapper 1	21,147	**20,090**	19,032	17,975	15,860
Snapper 2	598	**568**	538	508	449
Snapper 3	32,404	**30,784**	29,164	27,543	24,303
Snapper 4	93,634	**88,952**	84,271	79,589	70,226
Grouper 3	68,453	**65,030**	61,608	58,185	51,340
Grouper 4	2,373	**2,254**	2,136	2,017	1,780
Grouper 5	411	**390**	370	349	308
Parrotfish 2	70,619	67,088	63,557	**60,026**	52,964
Grunts 1	32,190	**30,581**	28,971	27,362	24,143
Grunts 2	2,441	**2,319**	2,197	2,075	1,831
Porgies	30,567	**29,039**	27,510	25,982	22,925
Jacks	47,016	**44,665**	42,314	39,964	35,262
Surgeonfish	26,623	25,292	23,961	**22,630**	19,967
Wrasses	3,106	**2,951**	2,795	2,640	2,330
Angelfish	21,526	20,450	19,373	**18,297**	16,145
Triggerfish	102,810	**97,670**	92,529	87,389	77,108
Dolphin	10,293	**9,778**	9,264	8,749	7,720
Wahoo	7,241	**6,879**	6,517	6,155	5,431

Stocks/stock complexes with an ABC set equal to zero by the SSC, which include queen conch, Nassau grouper, goliath grouper, Parrotfish 1 stock complex, Sea urchins stock complex, Sea cucumbers stock complex, and the Corals stock complex, were not included in the table as all sub-alternatives would result in an ACL of zero (ABC*0 = 0).

Taking the worked example through this final step, and using **Sub-alternative 2g** (management reduction coefficient = 0.85) as the hypothetical choice of the Council:

ACL = ABC x 0.85 = 19,600 x 0.85 = 16,660 pounds whole weight.

G.3 Calculated Outcomes from the Acceptable Biological Catch Control Rule

Table G.6. Calculated sustainable yield level (SYL) and ABC for each stock/stock complex to be managed under the St. Thomas/St. John FMP using the Caribbean Fishery Management Council's ABC Control Rule. Stocks/complexes for which the SSC set management measures on an ad hoc basis are not included in the table and include: Grouper 1 (Nassau grouper), Grouper 2 (goliath grouper), Parrofish 1 (midnight, blue and rainbow parrotfish), Queen Conch, Sea Cucumbers, Sea Urchins, and Corals.

Stock/Complex	Reference Period	Mean	SYL (lbs)	ABC (lbs)
Spiny Lobster	2000-2010	115,657	367,035	220,221
Snapper 1	2000-2010	17,999	55,651	21,147
Snapper 2	2000-2010	509	1,574	598
Snapper 3	2000-2010	27,580	85,274	32,404
Snapper 4	2000-2010	95,634	246,406	93,634
Grouper 3	2000-2010	50,963	159,194	68,453
Grouper 4	2000-2010	3,264	6,244	2,373
Grouper 5	2000-2010	347	1,083	411
Parrotfish 2	2000-2010	44,011	141,237	70,619
Grunts 1	2000-2010	32,570	84,711	32,190
Grunts 2	2000-2010	2,470	6,425	2,441
Porgies	2000-2010	23,662	61,133	30,567
Jacks	2000-2010	45,314	123,727	47,016
Surgeonfish	2000-2010	33,862	70,061	26,623
Wrasses	2012-2016	2,239	6,212	3,106
Angelfish	2012-2016	16,143	43,051	21,526
Triggerfish	2000-2010	82,149	205,621	102,810
Dolphin	2000-2016	6,904	20,585	10,293
Wahoo	2000-2016	4,302	14,482	7,241

Appendix H. Fisheries Data Requirements

H.1 Introduction

Management of fisheries and living marine resources depends on careful interpretation and analysis of reliable and comprehensive information (e.g., life history, landings data). The more information managers have available, the greater the likelihood that resource management goals will be achieved and the less uncertainty will be inherent in that effort. National Standard (NS) 1 of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) provides information on what the Councils must include in their fishery management plans (FMP) or associated public documents with respect to data, such as a description of general data collection methods as well as any specific data collection methods used for all stocks in the fishery and ecosystem component species (§ 600.310 (i)(1)-(3). These include:

(1) Source of fishing mortality (both landed and discarded), including commercial and recreational catch and bycatch in other fisheries;

(2) Description of the data collection and estimation methods used to quantify total catch mortality in each fishery, including information on the management tools used (*i.e.*, logbooks, vessel monitoring systems, observer programs, landings reports, fish tickets, processor reports, dealer reports, recreational angler surveys, or other methods); the frequency with which data are collected and updated; and the scope of sampling coverage for each fishery; and

(3) Description of the methods used to compile catch data from various catch data collection methods and how those data are used to determine the relationship between total catch at a given point in time and the annual catch limit (ACL) for stocks and stock complexes that are part of a fishery.

In addition, NS2 of the Magnuson-Stevens Act states that an FMP should identify scientific information needed from other sources to improve understanding and management of the resource, marine ecosystem, and the fishery (including fishing communities) (50 CFR § 600.315).

Management of federal fisheries in the U.S. Caribbean relies almost exclusively on landings data derived from the commercial and (presently in Puerto Rico only) recreational sectors. Currently in the U.S. Caribbean, additional parameters used in fisheries management (e.g., species age, length, growth rate, and reproductive patterns) are lacking or not consistently available. Landings data are of considerable value for delineating long-term harvest patterns and for detecting substantial changes in those patterns. However, landings data are not suited to address all federal fisheries management issues, both because of limited temporal and spatial resolution of the landings data and because landings data alone cannot answer important management questions pertaining to year-class strength, recruitment patterns, and other essential measures of population health.

Federal fishery management obligations have increased in the past several years resulting from the Congressional mandate to end overfishing of managed species, as defined in the 2007 revision of the Magnuson-Stevens Act. In particular, the Magnuson-Stevens Act requires as a statutory provision that ACLs be established, with few exceptions, for all federally managed species. These ACLs define the maximum allowable annual harvest for each stock (or stock complex) included in a federal FMP. Accountability measures (AM) are corollary to the ACLs and function to either prevent an ACL from being exceeded (generally via in-season response) or to ensure that management actions are taken to prevent an overage from occurring again (generally via a post-season response). More information on how ACLs and AMs are applied to the St. Thomas/St. John exclusive economic zone (EEZ) can be found in Sections 2.4 and 2.5, and Chapter 5 of this FMP.

It is essential that scientists and managers have available to them, in a timely manner and with the necessary level of temporal and spatial resolution, data suitable to meet these federal management obligations. Ideally, those data would be available on a monthly or more frequent basis, thereby allowing for in-season management, but so far that has not been the case. Instead, essential landings data are typically not available until at least a year following the end of the applicable fishing season. This delay in data availability results in a management approach dependent on post-season responses, and those responses may not be in place until 18 to 24 months following the event.

Appendix H.2 (Data Needs for Management) below, lists and discusses the minimum data requirements for effective management of St. Thomas/St. John EEZ fisheries and its shortfalls; and Appendix H.3 (Data Sources) discusses where current data comes from and how it is being collected to address management data needs.

H.2 Data Needs for Management

With respect to effective management of marine fisheries in the U.S. Caribbean EEZ, particularly in the St. Thomas/St. John EEZ, there exists a set of minimum data requirements necessary to maintain sustainable harvest (Table H.1). Note that additional data would be required to address economic and social issues associated with the fishery. Those economic and social issues may play an essential role in fishery and ecosystem health.

Table H.1. Status of data components recommended for enhancing federal fisheries management in the U.S. Caribbean. (Y= program available, N= program not available).

Program	Puerto Rico	St. Thomas/St. John	St. Croix
Commercial Landings Data	Y	Y	Y
Trip Intercept Program	Y	Y	Y
Marine Recreational Information Program	Y*	N	N
Fishery Independent Data	Y	Y	Y
Ecosystem Response Indicators	N	N	N

* Since late 2017, NMFS Statistics and Technology Office is no longer conducting any Access Point Angler Intercept Surveys (APAIS) sampling in Puerto Rico. MRIP, ST1 will be working with the regional partners to identify administrative body/group/agency to better define data needs and possible data collection projects to be considered for funding and testing by MRIP.

Commercial landings data: Commercial landings data are necessary to monitor trends in harvest, particularly with respect to changes in those trends, and to identify species that may be appropriate for inclusion in the list of federally managed species. Included in these landings reports is information on fishing effort and location. Commercial landings data are being acquired, but with limitations including a lack of specific information on harvest location, effort expended, and in many cases, species-level descriptions of the catch. Furthermore, it is important to note that some portion of the commercial catch does not enter the market, but instead is kept by the fishermen for personal use. The extent of this subsistence catch, the degree to which it is included in landings reports, and its influence on the achievement of federal management goals is not well understood in the U.S. Caribbean.

Trip intercept program (TIP) data: TIP data provides information on the basic biology of the catch, including size and sex distribution, species composition, and information on fishing locations and effort. These data are derived from surveys of the catch during dockside interviews with the fishermen.

Recreational Data: The Marine Recreational Information Program (MRIP), formerly known as the Marine Recreational Fisheries Statistics Survey or MRFSS, conducts vessel intercepts, direct and indirect (e.g., telephone) interviews, and other activities to gauge the composition, extent, and variability of harvest by the recreational sector.

Fishery-independent data: Fishery information collected by sampling methods independent of the commercial and recreational sectors provides data complementary to that collected by fishery-dependent means. Fisheries-independent data will help determine the health of the fishery to the extent to which those fishery resources can be sustainably harvested. For example, in the U.S. Caribbean, stock assessments rely on fisheries-dependent data sources to use data-limited approaches for determining stock status and sustainability levels. Given that data from fishery-independent surveys can provide an unbiased estimate of abundance with which to calibrate stock assessments, its use is preferable. Using good and reliable fishery-independent data can reduce dependence on fisheries-dependent data (Cass-Calay et al. 2016).

Fishery-independent data are collected under the auspices of several organizations and programs in the U.S. Caribbean and include a variety of methods such as diver-based surveys, visual census (underwater transects and point surveys), hook-and-line surveys, trap surveys, hydroacoustics, underwater video, and more, many with a limited spatial scale. However, often times these surveys do not take into account existing fishery knowledge or management needs. The results of these surveys require considerable effort to integrate into existing fishery data analysis. In addition, the survey designs are not necessarily appropriate for application to fishery management questions, nor are they repeated with any level of adequate consistency. A recent NOAA-sponsored workshop conducted in the U.S. Caribbean did a comprehensive review of the existing fishery-independent survey programs (Cass-Calay et al. 2016). Methods, statistical designs, and objectives differ among programs, and the workshop found that the majority of those objectives may not necessarily be directly related to stock assessments (i.e., information collected (abundance, density, size structure) was for particular species in localized areas). A general recommendation from the workshop was to develop comprehensive new surveys and/or improve the temporal and spatial scale of existing efforts to improve data collection activities so that stock assessments in the U.S. Caribbean can be better supported. Substantial funding is expended on these surveys, so it is essential that they be conducted in a manner that provides maximum applicability of the resultant data. This can be accomplished by close coordination among the various management agencies and organizations particularly with the involvement of local experts. Some of the recommendations from the 2016 U.S. Caribbean Fishery-Independent Survey Workshop for the development of new surveys and/or adaptation of existing surveys in the Caribbean include:

(1) Identify species of interest in the U.S. Caribbean to allow optimization of survey design.

(2) Consult experts in survey design, statistics, and stock assessment prior to modifications/expansion/development of surveys.

(3) Use similar methods across platforms to ensure adequate spatial coverage.

(4) When using different gear, overlap spatially and temporally to allow calibration of methods.

(5) Use cooperative research programs when fiseable (i.e., include fishing community).

(6) Develop/enhance capacity to process and analyze age, reproductive information, etc.

(7) Conduct a regional workshop to identify gaps in stock demographic data.

(8) Focus on filling spatial gaps to achieve a "representative fraction of the populations"

(9) Enhance data mining and recovery – scour and capture as much regional data as possible.

(10) Expand habitat mapping, including high resolution bathymetry.

(11) Collect information to facilitate Ecosystem-based Fishery Management (EBFM) and next-generation stock assessment.

(Source: Cass-Calay et al. 2016)

H.3 Data Sources

H.3.1 Fishery-Dependent Data

Fisheries managers utilize fishery-dependent catch statistics in the U.S. Caribbean to inform regulation of harvest levels (including ACLs) and implementation of management measures. The NOAA Fisheries Glossary (http://www.st.nmfs.noaa.gov/st4/documents/FishGlossary.pdf) defines fishery-dependent data as data collected directly on a fish or fishery from the commercial or sport fishermen and seafood dealers. Common methods of collecting fishery-dependent data include logbooks, trip tickets, creel sampling, fishery observers, and phone surveys. In the U.S. Caribbean, such data does not currently capture the full extent to which species under federal management are being extracted from the rest of the population. At the present time, commercial trip ticket data are collected from the U.S. Virgin Islands (USVI) Department of Planning and Natural Resouces (DPNR).

As mentioned above, a commercial TIP also exists in the USVI and it involves information collected by port samplers mainly on fishing effort. TIP is further discussed below. Recent Southeast Data Assessment Review Data (SEDAR)-sponsored stock assessments have primarily utilized commercial landings data obtained from catch reports or the trip tickets, with little reliance on data obtained from TIP sampling (SEDAR 2009). SEDAR is a regional cooperative fishery management council process initiated in 2002 to improve the quality and reliability of fishery stock assessments in the South Atlantic, Gulf of Mexico, and the U.S. Caribbean.

H.3.1.1 Commercial Landings Data

Commercial Trip Ticket Data

With such a high reliance on commercial catch reports, it is important to ensure to the greatest possible degree those self-reported data accurately reflect actual catch. Improvements to the USVI commercial catch reporting system have been ongoing throughout the history of the program, with an emphasis on ensuring fishermen adhere to the required reporting timelines. In preparation for implementation of the St. Thomas/St. John Island-based FMP, the USVI DPNR revised their commercial catch reporting form to include all species to be included for federal management in the new FMP. That latest revision of the reporting form was placed into service on July 1, 2016. State and federal fishery managers are continuing their efforts to improve the commercial data collection system, with a present emphasis on validation of the self-reported data.

Commercial Trip Intercept Program Data

The TIP data collection in the U.S. Caribbean has historically focused on the commercial sector trips in both Puerto Rico and USVI. These data are obtained by port samplers who interview fishermen and gather information on fish length and numbers of each species or species group landed, gear used, and information on the fishing trip (e.g., trip duration, fishing locations). Port samplers also collect a variety of information on fishing effort, including, but not limited to, trap soak time and number of traps. Included in the information collected are at least two matrices (length frequency and species composition) that could be viewed as some of the most valuable information from this data set.

H.3.1.2 Recreational Landings Data

The MRFSS/MRIP recreational data collection program does not operate in St. Thomas/St. John. The program was instituted in 2000, but after one year of operation was discontinued due to logistical problems including but not limited to retention of field samplers and complications with access to sampling sites. However, the USVI DPNR and NOAA are working to establish a robust recreational sampling program for the USVI.

H.3.1.3 Landings Data Transmission and Reporting

A historic problem with fishery dependent data reporting in the U.S. Caribbean has been the lengthy delay between the day species are harvested and the transmission of that harvest information to fishery managers. Currently, there may be as much as a two-year lag between the time landings are recorded and the time data are released for fishery management applications (CFMC 2011). This lag time reduces fishery managers' ability to adjust fishery management measures in a timely fashion. Ideally, landings data would be available to managers on a monthly basis within the fishing season, allowing for in-season adjustment of harvest rates to ensure that harvest limits are met but not exceeded. Currently, federal and territorial fishery agencies are working together to find ways to reduce the time lag and allow for a faster delivery of landings data.

The unavailability of landings data on time is problematic for ACL monitoring. For example, to determine if a sector ACL has been exceeded, NMFS compares the average of the most recent three years of available landings to the sector ACL for each stock or stock complex. Because each year's landings data do not become available until the following year, and there is a substantial time lag between data availability and implementation of a closure rule, effecting an

AM-based fishing season reduction in response to a sector ACL overage generally does not occur until two years following the most recent year of available landings.

MRAG Americas Inc. (2009) proposed a reporting scheme in which fishermen on Puerto Rico and the USVI would report on a weekly basis as a solution to the time lag issue. This scheme could speed up the process by reducing the delay with data reporting by using an electronic logbook system. The concern, however, is the time burden on fishermen, which could affect cooperation and compliance. To offset these concerns, a number of options could be offered, including self-addressed stamped envelopes, drop boxes in centralized locations, drop-offs in person at the agency office, and even call-ins (in special circumstances). Under this reporting scheme, receipts would be given to fisherman for all reports received. However there are limitations with this scheme, for example in Puerto Rico, agents cannot pick up landing reports and fishermen cannot drop them off at a centralized location because of the receipt requirement. Under the electronic logbook system, computers could be placed in government-sponsored fishing associations or in fishermen's associations with the associated training workshops. Fishermen, however, have made counter-proposals in which the MRAG timeline can be phased in on a slower timeframe. They would like to maintain the monthly reporting schedule, and phase in shorter reporting timeframes as the catch is approaching the quota limit (MRAG 2009).

Electronic reporting could aid in the timely submission of data and subsequent analysis to meet Magnuson-Stevents Act requirements in the U.S. Caribbean. Fisheries that may be suitable for electronic reporting include deep-water snapper grouper complex, for-hire boats and some of the key species of small scale fisheries, such as lobster, snappers, groupers, queen conch, among others.

H.3.1.4 Non-Reporting and Misreporting

Another integral step in enhancing fishery dependent data is identifying and accurately measuring non-reporting and misreporting. An important component of fishery management is accounting for uncertainty. Uncertainty results from both non- and misreporting. There are two types of non-reporting. The first type is the catch that simply goes unreported, either by the fishermen or the fish house. The second, a smaller portion of the catch is never accounted for because it is sold on the dock en-route to the fish house where the rest of the catch is reported.

Misreporting is the level of under or over reporting by a fisher. Misreporting needs to be corrected in order to more accurately and precisely know the level of species harvest. Better understanding of the temporal and seasonal changes in non-reporting and misreporting would allow for a better overall estimate of the expansion factor to be applied to the reported landings data (MRAG 2009).

A report published by MRAG Americas Inc[78] in 2009 proposed modifications to the present survey design to address these shortcomings. The proposed survey design would use the most recent census data to count the number of unlicensed fishermen by port and fishing center. Port samplers would then be able to refine the list based on their knowledge and experience with the local fishermen. Third, samplers would then conduct follow-up visits to each site confirming their estimates via interviews with the fishermen. Managers would use the information on the number of non-reporters by site to quantify the spatial and temporal variability in the ratio of reporters to non-reporters. From that information, managers can evaluate a design that obtains data from more sites at more times over the entire island, but a shorter sampling duration at each site. Port samplers should repeat this intense survey approximately every five years, and then over the longer term, managers would use the data to determine seasonality for sampling and intensities.

H.3.2 Fishery Independent Data

The NOAA Fisheries Glossary defines fishery-independent data as characteristic of information (e.g., stock abundance index) or an activity (e.g., research vessel survey) obtained or undertaken independently of the activity of the fishing sector. Fishery-independent data intends to avoid the biases (e.g., non-reporting and misreporting) inherent to fishery-related data or fishery-dependent data. There are fishery-independent data collection initiatives such as the Southeast Area Monitoring and Assessment Program (SEAMAP) and SEDAR currently underway in the U.S. Caribbean. SEAMAP is state/federal program designed to collect, manage and disseminate fishery-independent data in the southeastern United States.

In addition to the SEDAR and SEAMAP initiatives, these are also sporadic fishery independent surveys carried out in the U.S. Caribbean by other NOAA programs (Table H.2), academia, and other federal agencies. Increase coordination and prioritization between fishery managers, and these numerous fishery independent surveys will enhance fishery management in the U.S. Caribbean. An initiative to coordinate the numerous fishery independent projects would be labor intensive but would yield important results, and possibly fill the existing data gaps in the region. Thus, early collaboration within the NOAA programs working in the region is very important in setting a priority and avoiding duplication of effort.

As mentioned in Section H.2 (Data Needs for Management) there are many fishery-independent survey programs in the U.S. Caribbean and adjacent waters that serve as data sources for different objectives. Table H.2 lists NOAA Inititiatives that collect fishery-independent data.

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[78] MRAG Americas Inc. is a company comprised of scientists and specialists with expertise in fisheries and aquatic resource science, management, and monitoring; fisheries observer programs; ecosystem and protected area management; government liaison and relations; stakeholder engagement and outreach; and international conservation and management agreements.

Table H.3 lists a representation of ongoing or recent fishery-independent sampling activities conducted by federal agencies, NGOs, states and territories, and academic partners as discussed in the NOAA sponsored U.S. Caribbean Fishery-Independent Survey Workshop (Cass-Calay et al. 2016).

Table H.2. List of NOAA initiatives that collect fishery-independent data in the U.S. Caribbean.

NOAA Initiatives that Collect Fisheries-Independent Data
Caribbean Coral Reef Ecosystem Monitoring Project
Baseline Assessment of Guánica Bay, Puerto Rico in Support of Watershed Restoration
Seafloor Characterization of the U.S. Caribbean
Comprehensive U.S. Caribbean Coral Reef Ecosystem Monitoring Project (C-CCREMP)
Conservation Effects Assessment Project (CEAP): Jobos Bay, Puerto Rico Special Emphasis Watershed Partnership
Acoustic Tracking of Fish Movements in Coral Reef Ecosystems
An Ecological Characterization of the Marine Resources of Vieques, Puerto Rico
Coral Reef Ecosystem Studies (CRES) – U.S .Caribbean Component
Development of Reef Fish Monitoring Protocols to Support the National Park Service Inventory and Monitoring Program

Table H.3. Example of ongoing or recent fishery-independent sampling activities.

Fishery-Independent Sampling/Research Projects		
Survey	*Description*	*Entity in charge*
Biogeography Diver Based Surveys (historical) and National Coral Reef Monitoring Program (NCRMP)	Surveys covering benthos, fish, people, and climate. Not designed for stock assessment purposes.	Fish and benthos: NOS Biogeography Program, NMFS Southeast Fisheries Science Center
Reef Visual Cencus (RVC) Surveys	Provides info not provided by fishery-dependent fara such info on al species, sizes, on appropriate spatial scales within the context of movements and haitats.	J. Ault; Steve Smith; Jim Bonsack
Caribbean Reef Fish Video Survey	Provide fishery-independent estimates of reef fish stocks in the U.S. Caribbean and collect biological samples for age and reproductive information.	Southeast Fisheries Science CEnter
SEAMAP-C in the USVI and Puerto Rico	Several projects to mainly collect, manage and disseminate fishery-independent data on the species in territorial and EEZ waters; enable the USVI to identify, complement and measure effectiveness of management measures. Projects include: Reef fish, queen conch, lobster, parrotfish, yellowtail snapper, lane snapper, and	Collaboration among Puerto Rico DNER, Puerto Rico Sea Grant, CFMC, U.S. Fish and Wildlife Service, USVI DPNR, NMFS

Fishery-Independent Sampling/Research Projects		
	deep-water snapper surveys, and anhydroacoustic survey.	
Fish Spawning Aggregation Surveys in Puerto Rico	Monitor spawning aggregations using acoustic techniques focused on west coast areas Abrir La Sierra, Bajo de Sico, and Tourmaline Bank. Characterixe remnant Nassau grouper spawning aggregation and use visual survey results to validate acoustic monitoring work.	M. Scharer-Umpierre
Mesophotic Surveys	Characterize reef fish population in these ecosystems (30m-70m)	R. Appeldoorn; university partnerships
Survey of commercially exploited fish and shellfish populations from mesophotic reefs within the Puerto Rico EEZ	Characterize main species assemblagesof commercially important fish and shellfish in each of benthic habitats and dpeht surveyed (30-50m) within Abrir La Sierra, Bajo de Sico, Tourmaline Bank.; provide inferences of seasonal variations by species in Abrir La Sierra, particularly queen conch; produce rough population estimates for target species; provide preliminary analysis of status of commercially important fish and shellfish within mesophotic habitats based on the length frequency data.	J. García-Sais

*Information about early NOAA surveys in the U.S. Caribbean dating back to1959 can be found in here http://sero.nmfs.noaa.gov/sustainable_fisheries/caribbean/fish_indep_wkshp/documents/pdfs/presentations/ingram_early_fi_caribbean_surveys.pdf.

H.3.2.1 Socio-economic Data

In 2018, NMFS proposed to conduct a census of small-scale fishermen operating in the U.S. Caribbean. The extension for the data collection applies only to the Commonwealth of Puerto Rico because the data collection was completed in the USVI. The proposed socio-economic study will collect information on demographics, capital investment in fishing gear and vessels, fishing and marketing practices, economic performance, and miscellaneous attitudinal questions. The data gathered will be used for the development of amendments to FMPs, which require descriptions of the human and economic environment and socio-economic analyses of regulatory proposals. The information collected will also be used to strengthen fishery management decision-making and satisfy various legal mandates under the Magnuson-Stevens Act (U.S.C. 1801 et seq.), Executive Order 12866, Regulatory Flexibility Act, Endangered Species Act, and National Environmental Policy Act, and other pertinent statues. The information will be collected through in-person, telephone and mail surveys.

H.3.2.2 Southeast Data, Assessment, and Review (SEDAR)

The SEDAR is a cooperative fishery management council process initiated in 2002 to improve the quality and reliability of fishery stock assessments in the South Atlantic, Gulf of Mexico, and U.S. Caribbean. SEDAR is managed by the Caribbean, Gulf of Mexico, and South Atlantic Regional Fishery Management Councils in coordination with NMFS and the Atlantic and Gulf States Marine Fisheries Commissions. SEDAR seeks improvements in the scientific quality of stock assessments and greater relevance of quantities information available to address existing and emerging fishery management issues. SEDAR emphasizes constituent and stakeholder participation in assessment development, transparency in the assessment process, and a rigorous and independent scientific review of completed stock assessments. SEDAR is organized around three workshops. The first is a data workshop where datasets are documented, analyzed, and reviewed and data for conducting assessment analyses are compiled. The second is an assessment workshop where quantitative population analyses are developed and refined and population parameters are estimated. The third and final is a review workshop where a panel of independent experts reviews the data and assessment and recommends the most appropriate values of critical population and management quantities.

All SEDAR workshops are open to the public. Public testimony is accepted in accordance with each Council's Standard Operating Procedures. Workshop times and locations are noticed in advance through the Federal Register. For more information about the SEDAR visit http://www.sefsc.noaa.gov/sedar/. SEDAR Assessments for species in the U.S. Caribbean include:

- SEDAR 03 - Southeastern United States Yellowtail Snapper
- SEDAR 04 - Atlantic and Caribbean Deepwater Snapper-Grouper, Caribbean Species
- SEDAR 08A - Caribbean Spiny Lobster & Yellowtail Snapper
- SEDAR 14 - Caribbean Yellowfin Grouper, Mutton Snapper, Queen Conch
- SEDAR 26 - Caribbean Queen Snapper, Silk Snapper and Redtail Parrotfish
- SEDAR 30 - Caribbean Blue Tang and Queen Triggerfish
- SEDAR 35 - Caribbean Red Hind
- SEDAR 46 - Caribbean Data Limited Stocks
- SEDAR 57 - Caribbean Spiny Lobster (*scheduled for completion in 2019*)

H.3.2.3 Catch-Per-Unit-Effort Determination

In the U.S. Caribbean, effort data need to be improved so a more accurate catch per unit effort (CPUE) can be derived. The CPUE is used as a measure of economic efficiency and index of fish abundance, and in the U.S. Caribbean is fraught with issues. In addition, fishermen report the time actually fishing, which is a parameter to calculate CPUE, and the time away from the dock interchangeably (MRAG 2009). Multiple SEDAR assessments have attempted to develop standardized CPUE abundance trends from the U.S. Caribbean landings data, with minimal success (SEDAR 2009). For example, for queen conch, there is not a clear definition of the units of effort recorded for CPUE. This lack of definition results in indices that do not properly reflect queen conch abundance (MRAG 2009).

Improved calculations of CPUE can be achieved through enhanced reporting by fishermen. Better reporting would consist of denoting fishing start and end times. Another helpful improvement would be identifying specific location in which fishing was conducted to help identify transit time. To standardize this data, managers have developed and provided to licensed fishermen a gridded map to properly distinguish locations. Finally, quantifying the total number of helpers on board a fishing vessel would also benefit managers (MRAG 2009).

H.3.2.4 Biological Data Collection

The analysts and reviewers involved with SEDAR assessments have associated several problems with the inability to establish species abundance trends. First, the data lacks an adequate number of samples (temporally or spatially) for constructing an appropriate length time series (e.g., 1-2 life spans) which would allow evaluation of changes in population size over time. There is also inadequate secondary information on the fishing event to explain changes in rate of harvest over time, often resulting in indices with weak ability to predict trends.

Port samplers provide additional fishery-dependent data when collecting species harvest data from the docks. Length-frequency of the catch and species composition is the most important piece of information to collect (MRAG 2009). Port samplers could also collect additional biological samples of ageing parts (*i.e.*, otoliths, fins, dorsal spines) for specific species. When collected alongside length measurements and species composition, such samples would provide essential information on age-length relationships. The third priority in sampling is maturity and reproductive data (e.g., age and size at maturity, fecundity, reproductive strategy). The last priority is gathering trophic data (acquired through analyzing stomach contents). All of this data combined would help lower scientific uncertainty if collected according to valid scientific and statistical protocols (MRAG 2009).

The Council's Scientific and Statistic Committee (SSC) has also provided data research recommendations for purposes of enhancing SEDAR Assessment. Some examples of information needed include life history information, updating size/age studies and addressing sampling issues for under-sampled species, evaluating commercial landing expansion factors for Puerto Rico, and include spiny lobster and queen conch into MRIP (Source: SSC Meeting March 2016).

Appendix I. Information Used to Identify and Describe Essential Fish Habitat (EFH) for Species New to Federal Management in the St. Thomas/St. John Fishery Management Plan (FMP)

Through Action 6 of this integrated FMP/environmental assessment (EA), the Caribbean Fishery Management Council (Council) would describe and identify EFH for species new to federal management in the St. Thomas/St. John exclusive economic zone (EEZ) according to functional relationships between all life stages of the new species and the marine and estuarine habitats of St. Thomas/St. John. The species new to management under the St. Thomas/St. John FMP (Action 2, Preferred Alternative 2) include coral-reef associated fish, pelagic fish, and a number of benthic invertebrates (sea urchins, sea cucumbers, and corals).

Background

In 1983, the Council developed a Draft Environmental Impact Statement (DEIS) for the Caribbean Coastal Migratory Pelagic Fishery Management Plan (CCMP FMP) (CFMC 1983). The species considered under the CCMP FMP were: cero mackerel, king mackerel, great barracuda, dolphin, wahoo, almaco jack, bar jack, greater amberjack, horse-eye jack, yellow jack, blue runner, and rainbow runner. The Draft FMP was submitted in April 1983 at the 46th Council meeting but was withdrawn in December 1983 (48th CFMC meeting). The CCMP FMP was never formalized.

Coral reef-associated fish species (e.g., snappers, groupers) have been managed under the FMP for the Reef Fish of Puerto Rico and the U.S. Virgin Islands (USVI) (Reef Fish FMP) since 1985. The Reef Fish FMP included the jack species proposed for management in the CCMP FMP, but did not include the other pelagic species (cero mackerel, king mackerel, great barracuda, dolphin, or wahoo). Select corals, sea urchins, and sea cucumbers have been managed under the FMP for the Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the USVI (Coral FMP) since 1995.

For the species that were managed under the Reef Fish and Coral FMPs, EFH was described and identified in the Final Environmental Impact Statement (FEIS) for the Generic EFH Amendment (CFMC 2004) and the Caribbean Sustainable Fisheries Act (SFA) Amendment (CFMC 2005). Those EFH designations would still be applicable to the previously managed species that were retained in the St. Thomas/St. John FMP (see Action 2), but would not be applicable to the species new to management (Table I.1). The previous EFH designations were reviewed under the 2011 Five-Year EFH Review (CFMC 2011c) and are being reviewed under the on-going Five-Year EFH review. The 2011 EFH Five-Year review included information for a species proposed for management under the St. Thomas/St. John FMP, the yellowmouth grouper. This appendix contains the information used in developing the EFH designations for the species new to management in the St. Thomas/St. John FMP.

Table I.1. List of species new to federal management by designated functional group[79] under the St. Thomas/St. John FMP that require EFH designations. The St. Thomas/St. John FMP also includes all coral, sea urchin, and sea cucumber species that occur in the St. Thomas/St. John EEZ, and EFH would be designated for those species new to management.

Scientific Name	Common Name	Functional Group
Mycteroperca intersticialis	Yellowmouth grouper	Reef Fish
Coryphaena hippurus	Dolphin	Pelagic
Acanthocybium solanderi	Wahoo	Pelagic
-	Corals	Coral Reef Resources
-	Sea Urchins	Coral Reef Resources
-	Sea Cucumbers	Coral Reef Resources

This appendix is arranged in the following order: summary of species distribution (by functional group), habitat (including information on eggs, larvae, feeding and spawning), predator-prey interactions, and reported incidence of ciguatera. The issue of ciguatera is significant in the U.S. Caribbean and should be considered when site-specific areas of ciguatoxic fish are known.

Reef Fish

Under the U.S. Caribbean-wide FMPs, fishable habitat was defined to a depth of 100 fathoms. The deep-water grouper fishery, which includes the new species proposed for management under the Puerto Rico FMP, operates beyond that 100-fathom limit with reports for some species from areas that are surrounded by waters of 300 fathoms (549 meters [m] or 1,800 feet [ft]) or more.

Yellowmouth Grouper, *Mycteroperca intersticialis*

Distribution

Randall (1967, 1983) indicated that yellowmouth grouper were not very common in the West Indies. Yellowmouth grouper occur off Bermuda and the Bahamas, from North Carolina southward to the Florida Keys, throughout the Gulf of Mexico and Caribbean Sea, and southward to Brazil (Smith 1971). Yellowmouth grouper are found at depths 98 ft (30 m) or greater in the eastern Gulf of Mexico, but may be found at shallower depths in Bermuda and the Florida Keys (Bardach et al. 1958; Bullock and Smith 1991).

[79] Functional groups were defined in Chapter 5.

Habitat
In general, grouper eggs are pelagic and contain an oil globule indicative of flotation in the water column. Hatching occurs in 2 - 3 days after the absorption of the yolk sac.

Grouper larvae are found in low numbers in the surveys conducted in Puerto Rico (e.g., Ramírez-Mella and García-Sais 2003) and in general have a larval pelagic duration of 35 - 40 days. The larvae reported from southwestern Puerto Rico were found between 13 and 29 km offshore (Ramírez-Mella and García-Sais 2003). Serranid (grouper) larvae are being identified from samples taken during various NOAA research cruises in the Virgin Islands but the information is not yet available (CRCP Grant # NA17NMF4410270 FY17). However, identification to species requires DNA testing.

Yellowmouth grouper juveniles were reported at Bajo de Sico (BDS) in western Puerto Rico during 2013-2014 surveys targeting Nassau grouper suggesting that BDS could be considered a nursery area for yellowmouth grouper (Schärer and Nemeth 2015). Spawning aggregation sites such as El Seco in Vieques, Puerto Rico (García-Sais et al. 2011), Mona Island, Puerto Rico (Schärer et al. 2012), and Grammanik Bank, south of St. Thomas (Nemeth et al. 2006) are used by multiple species such as tiger grouper, cubera snapper, and yellowfin grouper and include, although in small numbers, yellowmouth grouper. However, yellowmouth grouper encounters were rare at U.S. Caribbean spawning sites (e.g., Schärer et al. 2012; Kadison et al. 2017).

Nemeth et al. (2005) indicated that a spawning site for *yellowmouth grouper* along the southwestern margin of the coral reef bank in Grammanik Bank. Although not as numerous as the yellowfin grouper (*M. venenosa)*, yellowmouth grouper showed reproductive color phase during March at Grammanik Bank but no courtship or spawning behaviors were observed.

Yellowmouth grouper are reported from the mesophotic reefs co-occurring with yellowfin groupers in the survey areas to about 50 m. The species was reported to occur to depths of 450 m (Grana Raffucci 2005) in Puerto Rico and the US Virgin Islands.

Fishable habitat to 100 fathoms is the definition of the current EFH for the US Caribbean. The depth of the deep-water snapper and grouper fishery, and of many of the new species proposed for management requires the redefinition of fishable habitat. The fishery for deep-water snappers and groupers, especially those associated with yellowmouth groupers. *Mycteroperca interstitialis* are reported from areas that are surrounded by waters of 300 fathoms (549 m or 1,800 ft) and more, form isolated seamounts or areas such as Grammanik Bank with depth ranges of 30- 50 m to over 350 fathoms within a small area of 1.5 km^2. The habitat of the co-occurring yellowfin grouper (*M. venenosa*) in Gramannik Bank is described as a mesophotic coral reef bank, dominated by *Orbicella* spp., and sparsely colonized hardbottom with isolated coral colonies and sponges with sand channels at depths of 30 to 50 m (Herzlieb et al. 2006, Smith et al. 2008).

<u>Predator-Prey Interactions</u>
Randall (1967) reported 100% of the stomach contents of yellowmouth grouper were fish including chromis, atherinids and *Scarus croisensi*. Garcia Sais et al. (2007) reported these species from BDS, in areas where the he area where *M. interstitialis* was present and on reef promontories described as feeding grounds for yellowmouth grouper.

<u>Ciguatera</u>
Many large groupers are believed to be ciguatoxic, but this species is not listed separately in the literature as being ciguatoxic.

Pelagic species

None of the pelagics species proposed for management under the St. Thomas/St. John FMP are defined as highly migratory species (HMS) under the Magnuson-Stevens Act, and thus are not managed under the Consolidated Atlantic HMS FMP. Dolphin and wahoo, described as coastal pelagics, are managed under the FMP for the Dolphin and Wahoo Fishery of the Atlantic (SAFMC 2003), but that management does not extend to the U.S. Caribbean.

The pelagic species are the most affected by the oceanographic phenomena, these species follow for example currents or temperature gradients and have a general established seasonal movement throughout not only the U.S. Caribbean but throughout the larger area of distribution

Dolphin, *Coryphaena hippurus*

<u>Distribution</u>
The common dolphin (*Coryphaena hippurus)* is an oceanic pelagic fish found worldwide in tropical and subtropical waters (Figure I.1). The range for dolphin in the western Atlantic is from George's Bank, Nova Scotia to Rio de Janeiro, Brazil. They are also found throughout the Caribbean Sea and the Gulf of Mexico, and they are generally restricted to waters warmer than 20˚C (Oxenford 1997). According to Shcherbachev (1973), dolphin penetrates temperate latitudes to range above 40°N in the summer. Rose and Hassler (1968) give Prince Edward Island, Nova Scotia and the southern tip of Africa as the range limits of the dolphin in the Atlantic. Sightings in the extreme limits of the range reportedly are rare, and the general range of this species probably is best described by the 20°C (68°F) isotherm (Gibbs and Collette 1959).

Dolphin are oceanic but also approach the coast. Gibbs and Collette (1959) report that this species comes close to shore; where blue waters sometimes are found near the shore. The increase in river outflow, rain events, near shore water contamination and sedimentation could have changed the behavior of the dolphin fish thus not allowing it to come nearshore.

Garcia-Moliner (2013) showed that during significant events of rain in the Amazon and the entrainment of these "green waters" in water masses moving from Brazil through the Caribbean, the landings of dolphin fish decreased significantly. Other changes in the habitat of dolphin fish include the massive presence of Sargasso in the Caribbean (Franks et al. 2010). Dammann (1969) reported that dolphin were caught in the USVI at the edge of the 100 fathom shelf and sometimes inshore. Dammann (pers. com. in CFMC 1983) also reported that dolphin have been caught in green water on top of the shelf very close (i.e. 100 yards [91 m]) to shore.

There is pronounced seasonal variation in abundance. Dolphin are caught off North and South Carolina from May through July. Dolphin caught off Florida's East Coast are caught mainly between April and June. February and March are the peak months off St. Thomas/St. John's coast. Dolphin are caught in the Gulf of Mexico from April to September with peak catches in May through August (SAFMC 1998a).

The migratory circuits of the dolphin fish include a northern cycle – extending from the east coast of the U.S. to north of St. Thomas/St. John and the USVI and a southern circuit extending from south –southeast St. Thomas/St. John to the south. The peak season in St. Thomas/St. John is reported to occur in February-March (SAFMC SAFE Report Dol-Wa FMP 1999) but having two seasons that are different for the North and South coasts. Changes in the peak months when dolphin are present in the U.S. Caribbean have been reported by fishermen (e.g., Captain M. Hanke, personal communication). It is suggested that these changes are associated with the presence of Sargassum. Sargasso flux is currently a much discussed issue throughout the wider Caribbean as it is yet to be determined the timing and frequency with which it arrives in local waters.

<u>Habitat</u>

Habitat of the dolphin include floating objects such as trees and other material brought by currents and river outflows, flotsam and jetsam, Sargasso and other floating seaweeds (lines of *Thalassia* and *Syringodium* for example concentrated by Langmuir circulation). The floating objects and vegetation create an environment where dolphin fish can feed and shelter during various life stages. The dolphin is well known for its propensity to station itself near nonmotile objects on the ocean surface (Kojima, 1965). This is because there is a greater availability of food near floating objects. Dolphin are also harvested around trap bouys as well as other specialized fish aggregating devices (FAD). FADs have been used in the USVI for over 30 years.

In the Florida Current and Gulf Stream dolphin associate with Sargassum windrows and, according to Beardsley (1967) and Gibbs and Collette (1959), take much of their food from that community. This tendency of dolphin to accumulate around floating objects also appears to take place in the Caribbean. Commercial and recreational fishermen in the Virgin Islands and St. Thomas/St. John indicate increased catches of dolphin when fishing near floating debris. It is common practice for fishermen to troll around floating buoys, discharged garbage, and Sargassum rafts.

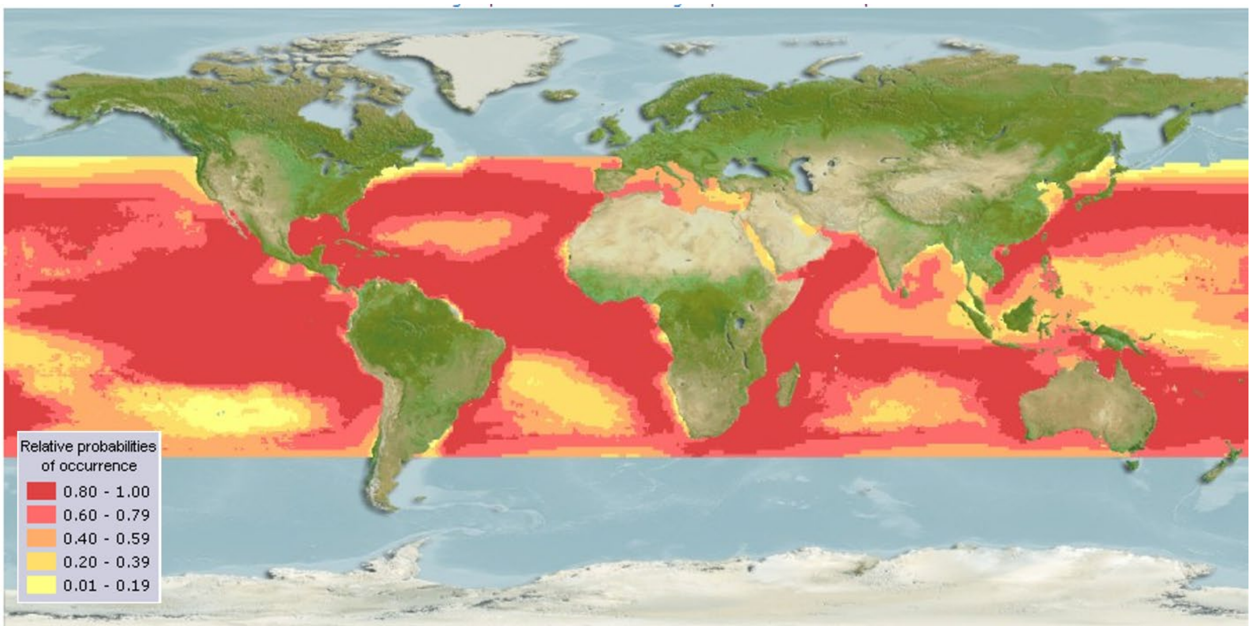

Figure I.1. Distribution map for dolphin (*Coryphaena hippurus*).
Source: www.aquamaps.org, version of Aug. 2016. Web. Accessed 25 Sep. 2019.

Spawning

In the Caribbean area most adult female dolphin had sub ripe ovaries throughout the year with a probable peak in February (Erdman, 1976). More than one set of eggs in the ovary of a single dolphin may ripen at different stages indicating that dolphin may have more than one spawning per season (Beardsley, 1967).

Predator-Prey Interactions

Stomach content analyses of dolphin indicate that fish are the most abundant, but not the sole food item, indicating that dolphin are non-selective feeders. In St. Thomas/St. John, Erdman (1976) showed that the diet of dolphinfish includes reef-associated species in the families Balistidae and Monacanthidae (triggerfish and filefishes), Acanthuridae (surgeonfish), *Pseudupeneus maculatus* (goatfish) Carangidae (jacks) as well as surface -associated species of flying fish, ballyhoo, with additional differences in species specific prey items during each season. The orange spotted filefish, *Cantherines pullus* being the most common fish found in the dolphin fish stomachs indicates that dolphin fish move throughout the water column since its prey item tend to stay near the bottom and near reef structures. Other prey species include *Priacanthus* spp found near deep water reefs.

The importance of the Sargassum community in providing food for common dolphin, particularly for juvenile and younger mature individuals, has been noted by several authors. Rose and Hassler (1974) found significantly more empty stomachs in small female dolphin in a summer when tidelines off the North Carolina coast were relatively rare, which suggests that this community makes an important contribution to the food supply of this group. Kojima (1965), Rose and Hassler (1974), and Beardsley (1967) considered the Sargassum community to have great ecological importance to the dolphin because of the food supply it provides. Furthermore, the Sargassum community provides protection for younger individuals from predation by other species. Segregation of younger from older individuals through behavioral differences reduces cannibalism. An adaptive significance to the attraction of smaller individuals to the Sargassum community is suggested (Rose and Hassler, 1974).

The common dolphin is thought to be a day feeder (Erdman, 1958) and perhaps does not feed effectively in darkness (Gibbs and Collette, 1959), although they would feed at night on small fishes and squid attracted to light from ships. Two known predators of the common dolphin in western Atlantic waters are the blue marlin (*Makaira nigricans*) (Gibbs and Collette 1959), and the swordfish (*Xiphias gladius*) (D. DeSylva, pers. comm. CFMC 1983).

Association of dolphin with floating objects could be determined by the presence of prey, an association that could change over time as fish grow. Palko et al (1982) suggested that the distribution and migration of dolphin fish can be highly influenced by the drifting floating objects. Taquet et al. (2000) suggest the presence of FADs can also influence the migration of dolphin and wahoo specifically arguing that juvenile fish aggregate and remain near these FADs because food is available. Further, because it has been shown in other pelagic species (Cayré 1991; Marsac et al. 1995), dolphin and wahoo could learn to navigate among FADs.

Taquet et al. (2000) argue, based on stomach contents studied by Oxenford and Hunte (1999), that food is an important factor in determining the aggregation of dolphinfish. Stomach contents of wahoo and dolphin show them to be piscivorous, most significantly feeding on fish known to be associated with drifting objects.

Hemphill (2005) argued that the Sargassum, as it extends into international waters, is an ecosystem that should be considered a critical marine habitat. Pelagic top predators such as dolphin have been shown to be food-dependent on floating algae such as Sargassum (Manooch et al. 1984) in at least part of their range. The changes in the presence of Sargassum throughout the Caribbean might influence the presence, abundance, and seasonality of dolphin.

Ciguatera
There are no reports of ciguatera poisoning by dolphinfish in the U.S. Caribbean. However, it has been implicated in ciguatera poisoning in the Florida-Caribbean region (Stinn et al. 2000).

Wahoo, *Acanthocybium solandri*

Distribution
Wahoo are oceanic pelagic fish found worldwide in tropical and subtropical waters of the Atlantic, Indian and Pacific oceans and the Caribbean and Mediterranean Seas (Figure I.2). The north to south extension of their distribution ranges from Brazil to the Northeast USA. In the western Atlantic wahoo are found from New York through Columbia including Bermuda, the Bahamas, the Gulf of Mexico, and the Caribbean, and seasonally extending its range into temperate waters (Collette 2002; Hogarth 1976).

Wahoo have been caught along the coast of northwest Africa and inhabits the eastern part of the equatorial Atlantic. It is also common off northern Brazil in the Guiana Current, the Gulf of Mexico, in the Gulf Stream from Florida to Cape Hatteras and in the Caribbean (Böhlke and Chaplin 1968). In the Pacific it is found off Central America, southern California, around Hawaii, and from Japan down to Australia (Iversen and Yoshita 1957). It is reported from the Indian Ocean, and one specimen has been reported from the Mediterranean (CFMC 1983). However, nowhere is the fish very abundant and large accumulations of the fish are not known to exist in any of the regions (FAO 1978). Routine seasonal migrations of wahoo are unknown in either Puerto Rico or the Virgin Islands. Wahoo apparently move frequently. There is pronounced seasonal variation in abundance. They are caught off North and South Carolina primarily during the spring and summer (April-June and July-September), off Florida's east coast year-round, off Puerto Rico and the USVI year-round with peak catches between September and March, in the Gulf of Mexico year-round, in the eastern Caribbean between December and June, and in Bermuda between April and September. The species is landed in the U.S. Virgin Islands year-round although it is less abundant in June through August (Dammann 1969).

Theisen et al. (2008) determined that wahoo constitute a "single globally distributed population" a finding attributed to extensive dispersal at all life stages.

Habitat
Wahoo produce buoyant eggs and are known to spawn in the vicinity of open-ocean currents, characteristics which can enhance dispersal (e.g., Brown-Peterson et al. 2000).

Larval and post larval wahoo are usually collected in water at depths greater than 328 ft (100 m). The species is a very powerful fast swimmer and, like the dolphin, is also frequently found in the open ocean (Hogarth 1976 and Iversen and Yoshita 1957). Large fish appear to be solitary but have been reported to form aggregations of different size fish. It is not known if these aggregations serve a specific function. Wahoo tend to be found near flotsam and jetsam, Sargassum, and in distinct breaks in the water (e.g., weed lines, sediment fronts).

The pelagic zone is 'typical habitat' for the adults of the wahoo (in Jacobsen and Browder 2006). It appears to be migratory in the Florida Straits and Gulf Stream but is caught with regularity in the U.S. Virgin Islands. Wahoo have been reported to travel in small schools, but this trait is probably restricted to young fish. Analysis of fish caught in the Gulf Stream suggests that they are pelagic fish of the open ocean and prey on organisms associated with Sargassum.

Although wahoo are a targeted species in both the commercial and recreational fisheries, little is known about its habitat (e.g., https://www.fisheries.noaa.gov/species/atlantic-wahoo), about its spawning sites or better information on the specific oceanographic conditions for growth to maturity, feeding and spawning.

Prey-Predator Interactions

Hogarth (1976) found that fishes accounted for 97.4% of all food items collected from stomach content with mackerels, butterfish, porcupinefish, and round herrings being the most identified fish.

Ciguatera

Wahoo has not been implicated in ciguatera poisoning (Olsen et al. 1984, Escalona de Motta et al. 1986).

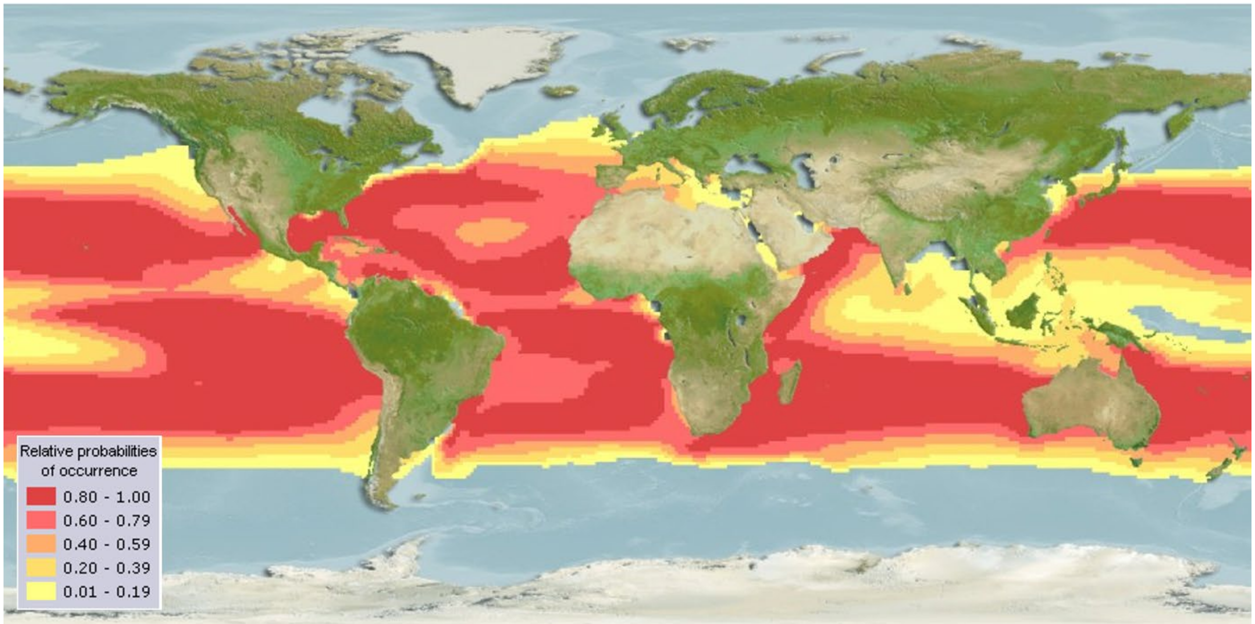

Figure I.2. Distribution map for wahoo (*Acanthocybium solandri*).
Source: www.aquamaps.org, version of Aug. 2016. Web. Accessed 25 Sep. 2019.

Coral Reef Resources

Sea Urchins – Class Echinoidea

Sea urchins belong to the Phylum Echinodermata, along with sea cucumbers, starfish, brittle stars, and crinoids. Sea urchins (class Echinoidea) are typically round and spiny, with tests (bodies) generally 1-4 in (3-10 cm). About 950 species are found in all oceans and depth zones along the seabed from intertidal depths down to 16,400 ft (5,000 m). Sea urchins generally move slowly, crawling with their tube feet, or pushing themselves with their spines. Urchins are adapted to live on rocks and other types of hard bottom (Barnes 1974) and are capable of living under rocky layers and excavating depressions on rocky surfaces. Urchins can also burrow in sand and crevices during high wave action and can survive on rocky shores as well as the deep ocean floor.

Roughly 76 species of Echinoids occur in the wider Caribbean region, with only 14 species reported in the U.S. Caribbean (Alvarado 2011). Three of the five most common sea urchins in the U.S. Caribbean (*Echinometra lucunter*, *E. viridis*, and *Diadema antillarum*) are associated with hardground substrates while the other two (*Tripneustes ventricosus* and *Lytechinus variegatus*) are associated with seagrass beds.

Sea urchins feed primarily on algae, but also eat slow-moving or sessile organisms and carrion. Predators of sea urchins include sea otters, starfish, triggerfish, and humans. Aside from grazing on reef algae, urchins can raze areas of seagrass beds as well. This grazing on the reefs is an important factor in coral reef health and stability. In some instances where *D. antillarum* was not present, algae were literally taking over the reef from the corals. At least 15 species of fishes are known to prey on *D. antillarum* and some juvenile fishes and shrimp and known to utilize the long spines of this urchin species as shelter.

Sea urchins eject sperm and eggs into the water column with fertilization occurring in the sea water. Depending on the species, fertilized eggs may be retained among the urchins spines in a brooding-like behavior. Sea urchins have planktonic larvae that might take months to develop. Once the adult skeleton is being formed, larvae sink to the bottom. Metamorphosis can be as short as 1 hour. D. antillarum are known to aggregate and spawn throughout the year in the Caribbean.

Sea urchins are common in shallow and deep-waters around St. Thomas/St. John. The deep-water surveys recently conducted in the U.S. Caribbean EEZ show what appear to be trails of these organisms.

Sea Cucumbers – Class Holothuroidea

Sea cucumbers belong to the Phylum Echinodermata, along with sea urchins. Sea cucumbers (Class Holothuroidea) have a soft, cylindrical body that usually measures between 4 and 12 in (10 and 30 cm) long, with some species measuring up to 10 ft (3 m). Sea cucumbers are found world-wide on rocky bottoms, sandy bottoms, mud-like bottoms, from shallow waters down to depths of 5.5 miles (8.9 km). Sea cucumbers form large herds that move across the bottom of the ocean. The body of some deep-water sea cucumbers made of tough gelatinous tissue that allows animals able to control their buoyancy, making it possible for them to actively swim. The swimming sea cucumber, *Enypniastes eximia*, was recently recorded during NOAA's Ocean Exploration and Research, Exploring Deep-sea Habitats off Puerto Rico and the U.S. Virgin Islands.

There are about 1,700 species of sea cucumbers, with roughly 63 species in the wider Caribbean region, about half of which are reported in the U.S. Caribbean (Alvarado 2011).

Sea cucumbers serve an important role as they break down detritus and other organic matter, they helping to recycle nutrients in the marine ecosystem. Sea cucumbers crawl on the bottom feeding on detritus from the sediments or algae growing over the hard surfaces. Most are deposit or suspension feeders. The sediment passes through the sea cucumber's gut and is returned devoid of food particles to the habitat. Some cucumbers have a commensal relationship with a fish (pearl fish) that lives in the respiratory tree, using the sea cucumber as shelter, with no apparent damage to the sea cucumber. The body wall of sea cucumbers often contain a toxin, which makes them distasteful to predators.

Reproduction in the sea cucumbers includes hermaphroditic protrandy (changing from male to females) and brooding behavior. Fertilization is external, except in a deep-water species that appear to have internal fertilization. The young leave the mother well-formed or brooding takes place within the ovary. In most species however, fertilized eggs develop in the water column and embryos are planktonic (pelagic). The stages of metamorphosis of the larvae are all pelagic until a small cucumber is form and settlement to the benthos takes place.

Corals

(For additional information, see Appendix J)

The Council intends to manage all species of corals, whether described in this section or not. Corals (Phylum Cnidaria) included for management under the St. Thomas/St. John FMP include species in (1) Class Hydrozoa: Subclass Hydroidolina - Order Anthoathecata - Family Milleporidae and Family Stylasteridae; (2) Class Anthozoa: Subclass Octocorallia (soft corals, gorgonians, sea pansies, sea pens) - Order Alcyonacea (soft corals), and Order Pennatulacea (sea pens); Subclass Hexacorallia - Order Scleractinia (stony corals), and Order Anthipatharia (black corals). A description of coral species previously managed under the U.S. Caribbean-wide Coral FMP can be found in the Caribbean SFA Amendment (CFMC 2005). Please see Section 3.3.1 of this document for an updated description of Endangered Species Act-listed corals and Appendix E for a list of coral species included in this FMP. Due to the large numbers of species included in the FMP, this summary is just a high-level overview of corals in the management area.

For most corals, it is believed that light requirement is the reason why coral reefs are limited to fairly shallow waters. With increasing depth below about 30 m corals are generally less heavily calcified than in shallower water and the ability to form reef structures decreases. Reef corals may occur to depths approaching 90-100 m in extremely clear water, but below 45-50 m in their constructional abilities are severely limited and may be surpassed by those of other groups of organisms such as the sclerosponges (Colin 1978).

Star corals (Montastrea spp.) are generally the most common species of coral on Atlantic reefs at moderate depths (Colin 1978). Massive boulders reaching several meters across can form in shallow water (1 - 20 m) and flattened heads or plate-like colonies in deeper water (below 20 m). Star corals often form massive mounds that are important structural elements of buttresses and other fore reef elements at moderate depth and the coral colonies become more flattened as water depth increases.

Black corals are typically deep sea, slow growing colonial anthozoans usually occurring under ledges, possibly because their larvae is negatively phototactic. The axial skeleton is black, spiny and scleroproteinaceous, and is secreted in concentric layers around a hollow core. The polyps overlay the horny skeleton, are interconnected and possess six non-retractile, unbranched tentacles. They usually contain a diverse array of internal and external unstudied commensal organisms that include palaemonid crustaceans, lichomolgid copepods, and pilargiid polychaetes. Available evidence suggests that recruitment is infrequent.

A number of organisms prey directly on corals. Certain fishes pick polyps from the surface of the colony (butterflyfishes) while others ingest or scrape portions of skeleton with their attached polyps (puffers, parrotfishes). Some gastropod molluscs feed on coral polyps by inserting their proboscis into the polyp, and a few polychaete worms feed on branched corals by engulfing the tip of a branch in their mouth (Colin 1978). Boring sponges and clams occur in the skeleton and weaken it by their mechanisms of removing calcareous material (Colin 1978).

Within a colony, reproduction is asexual. New polyps are budded from other polyps as the colony increases in diameter or length. The rate of growth is variable between species, with branched species generally growing faster than massive species, and is strongly influenced within each species by environmental conditions. Sexually produced larvae, termed planulae, result in the establishment of new colonies. Larvae may either swim (entering the plankton and covering large distances) or crawl (staying close to the parent) until they attach to the bottom to initiate a new colony (Colin 1978).

Appendix J. Description of the Species Included in the St. Thomas/St. John Fishery Management Plan (FMP)

This appendix summarizes the available information on the biology and life history for stocks/stock complexes (e.g., fish, spiny lobster, queen conch, corals, sea cucumbers, and sea urchins) managed in the St. Thomas/St. John FMP. A complete description of the life history characteristics and ecology of all species previously-managed by the Caribbean Fishery Management Council (Council) can be found in the Caribbean Sustainable Fisheries Act (SFA) Amendment (CFMC 2005), the 2010 Caribbean Annual Catch Limit (ACL) Amendment (CFMC 2011a), and the 2011 Caribbean ACL Amendment (CFMC 2011b), and is incorporated herein by reference. Regulatory Amendment 4 to the Reef Fish FMP (CFMC 2013c) has the recent description of the biology and ecology of parrotfish, and Regulatory Amendment 2 to the Queen Conch FMP has the most updated information for queen conch in federal waters (CFMC 2013b). The biology and ecology of managed corals and reef associated plants and invertebrates were updated through Amendment 4 to the Coral FMP (CFMC 2013a).

Queen conch, *Lobatus gigas*

The queen conch is an invertebrate with a hard shell and a soft body, which consists of the black speckled foot, the visceral mass within which resides the thoracic and abdominal organs, two slender tentacles, a "head" with bright yellow eyes perched on the end of two protruding stalks, and a snout-like mouth (proboscis) which the conch extends to graze on algae. Enclosing the foot and head is a snug, orange or yellow fleshy covering called the mantle, which secretes the shell and also houses the feathery gills that allow the conch to extract oxygen from the water. The queen conch's shell is its most striking feature. Adults have a heavy shell with a broad, flared lip that is a glossy pink, orange, or yellow on the interior. The outside of the shell is marked by a blunt crown of spines that project from each whorl of the spiral. Queen conchs are "right-handed," meaning that as the observer looks at the pointed crown, the spiral coils to the right. A brown, papery layer called the periostracum covers the shell and collects silt, bacteria, and algae, which help to disguise the animal. The periostracum flakes off when the shell is removed from the water and dried.

Distribution and Habitat

The queen conch occurs in semi-tropical and tropical waters of the Atlantic Ocean, ranging from south Florida (USA) and Bermuda to northern South America, including the Caribbean Sea (Rhines 2000). This species generally occurs on expanses of shelf to about 250 ft (76 m) depth. It is commonly found on sandy bottoms that support the growth of seagrasses, primarily turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*), shoal grass (*Halodule wrightii*), and epiphytic algae upon which it feeds (Randall 1964; Stoner and Waite 1990).

Queen conch also occurs on gravel, coral rubble, smooth hard coral or beach rock bottoms, and sandy algal beds (CFMC 1996). Additional information on queen conch habitat in deeper water (30-50 m) indicates that the species occurs on rhodolith reefs, a habitat that functions as a foraging ground for conch (García-Sais et al. 2010). Sandt and Stoner (1993) have shown that queen conch actively select among their habitats, with juveniles being more selective than adults, and are dependent on certainhabitat requirements. The most productive nurseries occur in shallow (5-6 m deep) seagrass meadows (Stoner 1997). Juveniles exhibit a strong preference for intermediate densities of seagrasses, whereas adults show less habitat specificity (Stoner and Waite 1990).

Juveniles settle in shallow subtidal habitats where they spend much of their first year buried in the sediment (CFMC 1996, CFMC CFRAMP 1999, Rhines 2000). At shell lengths ranging from 2.0-3.0 in (5-7.5 cm), young juveniles begin to emerge and take up an epibenthic existence. Some studies have documented a habitat shift at the time of emergence, from the area of settlement into nearby seagrass beds. Queen conch exhibit two general patterns of migration. The first is an ontogenetic migration into deeper water, a pattern which generally becomes more pronounced in large juveniles (CFMC CFRAMP 1999). Aggregations of over 100,000 juveniles have been reported in the Bahamas (CFMC 1996). The second migration is related to spawning. Conch generally move inshore to spawn as temperature begins to increase in March, and return to deeper water in October. This migration is manifested as a general shift in the distribution of conch, with conch in deep water migrating but still remaining deep relative to conch in shallow water areas (CFMC CFRAMP 1999).

Life History

Adult queen conch grow to 6-12 in (15-30.5 cm) in length (CFMC 1996), weigh about 4.4 lb (2 kg) on average, and generally live 6 to 7 years; although they may survive as many as 26 (Rhines 2000) or even 40 (CFMC 1996) years in deep water habitats. Growth in shell length generally ceases at the time of sexual maturity, after which growth occurs primarily through the thickening of the shell, especially at the lip (CFMC CFRAMP 1999). The shell length of an adult queen conch can progressively decrease with age due to bioerosion of the shell. The flaring of the lip starts at an age of approximately two to four years and lasts for approximately seven to ten months, or longer (Glazer and Berg 1992). While Rhines (2000) reports age at maturation as 3.5 - 4 years, the average age of maturation for both sexes of queen conch off Puerto Rico is reached at approximately five years (Appeldoorn 1994) whereas off St. John it is 3 years (CFMC 1996).

Diet

Queen conch larvae feed on plankton (Rhines 2000). Juvenile and adults graze on algae and seagrasses (Rhines 2000; Sefton and Webster 1986). Foraminiferans, bryozoans, and small bivalves and gastropods have also been found in conch stomachs but were probably ingested accidentally while grazing (Rhines 2000). Feeding has been observed in sand flats and shallow, sandy lagoons (Sefton and Webster 1986), particularly in turtle grass beds (Colin 1978; Sefton and Webster 1986), on hard bottom habitats, and in rubble (Rhines 2000). Juveniles are preyed on by a variety of gastropod mollusks, cephalopods, crustaceans, and fish (Colin 1978). Adults are preyed upon by crabs, turtles, sharks, and rays (Rhines 2000). The hermit crab (*Petrochirus diogenes*) expropriates the shell of the queen conch after consuming the animal. The conch fish (*Astrapogon stellatus*), and possibly a porcellanid crab, have commensal relationships with the queen conch; the former spends the day within the conch's mantle cavity, emerging at night to feed (Colin 1978).

Reproduction and Spawning

Sexes are separate and fertilization is internal. Copulation can precede spawning events by several weeks (CFMC 1996). Research indicates the lack of reproduction in low-density populations is related primarily to the lack of encounters between females and males. In the Bahamas, Stoner and Ray-Culp (2000) found that reproduction increased proportionally with density levels (due to increased likeliness of encounters) and remained stable near densities of 200 individuals-ha. This highlights the importance of maintaining stock density above a critical level to prevent recruitment failure. In Puerto Rico, surveys undertaken in 1996 found densities of 7.4 individuals-ha on the East Coast and 8.5 individuals-ha on the West Coast (Mateo et al. 1998). For St. Thomas, juvenile density of 1.9 individuals-ha was observed in 2001, while adult density in St Croix waters was around 26-27 individuals-ha (Gordon 2002). Recent fishery independent surveys show a marked increase in both juvenile and adult densities in Puerto Rico and the USVI (N. Jimenez, PRDNER, pers. comm.; S. Gordon, Virgin Islands Department of Planning and Environmental Resources, pers. comm.). Rhines (2000) reports the peak reproductive season extends from April to August. Peak spawning activity in the U.S. Caribbean appears to occur from May through September, corresponding to the highest water temperatures (CFMC 1996). Spawning occurs in aggregations (CFMC 1996). Egg masses are composed of a number of gelatinous egg strings, usually deposited in clean coral sand with low organic content but sometimes also in seagrass habitat (CFMC 1996). Fecundity is highly variable: individual strings may contain as many as 185,000 - 460,000 eggs (Rhines 2000); egg masses, from 310,000 - 750,000 eggs. Females commonly spawn 6-8 times per season and produce 1-25 egg masses per season (CFMC 1996).

Embryos hatch into planktonic larvae (Colin 1978, Rhines 2000) after a period of about 5 days. Larvae spend between 18 and 40 days in the water column before settling and metamorphosing into adults. Little is known about recruitment patterns. Some studies have concluded that the majority of larvae are retained locally (e.g., within the area where they are spawned); others, that larvae could be transported 26 mi (43 km) per day, or 540 mi (900 km) during the 3-week larval period depending upon current patterns. Eggs hatched off Puerto Rico and the USVI may supply conch to areas located downstream, such as Haiti, the Dominican Republic, and Cuba. Conversely, islands situated upstream in the Caribbean arc may provide conch that settle in

Puerto Rico and the USVI (CFMC 1996). However, evidence of local entrainment of larvae suggests that it is important to focus primarily on management of the local conch stock.

Caribbean spiny lobster, *Panulirus argus*

Distribution and Habitat

The Caribbean spiny lobster, *P. argus* (hereafter referred to as spiny lobster), occurs in the Western Central and South Atlantic Ocean, including the Caribbean Sea and the Gulf of Mexico. North Carolina marks its northernmost limit; Brazil, its southernmost limit (Bliss 1982). The spiny lobster occurs from the extreme shallows of the littoral fringe to depths of at least 100 m (Kanciruk 1980; Munro 1974a). CFMC (1981) reports that its distribution off Puerto Rico extends to the edge of the shelf, which is described as the 100-fathom contour (183 m). Shallow areas with mangroves and seagrass (Thalassia testudinum) beds serve as nursery areas for pre-adult populations wherever such habitats are available (Munro 1974a). Generally, spiny lobsters move offshore when they reach reproductive size (Phillips et al. 1980). Adults are found on most shelf areas which offer adequate shelter in the form of reefs, wrecks or other forms of cover (Munro 1974a). This species shelters communally by day in groups of two to over one hundred (Cobb and Wang 1985) in holes and crevices in reefs or other refuges. The largest dominant male usually occupies the most favored and safest position deep within the refuge. At night, they emerge to feed (Munro 1974a).

Mass migrations have been reported most often from Florida and the Bahamas, where movement is usually southwards (Munro 1974a) and occurs in mid-autumn or mid-winter, usually after a period of stormy weather (Cobb and Wang 1985). This migratory behavior is especially striking in the Bahamas, where large numbers of lobsters are observed to migrate day and night in queues of 2-60 animals. As many as 100,000 individuals have been observed moving in queue formation in a southerly direction on the shelf area west of Bimini (Cobb and Wang 1985).

The significance of migratory behavior is not yet understood. While local spiny lobster populations travel the same direction each year, populations in other areas may travel in different directions. Return migrations have not been described (Cobb and Wang 1985). Some hypothesize that migrations may serve to redistribute young mature adults in areas appropriate for adult habitation and larval release (Phillips et al. 1980); others, that the lobsters may be trying to escape the stress of severe winters in shallow waters (Cobb and Wang 1985).

Life History

Kanciruk (1980) estimates maximum age as 20 years.

Diet

These animals are primarily carnivores, and serve as the major benthic carnivores in some ecosystems (Kanciruk 1980). They generally feed on smaller crustaceans, mollusks and annelids (Cobb and Wang 1985). One study reported that specimens taken from a lagoon area appeared to feed only on mollusks, but that individuals taken in reef habitat consumed algae, foraminifera, sponge spicules, polychaetes and sand, in addition to bivalve and gastropod mollusk and crustacean remains (Munro 1974a). The reported consumption of seaweed, algae, and inorganic material has been attributed both to incidental ingestion (Cobb and Wang 1985) and to a shortage of other food sources (Kanciruk 1980), as opposed to preference. A 1971 study reported that juveniles at the USVI sheltered in daytime aggregations of the sea urchin (Diadema antillarum) and thus gained access to extensive feeding areas which were otherwise devoid of shelter (Munro 1974a).

Pelagic fishes, including the tunas Katsuwonus pelamis and Thunnus atlanticus, feed on spiny lobster in their planktonic phase. Natural predators of sub-adult and adult spiny lobster include large benthic feeding fishes, sharks, octopuses (Cobb and Wang 1985), rays, skates, crabs, dolphins (Munro 1974a) and turtles (CMI 1996). A small whelk (Murex pomum) is reported to eat lobsters in traps, and presumably in nature, by boring through the carapace. Barnacles (Balanus ebureus) settle on the carapace of large specimens and could serve as indicators of habitat and of the intermolt period (Munro 1974a).

Reproduction and Spawning

Sexes are separate and anatomically distinct. Males have larger and heavier carapaces, but lighter and shorter tails than females. But relationships between total length and total weight are very nearly identical for males and females in Caribbean waters (Munro 1974a). Molting appears to be tied to reproduction for females (Munro 1974a; Phillips et al. 1980), but males appear to be able to reproduce successfully year round (Phillips et al. 1980).
Maturity occurs at a single molt (the "maturity molt") and is generally related to length, rather than age. According to CFMC (1981), most females reach sexual maturity between 3.1-3.5 in (7.9-8.9 cm) carapace length (CL) and are at peak egg production between 4.3-5 in CL. Conservation Management Institute reports that intense fishing may have caused a decline in the minimum size of spawning females in Florida waters (CMI 1996). Fecundity varies greatly among size classes, but is generally high. In the early years of a spiny lobster, the larger a female, the more eggs produced. But fecundity begins to decrease at a certain age; possibly around the time when molting decreases in frequency (Munro 1974a). Munro (1974) reports that egg production per unit body weight ranges from about 670 to 1,210 eggs/g of total body weight, with an average of 830 eggs/g. CFMC (1981) reports that the number of eggs ranges from 0.5-1.7 million per spawning.

Spiny lobsters spawn at least once a year (Cobb and Wang 1985). Females in Bermuda have been reported to spawn at least twice (Morgan 1980; Munro 1974a) between May and August. But the numbers of broods produced in Caribbean waters, where the spawning period appears to be more extended are not known. For most territories within the Caribbean Sea, egg-bearing (berried) females have been observed in all months of the year, but with greatest frequency in the months from February to August (Munro 1974a). CFMC (1981) reports that reproduction occurs yearround, but declines in the fall.

Fertilization is external (Bliss 1982). Females carry fertilized eggs until they are fully developed (Cobb and Wang 1985), a period of about four weeks, and tend to move towards deeper water when the eggs are ready to hatch (Munro 1974a). Embryos hatch as planktonic larvae (Bliss 1982), which spend up to eleven months (Phillips et al. 1980) or more (Munro 1974a; Phillips and Sastry 1980) at sea before metamorphosing into the puerulus stage (Cobb and Wang 1985) and settling on the ocean bottom. This extended planktonic stage could permit extremely wide dispersal of the larvae. It appears most likely that larvae spawned in the Caribbean could, for example, settle at Bermuda (Munro 1974a).

Black snapper, *Apsilus dentatus*

Distribution and Habitat

Black snapper occurs in the Western Central Atlantic, off the Florida Keys (USA), and in the western Gulf of Mexico and Caribbean Sea. A demersal species, the black snapper is primarily found over rocky bottom habitat, although juveniles are sometimes found near the surface (Allen 1985 in Froese and Pauly 2002). It moves offshore to deep-water reefs and rocky ledges as it grows and matures (SAFMC 1999). Allen (1985), in Froese and Pauly (2002) reports depth range as 100-300 m. The findings of a Caribbean study indicate that it is most abundant at depths of 60-100 m off Jamaica (Thompson and Munro 1974a).

Life History

Maximum reported size is 65 cm TL (male). Maximum reported weight is 3,170 g (Allen 1985 in Froese and Pauly 2002). Size at maturity and age at first maturity estimated in Froese and Pauly (2002) are 34.9 cm TL and 1 year, respectively. Observed maximum fork lengths of catches taken in a Jamaican study were 56 cm FL and 54 cm FL for males and females, respectively; estimated mean sizes of maturity, 43-45 cm FL and 39-41 cm FL for males and females, respectively (Thompson and Munro 1974a). Approximate life span is 4.4 years; natural mortality rate, 0.30 (Ault et al. 1998). Large catches occasionally obtained over a short period of time suggest a schooling habit for this species (Thompson and Munro 1974a).

Diet

Prey includes fishes and benthic organisms, including cephalopods, tunicates (Allen 1985 in Froese and Pauly 2002), and crustaceans (Thompson and Munro 1974a). Halstead (1970), in Froese and Pauly (2002), report that it can be ciguatoxic.

Reproduction and Spawning

Aida Rosario (unpublished data; personal communication) reports that females with ripe gonads were collected from December to May and from August to September, and were collected with the highest frequency in March and September. In the northeastern Caribbean, individuals in spawning condition have been observed from February through April, and in September (Erdman 1976). Thompson and Munro (1974a) reports that, off Jamaica, the greatest proportions of ripe fishes were found in JanuaryApril and September-November (Thompson and Munro 1974a).

Blackfin snapper, *Lutjanus buccanella*

Distribution and Habitat

Blackfin snapper occurs in the Western Atlantic, as far north as North Carolina (USA) and Bermuda, south to Trinidad and northern Brazil, including the Gulf of Mexico and Caribbean Sea (Allen 1985 in Froese and Pauly 2002). This species is very common in the Caribbean, particularly in the Antilles. The blackfin snapper is a demersal species, found from 20-200 m depth. Adults inhabit deeper waters over sandy or rocky bottoms, and near drop-offs and ledges. Juveniles occur in shallower waters, often between about 35 and 50 m (Allen 1985 in Froese and Pauly 2002), and sometimes in small schools (Thompson and Munro 1974a). Suitable bottom type is probably more important than depth in influencing the distribution of this species. Most fish taken in fish traps during a 1978 survey off Puerto Rico were captured at 75-110 m depth (Boardman and Weiler 1979).

Life History

This species is moderately resilient, with a minimum population doubling time of 1.4-4.4 years (K = 0.10 - 0.70). Maximum reported size is 75 cm TL (male); maximum weight, 14 kg (Allen 1985 in Froese and Pauly 2002). The modal lengths for male and female blackfins taken in the Puerto Rican survey were 26 cm FL and 23 cm FL, respectively. Maximum size was 47 cm FL. Estimated lengths of maturity for females and males were 20 cm FL and 38 cm FL, respectively (Boardman and Weiler 1979). Size at maturity and age at first maturity are estimated in Froese and Pauly (2002) as 34 cm TL and 1.9 years, respectively. Approximate life span is 8.2 years; natural mortality rate, 0.23 (Ault et al. 1998).

Diet

Allen (1985), in Froese and Pauly (2002) identify fishes as the primary prey. Thompson and Munro (1974a) report that the main items in the stomachs of this species taken at the Virgin Islands were isopods (37.5%) and fish (33.3%), with shrimps, spiny lobsters, crabs, octopus and squid making up the rest of the diet. Tunicates have been found in the stomachs of some adults (Thompson and Munro 1974a). It can be ciguatoxic (Allen 1985 in Froese and Pauly 2002).

Reproduction and Spawning

The findings of Boardman and Weiler (1979) indicate that spawning occurs year-round in the U.S. Caribbean, in relatively large numbers. In the northeastern Caribbean, individuals in spawning condition have been observed in February, April, and September (Erdman 1976). Ripe fishes have been observed in Jamaican waters in February-May and in August-November, with maxima in April and September (Thompson and Munro 1974a).

Silk snapper, *Lutjanus vivanus*

Distribution and Habitat

Silk snapper are found in western Atlantic waters, as far north as Cape Hatteras, North Carolina and Bermuda and as far south as Brazil (Bohlke and Chaplin 1967, Froese and Pauly 2011, Figure 2.8.1). They are also found in the Gulf of Mexico along the continental shelf (Bohlke and Chaplin 1967, Boardman and Weiler 1980, Sylvester et al. 1980). The reported depth range for silk snapper is 64m – 300m (Sylvester et al. 1980, Parker and Mays 1998, Cummings 2003). Depth distribution and ontogenetic stage are positively correlated, where younger, smaller fish are generally found in shallower depths than older and larger individuals (Boardman and Weiler 1980). The silk snapper occurs in the Western Atlantic, as far north as Bermuda and North Carolina (USA), southward to central Brazil. It is most abundant around the Antilles and the Bahamas. The silk snapper is mainly found from 90-140 m depth, commonly near the edge of the continental and island shelves, but also beyond the shelf edge to depths of 300 m. Adults are generally distributed further offshore than juveniles (SAFMC 1999), and usually ascend to shallow water at night (Allen 1985 in Froese and Pauly 2002). Suitable bottom type is probably more important than depth in influencing the distribution of this species. According to Rivas (1970), silk snapper are the only deep water snappers found over mud substrate in the Western Atlantic. Most fish taken in fish traps during a 1978 survey off Puerto Rico were captured at 112-165 m depth. Silk snapper have been reported to school in size groups (Dammann et al. 1970). Boardman and Weiler (1979) suggest that silk snapper are commonly associated with blackfin snapper and vermillion snapper, though silk snapper are usually found at a slightly deeper depth.

Life History

This species is of low resilience, with a minimum population doubling time of 4.5 - 14 years (K = 0.09-0.32; tm = 5). Maximum reported size is 83 cm TL (male); maximum weight, 8,320 g (Allen 1985 in Froese and Pauly 2002). The predominant lengths for males and females surveyed with trap gear in Puerto Rican waters were 29 cm FL and 26 cm FL, respectively, as determined from length-frequency curves. But trap-caught silk snapper tend to be smaller than those caught by hook and line gear. The maximum size of fish taken in that study was 71 cm FL. Females and males appeared to mature at 50 cm FL and 38 cm FL, respectively (Boardman and Weiler 1979). Size at maturity and age at first maturity are estimated in Froese and Pauly (2002) as 43.4 cm TL and 6.3 years, respectively. A Jamaican study estimates mean sizes of maturity as 55-60 cm FL (males) and 50-55 cm FL (females) (Thompson and Munro 1974a). The approximate life span of this fish is 28.7 years; natural mortality rate, 0.23 (Ault et al. 1998). However, Tabash and Sierra (1996) suggested a maximum life span of seven years and estimated an M using Ralston's (1987) method to be 0.86, which was also advocated by the SEDAR process.

The range of published natural mortality estimates was large, ranging from 0.19 and 0.86 per year. Martinez-Andrade (2003) estimated natural mortality to be between 0.54 and 0.56 per year using the equation published in the FishBase manual (Froese and Pauly 2011). The reported ranges for Linf, K, and t0 were 600 -1170 mm total length (TL), 0.051-0.32 per year, and - 2.309 - -0.04 years, respectively. The reported range for the allometric growth parameter, b, was 2.86 - 3.1 and the range for the scaling parameter, a, was 1e-5 - 0.117. Estimates of length-at-maturity, Lmat, from the literature varied. The lowest estimates of Lmat were 296mm fork length (FL) and 267mm FL for males and females, respectively (Rosario et al. 2006). The remaining estimates ranged between 340mm TL and 600mm TL. Lmat was generally determined by macroscopic inspection of the gonads. Rosario et al. (2006), however, conducted a histological investigation, which may more accurately represent Lmat. Estimates of age-at-maturity, tmat, were also discussed. The range for tmat was between two and six years.

Diet
Prey items include mainly fishes, shrimps, crabs, gastropods, cephalopods, tunicates and some pelagic items, including urochordates (Allen 1985 in Froese and Pauly 2002). The main items in the stomachs of fishes captured off the Virgin Islands consisted of fish (50.1%), shrimp (17.8%), and crabs (11%), with isopods and other invertebrate groups completing the diet (Thompson and Munro 1974a). It can be ciguatoxic (Allen 1985 in Froese and Pauly 2002).

Reproduction and Spawning
Silk snapper are gonochronistic (i.e., sexes are distinct; Sylvester et al. 1980). Silk are thought to spawn year round (Sylvester et al. 1980). Peak spawning months for silk in the USVI are April-June and October-December (Sylvester 1974). Parker and Mays (1998) have suggested that peak spawning months in the southeast USA are July-September and again in October-December. The findings of Boardman and Weiler (1979) indicate that this species spawns year-round in the U.S. Caribbean, in low percentages. But the small number of ripe fish observed in that study may have been due to the majority of the catch being smaller than estimated size at maturity.

Apparent peaks in spawning in July-September and October-December were probably due to chance collection of spawning groups of a few large fishes (Boardman and Weiler 1979). In the northeastern Caribbean, individuals in spawning condition have been observed from February through April, and in September and November (Erdman 1976). Ripe fishes have been observed off the coast of Jamaica in March-May and August, September and November (Thompson and Munro 1974a).

Vermilion snapper, *Rhomboplites aurorubens*

Distribution and Habitat
Vermilion snapper occur in the Western Atlantic from Bermuda and North Carolina (USA) to Brazil, including the Gulf of Mexico and Caribbean Sea (Allen 1985 in Froese and Pauly 2002). Vermilion snapper are demersal, commonly found over rock, gravel, or sand bottoms near the edge of the continental and island shelves (Allen 1985 in Froese and Pauly 2002). Suitable bottom type is probably more important than depth in influencing the distribution of this species (Boardman and Weiler 1979). According to Allen (1985), in Froese and Pauly (2002), this fish is found in moderately deep waters from 180-300 m. But most fish taken in fish traps during a 1978 survey off Puerto Rico were captured at 75-110 m depth (Boardman and Weiler 1979). Vermilions often form large schools; particularly the young, which generally occur at shallower depths (Allen 1985 in Froese and Pauly 2002).

Life History
This fish is moderately resilient, with a minimum population doubling time of 1.4 - 4.4 years (K = 0.20; tm = 3; tmax = 10) (Allen 1985 in Froese and Pauly 2002). Maximum size and weight reported by Allen (1985), in Froese and Pauly (2002), is 60 cm TL (male) and 3,170 g, respectively. The modal length of both males and females collected in a three-year fish trap survey in Puerto Rican waters was 23 cm FL; maximum size, 38 cm. Size at maturity was 14 cm FL (males) and 20 cm FL (females) (Boardman and Weiler 1979). Size at maturity and age at first maturity for this species are estimated in Froese and Pauly (2002) as 34.5 cm TL and 3.3 years, respectively. Maximum reported age is 10 years (Allen 1985 in Froese and Pauly 2002); natural mortality rate, 0.23 (Ault et al. 1998).

Diet
Prey items include fishes, shrimps, crabs, polychaetes, other benthic invertebrates, cephalopods, and planktonic organisms (Allen 1985 in Froese and Pauly 2002).

Reproduction and Spawning
According to Boardman and Weiler (1979), this fish spawns year-round in the U.S. Caribbean and in relatively large numbers. Erdman (1976) reports that the majority of fishes collected off the south coast of Puerto Rico in February, March, April, and June had sub-ripe or ripe gonads.

A study off Jamaica captured one active male during May, and one ripe and three active females during October (Thompson and Munro 1974a).

Lane snapper, *Lutjanus synagris*

Distribution and Habitat
Lane snapper occur in the Western Atlantic from Bermuda and North Carolina (USA) to southeastern Brazil, including the Gulf of Mexico and Caribbean Sea. It is most common around the Antilles, on the Campeche Bank, off Panama, and the northern coast of South America. Lane snapper are found over all bottom types, but are usually encountered around coral reefs and on vegetated sandy areas, in turbid as well as clear water, from 10-400 m depth (Allen 1985 in Froese and Pauly 2002).

Life History
This species is moderately resilient, with a minimum population doubling time of 1.4-4.4 years (K = 0.13-0.26; tm = 2; tmax = 10). Maximum reported size is 60 cm TL (male); maximum weight, 3,530 g (Allen 1985 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated in Froese and Pauly (2002) as 26.9 cm TL and 3 years, respectively. Figuerola and Torres (1997) estimate size at 50% maturity as 14.7 cm FL (males) and 18.5 cm FL (females) based on fishery dependent and independent data collected in the U.S. Caribbean. Allen (1985), in Froese and Pauly (2002), report maximum age as 10 years. Studies from northeast Brazil and Cuba used otoliths to estimate ages of this species up to 6 years (Thompson and Munro 1974a). Estimated natural mortality rate is 0.30 (Ault et al. 1998).

Diet
This species feeds at night on small fishes, bottom-living crabs, shrimps, worms, gastropods and cephalopods (Allen 1985 in Froese and Pauly 2002). According to Olsen et al. (1984), in Froese and Pauly (2002), it can be ciguatoxic.

Reproduction and Spawning
This fish often forms large aggregations, especially during the spawning season (Allen 1985 in Froese and Pauly 2002). Spawning season is protracted, with some degree of reproductive activity occurring practically year-round (Figuerola and Torres 1997). Most spawning occurs from March to September in the U.S. Caribbean (Erdman 1976; Figuerola and Torres 1997) and, with greater intensity, between April and July. Spawning is believed to peak in June and July around the full moon (Figuerola and Torres 1997). Fecundity ranged from 347,000 to 995,000 eggs per fish in a study of six individuals captured off Cuba (Thompson and Munro 1974a).

Mutton snapper, *Lutjanus analis*

Distribution and Habitat

Mutton snapper occur in the Western Atlantic as far north as Massachusetts (USA), southward to southeastern Brazil, including the Caribbean Sea and the Gulf of Mexico. It is most abundant around the Antilles, the Bahamas, and off southern Florida (USA). According to Allen (1985), in Froese and Pauly (2002), mutton snapper can be found in both brackish and marine waters from 25-95 m depth. Thompson and Munro (1974a) report that this species was captured on mud slopes off the southeast coast of Jamaica at depths of 100-120 m (Thompson and Munro 1974a). Juveniles generally occur closer to shore, over sandy, vegetated (usually Thalassia) bottom habitats, while large adults are commonly found offshore among rocks and coral habitat (Allen 1985 in Froese and Pauly 2002).

Life History

This fish is of low resilience, with a minimum population doubling time of 4.5-14 years (K = 0.13-0.25) (Allen 1985 in Froese and Pauly 2002). Allen (1985), in Froese and Pauly (2002), reports maximum size as 94 cm TL (male); maximum weight, 15.6 kg (Allen 1985 in Froese and Pauly 2002). The largest male and female observed in a study conducted in Puerto Rico between February 2000 and May 2001 measured 70 cm FL and 69 cm FL, respectively (Figuerola and Torres 2001). Approximate life span is 14 years (Allen 1985 in Froese and Pauly 2002); natural mortality rate, 0.214 (Ault et al. 1998). Maximum reported age is 17 years (Figuerola and Torres 2001). Size at maturity and age at first maturity are estimated in Froese and Pauly (2002) as 47.3 cm TL and 3.1 years, respectively. Figuerola and Torres (2001) estimate size at 50% maturity as 33 cm FL and 41.4 cm FL for males and females, respectively, based on the Puerto Rican survey. They indicate that all males and females are probably mature at 43.1 cm FL and 45 cm FL, respectively. That study, which was based on fishery dependent data, notes that 53% of males and 72% of females were taken prior to achieving sexual maturity. One study estimated that the ovary of an individual fish contained about 1,355,000 eggs (Thompson and Munro 1974a).

Diet

It feeds both day and night on fishes, shrimps, crabs, cephalopods, and gastropods (Allen 1985 in Froese and Pauly 2002). According to Olsen et al. (1984), in Froese and Pauly (2002), it can be ciguatoxic.

Reproduction and Spawning

Spawning occurs in aggregations (Figuerola and Torres 2001). Erdman (1976) reports that individuals have been observed in spawning condition in the U.S. Caribbean from February through July (Erdman 1976). Figuerola and Torres (2001) report that some degree of reproduction occurs from February to June, but that spawning activity generally peaks during the week following the full moon in the months of April and May. Spawning aggregations are known to occur north of St. Thomas and south of St. Croix, USVI in March, April, and May (Rielinger 1999).

Queen snapper, *Etelis oculatus*

Distribution and Habitat

Queen snapper occur in the Western Atlantic from Bermuda and North Carolina (USA) to Brazil, including the Gulf of Mexico and Caribbean Sea. It is commonly found near oceanic islands, and is particularly abundant in the Bahamas and the Antilles. Queen snapper are bathydemersal (Allen 1985 in Froese and Pauly 2002) and move offshore to deep-water reefs and rocky ledges as they grow and mature (SAFMC 1999). Allen (1985), in Froese and Pauly (2002) indicate queen snapper are primarily found over rocky bottom habitats, in depths of 100-450 m. Gobert et al. (2005) fished for and found queen snapper at depths between 100m and 500m. This was the widest depth distribution found reported in the literature, however, video taken during recent surveys in deep water habitats observed a queen snapper at 539 m.

Life History

This fish is a moderately resilient species, with a minimum population doubling time 1.4-4.4 years (K = 0.29 - 0.61). Maximum reported size is 100 cm TL (male). Maximum reported weight is 5,300 g (Allen 1985 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated as 53.6 cm TL and 1 year, respectively. Approximate life span is 4.7 years; natural mortality rate, 0.76 (Froese and Pauly 2002). The reported estimates for Linf and K, were 1020 mm TL and 1030 mm TL, and 0.29-0.621 per year, respectively (Murray and Moore 1992, Murray et al. 1992, Murray and Neilson 2000). The reported range for the allometric growth parameter was 2.55-2.908 and the range for the scaling parameter was 0.012-0.0632 (Bohnsack and Harper 1988, Murray and Moore 1992, Rosario et al. 2006). Estimates of Lmat from the literature ranged from 230mm and 536mm. Rosario et al. (2006) provided lower estimates, which were measured in millimeters fork length, than Martinez-Andrade (2003). Estimates of age-at-maturity ranged between one and two years.

Diet

Primary prey items include small fishes and squids (Allen 1985 in Froese and Pauly 2002).

Reproduction and Spawning

Queen snapper are gonochronistic (i.e., sexes are distinct) and thought to spawn year round (Rosario et al. 2006). Spawning is thought to peak during October and November in Puerto Rico (Rosario et al. 2006).

Yellowtail snapper, *Ocyurus chrysurus*

Distribution and Habitat

Yellowtail snapper occur in the Western Atlantic from Massachusetts (USA) to southeastern Brazil, including the Gulf of Mexico and Caribbean Sea. This species is most common in the Bahamas, off south Florida, and throughout the Caribbean. Yellowtail snapper inhabit waters to 180 m depth, and usually occur well above the bottom (Allen 1985 in Froese and Pauly 2002). A Jamaican study reports this species was most abundant at depths of 20-40 m near the edges of shelves and banks (Thompson and Munro 1974a). Early juveniles are usually found over seagrass beds (Allen 1985 in Froese and Pauly 2002; Thompson and Munro 1974a). Later juveniles inhabit shallow reef areas. Adults are found on deeper reefs (Thompson and Munro 1974a). This fish wanders a bit more than other snapper species (SAFMC 1999). But the extent of its movement is unknown. It also exhibits schooling behavior (Thompson and Munro 1974a).

Life History

This species is of low resilience, with a minimum population doubling time of 4.5-14 years (K = 0.10-0.16; tm = 2; tmax = 14). Maximum reported size is 86.3 cm TL (male); maximum weight, 4,070 g (Allen 1985 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated in Froese and Pauly (2002) as 42.5 cm TL and 4 years, respectively. Figuerola and Torres (1997) estimate size at 50% maturity as 22.4 cm FL (males) and 24.8 cm FL (females), based on fishery independent and dependent data collected off Puerto Rico. Maximum reported age is 14 years (Allen 1985 in Froese and Pauly 2002); estimated natural mortality rate, 0.21 (Ault et al. 2002).

Diet

Juvenile yellowtail snappers feed primarily on plankton (Allen 1985 in Froese and Pauly 2002; Thompson and Munro 1974a). Adults feed mainly at night on a combination of planktonic (Allen 1985 in Froese and Pauly 2002), pelagic (Thompson and Munro 1974a), and benthic organisms, including fishes, crustaceans, worms, gastropods and cephalopods (Allen 1985 in Froese and Pauly 2002). Dammann (1969), in Froese and Pauly (2002), reports that it can be ciguatoxic.

Reproduction and Spawning

Spawning extends over a protracted period (Allen 1985 in Froese and Pauly 2002; Figuerola and Torres 1997), peaking at different times in different areas (Allen 1985 in Froese and Pauly 2002). Figuerola and Torres (1997) report that, in the U.S. Caribbean, the reproductive season of this fish extends from February to October, with a peak from April to July. Erdman (1976) reports that 80% of adult yellowtails captured off San Juan from March through May, and over Silver Bank in early September, had ripe or sub-ripe gonads. Evidence indicates that spawning occurs in offshore waters (Figuerola and Torres 1997; Thompson and Munro 1974a) and during the new moon (Figuerola and Torres 1997). Fecundity ranged from 100,000 to 1,473,000 eggs per fish in four individuals captured off Cuba (Thompson and Munro 1974a).

Nassau grouper, *Epinephelus striatus*

Distribution and Habitat

Nassau grouper occur in the tropical Western Atlantic, ranging from Bermuda, the Bahamas, and Florida (USA) to southern Brazil. Take and possession of Nassau grouper is prohibited in federal waters and Puerto Rico implemented new regulations on March 12, 2004, to prohibit the possession or sale of Nassau grouper. The Nassau grouper occurs from the shoreline to at least 90 m depth. It is a sedentary, and reef associated species, usually encountered close to caves; although juveniles are common in seagrass beds (Heemstra and Randall 1993 in Froese and Pauly 2002).

Life History

This fish is of low resilience, with a minimum population doubling time of 4.5 - 14 years (Musick et al. 2000 in Froese and Pauly 2002). Maximum reported size is 122 cm TL (male); maximum weight, 25 kg (Heemstra and Randall 1993 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated as 47.5 cm TL and 6.9 years, respectively. Approximate life span is 31.9 years (Froese and Pauly 2002); maximum reported age, 16 years (Heemstra and Randall 1993 in Froese and Pauly 2002). Ault et al. (1998) estimate natural mortality rate to be 0.18.

Diet

Nassau grouper are top-level predators. Juveniles feed mostly on crustaceans, while adults (>30 cm) forage alone, mainly on fish (NMFS 2001b), but also on crabs and, to a lesser extent, other crustaceans and mollusks (Heemstra and Randall 1993 in Froese and Pauly 2002). Olsen et al. (1984), in Froese and Pauly (2002), report that it can be ciguatoxic.

Reproduction and Spawning

This fish was initially characterized as a protogynous hermaphrodite, but recent investigations of histological and demographic data, and the nature of the mating system, indicates that Nassau grouper may not be strictly protogynous. Thus, it has been characterized as gonochoristic (separate sexes), with a potential for sex change (NMFS 2001b). One study reported 785,101 eggs for a specimen of 35.8 cm SL (Thompson and Munro 1974b). Nassau grouper aggregate to spawn at specific times and locations each year (Coleman et al. 2000; Sadovy et al. 1994), reportedly at some of the same sites utilized by the tiger, yellowfin, and black groupers (Sadovy et al. 1994). Concentrated aggregations of a few dozen (NMFS 2001b) up to 30,000 Nassau groupers have been reported from the Bahamas, Jamaica, Cayman Islands, Belize, and the Virgin Islands (Heemstra and Randall 1993 in Froese and Pauly 2002). Spawning aggregations composed of about 2000 individuals have been documented north and south of St. Thomas, USVI, at 10-40 m depth, from December through February, around the time of the full moon (Rielinger 1999).

According to NMFS (2001b), spawning aggregations occur in depths of 20-40 m at specific locations of the outer reef shelf edge always in December and January around the time of the full moon in waters 25-26 degrees Celsius. Thompson and Munro (1974b) indicate that the spawning season probably extends from January to April in Jamaican waters. They report that spawning aggregations lasting up to two weeks have been encountered annually during late January to early February around the Cayman Islands (Thompson and Munro 1974b). In the northeastern Caribbean, individuals in spawning condition have been observed in March (Erdman 1976).

Goliath grouper, *Epinephelus itajara*

Distribution and Habitat

Goliath grouper, occur in the Western and Eastern Atlantic, and in the Eastern Pacific Ocean. In the Western Atlantic, its range extends from Florida (USA) to southern Brazil, including the Gulf of Mexico and the Caribbean Sea. Take and possession of Goliath grouper is prohibited in both federal and Puerto Rico implemented new regulations on March 12, 2004, to prohibit the possession or sale of Goliath grouper. A solitary species, Goliath grouper inhabit rock, coral, and mud bottom habitats, from shallow, inshore areas to depths of 100 m (Heemstra and Randall 1993 in Froese and Pauly 2002) or 150 m (NMFS 2001a). Juveniles are generally found in mangrove areas and brackish estuaries. Large adults also may be found in estuaries. They appear to occupy limited home ranges with little inter-reef movement (Heemstra and Randall 1993 in Froese and Pauly 2002).

Life History

This species is of low resilience, with a minimum population doubling time of 4.5 - 14 years (K=0.13; tm=5.5-6.5). Maximum reported size is 250 cm TL (male); maximum weight, 455 kg (Heemstra and Randall 1993 in Froese and Pauly 2002). NMFS (2001a) reports that males generally range in size between 80-210 cm TL; females, from 30-220 cm. Estimated size at maturity and age at first maturity are 98 cm TL and 4.3 years, respectively (Froese and Pauly 2002). In the eastern Gulf of Mexico, males were found to mature at 110-115 cm TL, and females at 120-135 cm TL (Bullock et al., 1992), at approximately 6 years of age. Ault et al. (2002) estimate natural mortality rate to be 0.13. Fish taken from exploited populations range to 37 years of age. But it is likely that this species could live much longer than 40 years if left unexploited (NMFS 2001a).

Diet
This fish feeds primarily on crustaceans, particularly spiny lobsters, as well as turtles and fishes, including stingrays.

Reproduction and Spawning
This species exhibits definite or strongly suggestive indications of sex reversal (protogynous hermaphrodite) (Thompson and Munro 1974b). It forms consistent aggregations (always containing the largest, oldest individuals in the population), but only during the spawning season (Coleman et al. 2000). Aggregations off Florida declined in the 1980s from 50-100 fish to less than 10 per site. Since the harvest prohibition, aggregations have rebounded somewhat to 20-40 fish per site. Spawning in that area occurs in July through September over full moon phases. Fish may move up to 100 km from inshore reefs to the offshore spawning aggregations in numbers of up to 100 or more on ship wrecks, rock ledges, and isolated patch reefs along the southwest coast (NMFS 2001a). In the northeastern Caribbean, individuals in spawning condition have been observed in July and August (Erdman 1976). Bullock et al. (1992) reported that goliath grouper spawn during June through December with a peak in July to September in the eastern Gulf of Mexico.

Coney, *Cephalopholis fulva*

Distribution and Habitat
Coney occur in the Western Atlantic, ranging from South Carolina (USA) and Bermuda to southern Brazil, including Atol das Rocas. Wary, but approachable, this species is taken in commercial fisheries and also is utilized in the aquarium trade (Heemstra and Randall 1993 in Froese and Pauly 2002). Coney are sedentary and prefer coral reefs and clear water. They can be found to depths of 150 m.

Life History
This fish is moderately resilient, with a minimum population doubling time of 1.4 - 4.4 years (K=0.14-0.63; Fec=67,000). Maximum reported size is 41 cm TL (male). It is a protogynous hermaphrodite (Heemstra and Randall 1993 in Froese and Pauly 2002). Size at maturity and age at first maturity estimated in Froese and Pauly (2002) is 19.8 cm TL and 1.1 years, respectively. Size at 50% maturity for female coneys sampled off the west coast of Puerto Rico is 13 cm FL (Figuerola and Torres 2000). Heemstra and Randall (1993), in Froese and Pauly (2002), report that females mature at 16 cm TL and transform to males at about 20 cm TL. The approximate life span of this fish is 4.5 years; natural mortality rate, 0.18 (Ault et al. 1998).

Diet

The diet of this fish is composed primarily of small fishes and crustaceans. It may follow morays and snake eels to feed on flushed preys (Heemstra and Randall 1993 in Froese and Pauly 2002). Olsen et al. (1984), in Froese and Pauly (2002), report that it can be ciguatoxic.

Reproduction and Spawning

Several studies have indicated that coney do not form spawning aggregations. Spawning occurs in pairs within small groups composed of one male and multiple females. Although ripe ovaries are found from November to March off the west coast of Puerto Rico, spawning activity appears to be limited to several days around the last quarter and new moon phases during January and February (Figuerola and Torres 2000).

Red hind, *Epinephelus guttatus*

Distribution and Habitat

Red hind occur in the Western Atlantic, ranging from North Carolina (USA) to Venezuela, including the Caribbean Sea. Red hind are found in shallow reefs and rocky bottoms, from 2-100 m depth. They are usually solitary and territorial.

Life History

This species is moderately resilient, with a minimum population doubling time of 1.4 - 4.4 years (K=0.12-0.24; tm=3; tmax=17; Fec=96,000). Maximum reported size is 76 cm TL (male); maximum weight, 25 kg (Heemstra and Randall 1993 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated in Froese and Pauly (2002) as 31.4 cm TL and 5.5 years, respectively. Figuerola and Torres (2000) estimate size at maturity as 21.7 cm FL based on data collected in a study conducted off the west coast of Puerto Rico. The approximate life span of this fish is 23.8 years; natural mortality rate, 0.18 (Ault et al. 1998).

Diet

Red hind feed mainly on crabs and other crustaceans, fishes, such as labrids and haemulids, and octopus (Heemstra and Randall 1993 in Froese and Pauly 2002). Halstead (1970), in Froese and Pauly (2002), reports that it can be ciguatoxic.

Reproduction and Spawning

Red hind are protogynous hermaphrodites and mean size at sex reversal appears to be in the region of 38 cm TL (Thompson and Munro 1974b). But, according to Heemstra and Randall (1993), in Froese and Pauly (2002), some individuals have been observed to undergo sexual inversion at just 28 cm TL. CFMC (1985) reports size at sex reversal as 35 cm TL. Most fish larger than 40 cm are males, which is important in terms of numbers caught and total weight of landings in the Caribbean (Heemstra and Randall 1993 in Froese and Pauly 2002). One study showed 233,273 eggs for a specimen of 35.8 cm SL (Thompson and Munro 1974b).

This species aggregates in large numbers during the spawning season (Coleman et al. 2000; Sadovy et al. 1994). A number of spawning aggregation sites have been documented in the U.S. Caribbean. Three sites are located off the western coast of Puerto Rico. A fourth site is located near the shelf edge off the southwest coast of Puerto Rico, El Hoyo and La Laja, and is utilized by as many as 3,000 individuals at 20-30 m depth. A fifth site is located on the Lang Bank, north-northeast of St. Croix, and is characterized by aggregations from 38-48 m depth. Finally, a sixth site is located south of St. Thomas, USVI. That aggregation also generally occurs at 38-48 m depth. The timing of aggregations is somewhat variable. Aggregations off Puerto Rico generally occur from January through March in association with the full moon, while those off the USVI generally occur from December through March in association with the full moon (Rielinger 1999).

Black grouper, *Mycteroperca bonaci*

Distribution and Habitat

Black grouper occur in the western Atlantic, from Bermuda and Massachusetts, USA to southern Brazil, including the southern Gulf of Mexico and throughout the Caribbean (Heemstra and Randall 1993). Adults are found on rocky and coral reefs, from depths of 10-30 m, and juveniles occur in mangroves.

Life History

Attains at least 133 cm TL and weight of 65 kg, with one report of black grouper from Bermuda attaining a weight of 81 kg (Heemstra and Randall 1993).

Diet

Adults feed primarily on fishes and juveniles prey mainly on crustaceans.

Reproduction and Spawning

The spawning season for this species varies with the most common spawning season from December to April with peak spawning from January to March (Kobara, et al. 2017). Black grouper form transient spawning aggregations of tens to hundreds of fish over reef promontories at the shelf edge. Aggregations form on the full moon, with spawning typically commencing 10 to 12 days later. Courtship occurs in pairs to small groups up to five fish, with courtship activity peaking during or minutes after sunset. Black grouper are broadcast spawners with external fertilization. Evidence reported for protogynous hermaphrodism and sizes of ripe females from 50-100 cm and males from 96-166 cm (Heemstra and Randall 1993). Black grouper in spawning condition were observed on the Campeche Bank in July and August.

Red grouper, *Epinephelus morio*

Distribution and Habitat
Red grouper occur in the Western Atlantic, ranging as far north as Massachusetts (USA) to southern Brazil, including the Gulf of Mexico and Caribbean Sea. A sedentary species, red grouper are usually found resting on rocky and muddy bottoms, from 5-300 m depth. It is uncommon around coral reefs. Juveniles can be found in shallow water, but adults are usually taken in waters deeper than 60 m.

Life History
This fish is of low resilience, with a minimum population doubling time of 4.5 - 14 years (K=0.1-0.18; tm=4-6; tmax=25; Fec=1.4 million). Maximum reported size is 125 cm TL (male); maximum weight, 23 kg. The world record for hook and line is 17.7 lbs, from Cape Canaveral, Florida (Heemstra and Randall 1993 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated as 47.1 cm TL and 5.2 years, respectively (Froese and Pauly 2002). Maximum reported age is 25 years (Heemstra and Randall 1993 in Froese and Pauly 2002). Estimated natural mortality rate is 0.18 (Ault et al. 1998).

Diet
It feeds on a wide variety of fishes and invertebrates (Heemstra and Randall 1993 in Froese and Pauly 2002).

Reproduction and Spawning
Red grouper are protogynous hermaphrodites. Most females transform to males between ages 7 to 14. In the northeastern Caribbean, individuals in spawning condition have been observed from February through May (Erdman 1976).

Tiger grouper, *Mycteroperca tigris*

Distribution and Habitat
Tiger grouper occur in the Western Atlantic, ranging from Bermuda and south Florida (USA) to Venezuela and, possibly, Brazil, including the Gulf of Mexico and Caribbean Sea. A solitary species, the tiger grouper inhabits coral reefs and rocky areas, from 10-40 m depth.

Life History
This fish is of low resilience, with a minimum population doubling time of 4.5 - 14 years (K=0.11; tm=6.5-9.5). Maximum reported size is 101 cm TL (male); maximum weight, 10,000 g (Heemstra and Randall 1993 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated as 39.9 cm TL and 5.8 years, respectively. Approximate life span is 26 years; natural mortality rate, 0.116 (Ault et al. 2002).

Diet

The tiger grouper ambushes a variety of fish species, and frequents cleaning stations (Heemstra and Randall 1993 in Froese and Pauly 2002). Off the island of Vieques, predation on tiger groupers by sharks at the time of capture is high (one for every six tiger grouper caught during the seasons of 1997 and 1998), and should be considered in the estimation of the number of fish that are being removed, directly or indirectly, from the fishery (Matos and Posada 1998). Dammann (1969), in Froese and Pauly (2002), reports that it can be ciguatoxic.

Reproduction and Spawning

The size-sex ratios described in a Bermuda study indicate this fish is probably a protogynous hermaphrodite (Heemstra and Randall 1993 in Froese and Pauly 2002). It forms aggregations at specific times and locations each year, but only during the spawning season (Coleman et al. 2000; Matos and Posada 1998). A presumptive courting group of three tiger groups also has been observed off the Bahamas, indicating that courtship also may occur in small groups (Sadovy et al. 1994). One known aggregation site in the U.S. Caribbean is a well-defined promontory of deep reef known as "El Seco," which is located about 4.7 nm east of Vieques Island, Puerto Rico. This site was discovered in the early 1980s by a local diver-fisher who also encountered large numbers of yellowfin grouper at the site. The site differs from other aggregation sites described for western Atlantic groupers in that it is relatively level, rather than near a distinct shelf-edge break. Other aggregation sites also have been reported, but not confirmed, including one site north of Vieques Island and another off St. Thomas, USVI. Apparently, both of those sites are used by the yellowfin grouper as well. Aggregating tiger and yellowfin grouper were observed at a site off Guanaja Island, Honduras, that is also used by aggregating Nassau and black grouper (Sadovy et al. 1994).

The "El Seco" tiger grouper aggregation is routinely targeted by fishermen using spear guns and hook and line gear. This fish is only infrequently taken outside of the aggregation season and is not taken by fish traps in the area (Matos and Posada 1998; Sadovy et al. 1994). The aggregation begins about two days after the full moons of February and March and last for about 5-6 days (Matos and Posada 1998). Females taken from the "El Seco" aggregation in 1997 and 1998 averaged 46.2 cm TL and 48.2 cm TL, respectively; males averaged 53.4 cm TL and 54.0 cm TL, respectively. The female to male ratio was 1:6.4 in 1997 and 1:12.0 in 1998 (Matos and Posada 1998). White et al. (2002) reported that spawning aggregations of tiger grouper occur one week following the full moon during January through April off Puerto Rico.

Yellowfin grouper, *Mycteroperca venenosa*

Distribution and Habitat

Yellowfin grouper occur in the Western Atlantic, ranging from Bermuda to Brazil and Guianas, including the Gulf of Mexico and Caribbean Sea. Yellowfin grouper inhabit waters from 2-137 m depth. Juveniles are commonly found in shallow turtle grass beds; adults, on rocky and coral reefs.

Life History

This fish is of low resilience, with a minimum population doubling time of 4.5 - 14 years (K=0.09-0.17; tmax=15; Fec=400,000). Maximum reported size is 100 cm TL (male); maximum weight, 18.5 kg (Heemstra and Randall 1993 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated as 45.6 cm TL and 3.7 years, respectively. Approximate life span is 16.9 years; natural mortality rate, 0.18 (Ault et al. 1998).

Diet

It feeds mainly on fishes (mostly on coral reef species) and squids (Heemstra and Randall 1993 in Froese and Pauly 2002).

Reproduction and Spawning

This fish is believed to be a protogynous hermaphrodite. One studied specimen contained a total of 1,425,443 eggs (Thompson and Munro 1974b). Yellowfin grouper reportedly aggregate at some of the same sites utilized by the tiger, Nassau, and black groupers (Sadovy et al. 1994). Three spawning aggregation sites have been documented off the USVI. Sites located north and south of St. Thomas are utilized from February through April. A third site located in the USVI National Park off St. John, USVI, is utilized year-round. Individuals aggregating at that site number about 200 (Rielinger 1999). Spawning has been observed in Puerto Rican waters in March. Most spawning appears to occur in Jamaican waters between February and April (Thompson and Munro 1974b).

Yellowmouth grouper, *Mycteroperca interstitialis*

Please see Appendix I for information about this species.

Yellowedge grouper, *Hyporthodus flavolimbatus*

Distribution and Habitat

Yellowedge grouper occur in the Western Atlantic, ranging from North Carolina (USA) to southern Brazil, including the Gulf of Mexico and the Caribbean Sea. A solitary and demersal species, yellowedge grouper occur in rocky areas and on sand mud bottom, ranging from 64-275 m (210-892 ft) depth. On soft bottoms, yellowedge grouper are often seen in or near trenches or burrow-like excavations.

Life History

This fish is of low resilience in rebuilding from low abundance, with a minimum population doubling time of 4.5 - 14 years (K= 0.10; tmax=35). Maximum reported size is 115 cm (45 inches) TL (male); maximum weight, 18.6 kg (41 pounds; Heemstra and Randall 1993). Estimated size at maturity and age at first maturity are 50.5 cm (20 inches) TL and 6.2 years, respectively (Froese and Pauly 2002). Maximum reported age is 32 years (Heemstra and Randall 1993). Natural mortality rate is estimated at 0.20 (Ault et al.2002).

Epinephelus flavolimbatus is listed as “vulnerable” by Ferreira and Peres (2008) owing to an overall 30 percent decline from fisheries catch data throughout much of its range, although catch data suggests much higher declines in some areas. Generation length has been assumed during the assessment as 10 yrs (most certainly an underestimate) and the general biological characteristics of the species, including longevity, formation of aggregations for spawning, and its high desirability in regional fisheries, combined with a lack of effective management of multi-species fisheries in much of the region and pressure on such stocks predicted to increase, make this a vulnerable species. The yellowedge grouper has been managed under a seasonal closure (spawning months) in federal waters since 2005 and in the USVI since 2006 (February through April). Puerto Rico has not implemented a seasonal closure for the species.

Diet

It feeds on a wide variety of invertebrates (mainly brachyuran crabs) and fishes (Heemstra and Randall 1993).

Reproduction and Spawning

In the northeastern Caribbean, individuals in spawning condition have been observed in April (Erdman 1976). Spawning is reported to occur during April through October in the South Atlantic (Keener 1984) and May through September in the Gulf of Mexico (Bullock et al. 1996).

Misty grouper, *Hyporthodus mystacinus*

Distribution and Habitat

Misty grouper occur in Western Atlantic from Bermuda and North Carolina (USA) to Mexico, including the Gulf of Mexico and Caribbean Sea. The misty grouper is a solitary, bathydemersal, deep-water species, ranging from 30-400 m depth. Juveniles occur in shallower waters.

Life History
Virtually nothing is known about the age, growth, and reproduction of this species. Maximum reported sizes are 160 cm TL and 100 cm TL for males and females, respectively. Maximum reported weight is 107 kg (Heemstra and Randall 1993 in Froese and Pauly 2002). Estimated size at maturity is 81.1 cm TL; natural mortality rate, 0.14 (Froese and Pauly 2002).

Diet
Prey items include fishes, crustaceans, and squids (Heemstra and Randall 1993 in Froese and Pauly 2002).

Reproduction and Spawning
In the northeastern Caribbean, individuals in spawning condition have been observed in January, April, August, and November (Erdman 1976).

Blue parrotfish, *Scarus coeruleus*

Distribution and Habitat
Blue parrotfish occur in the Western Atlantic, ranging from Maryland (USA) and Bermuda to Brazil, including the Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002). Blue parrotfish inhabit coral reef habitat, occurring from 3-25 m depth. Juveniles are found on seagrass (Thalassia) beds.

Life History
Maximum reported size is 120 cm TL (male) (Robins and Ray 1986 in Froese and Pauly 2002). Estimated size at maturity is 62.9 cm TL; natural mortality rate, 0.43 (Froese and Pauly 2002).

Diet
Dietary items include benthic plants and small organisms in the sand (Robins and Ray 1986 in Froese and Pauly 2002).

Reproduction and Spawning
This fish is known to form large spawning aggregations (Robins and Ray 1986 in Froese and Pauly 2002). In Jamaican waters, the highest proportion of active and ripe fishes occurs between January and May (Reeson 1975b).

Midnight parrotfish, *Scarus coelestinus*

Distribution and Habitat
Midnight parrotfish occur in the Western Atlantic, ranging from Bermuda to Brazil, including the Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002). Midnight parrotfish occur from rocky coastal reefs to seaward reefs, in depths of 5-75 m.

Life History
Maximum reported size is 77 cm TL (male); maximum weight, 7,000 g (Robins and Ray 1986 in Froese and Pauly 2002).

Diet
It is often encountered in schools, feeding on algae along with surgeonfishes.

Reproduction and Spawning
The midnight parrotfish has been observed to spawn in pairs. A Jamaican study reported that the highest proportion of active and ripe fishes was confined to the period between January and May. Spawning seems to be confined to the warmer months of the year in Bermuda (Reeson 1975b).

Rainbow parrotfish, *Scarus guacamaia*

Distribution and Habitat
Rainbow parrotfish occurs in the Western Atlantic, ranging from Bermuda to Argentina, including the Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002). Rainbow parrotfish are found from 3-25 m depth. Juveniles are commonly encountered in mangrove areas.

Life History
Maximum reported size is 120 cm TL (male); maximum weight, 20 kg (Robins and Ray 1986 in Froese and Pauly 2002). Estimated size at maturity is 62.9 cm TL; natural mortality rate, 0.43 (Froese and Pauly 2002).

Diet
This fish feeds primarily on benthic algae (Robins and Ray 1986 in Froese and Pauly 2002).

Reproduction and Spawning
In Jamaican waters, the highest proportion of active and ripe fishes appear to be confined to the period between January and May (Reeson 1975b). In the northeastern Caribbean, individuals in spawning condition have been observed in June and July (Erdman 1976).

Queen parrotfish, *Scarus vetula*

Distribution and Habitat
Queen parrotfish occur in the Western Central Atlantic, ranging from Bermuda to northern South America, and throughout the Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002). Queen parrotfish inhabit coral reefs and adjacent habitats, from 3-25 m depth.

Life History
Maximum reported size is 61 cm TL (male) (Robins and Ray 1986 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated as 30.6 cm TL and 1.1 years, respectively. Approximate life span is 4.8 years; natural mortality rate, 1.05 (Froese and Pauly 2002).

Diet
Qqueen parrotfish feed on algae and sleeps in a mucus cocoon (Robins and Ray 1986 in Froese and Pauly 2002).

Reproduction and Spawning
It is often observed in groups of one supermale with several young adults, most of which are believed to be females. In the northeastern Caribbean, individuals in spawning condition have been observed in January, February, May, June, and August (Erdman 1976). Spawning pairs have been observed in August and January off the Virgin Islands and Puerto Rico, respectively (Reeson 1975b).

Princess parrotfish, *Scarus taeniopterus*

Distribution and Habitat
Princess parrotfish occur in the Western Atlantic, ranging from Bermuda to Brazil, and throughout the Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002). Princess parrotfish are found on coral or rock bottoms, from 2-25 m depth. Juveniles often occur in association with seagrass(Thalassia).

Life History
Maximum reported size is 35 cm TL (male) (Robins and Ray 1986 in Froese and Pauly 2002). Size at maturity is estimated as 21.2 cm TL; natural mortality rate, 0.88 (Froese and Pauly 2002).

Diet
It feeds on plants in large aggregations, and sleeps in a mucus cocoon (Robins and Ray 1986 in Froese and Pauly 2002).

Reproduction and Spawning
This species appears to spawn throughout the year in Jamaican waters, with the highest proportion of ripe fishes occurring in December and January (Reeson 1975b).

Redtail parrotfish, *Sparisoma chrysopterum*

Distribution and Habitat
Redtail parrotfish occur in the Western Atlantic, ranging from southern Florida (USA) to Brazil, and throughout the Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002). Redtail

occur in coral reefs and adjacent habitats to depths of 15 m. Juveniles most commonly inhabit seagrass beds.

Life History

Maximum reported size is 46 cm TL (male) (Robins and Ray 1986 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated in Froese and Pauly (2002) as 23.9 cm FL and 0.9 years, respectively; approximate life span, 3.6 years. Estimated size at 50% maturity based on fishery independent and dependent data collected from Puerto Rican waters is 23.5 cm FL (females). Transitional fish ranged from 20.1 cm FL to 24.8 cm FL (Figuerola and Torres 1997).

Diet

Redtail parrotfish feed on benthic algae and seagrasses (Robins and Ray 1986 in Froese and Pauly 2002).

Reproduction and Spawning

Spawning period is protracted. According to Figuerola and Torres (1997), no peaks are apparent in the U.S. Caribbean, but spawning activity appears to decrease during the summer (May through August). Data from a Jamaican study indicate that the highest proportion of active and ripe fishes occurs between January and May (Reeson 1975b).

Stoplight parrotfish, *Sparisoma viride*

Distribution and Habitat

The stoplight parrotfish occurs in the Western Atlantic, ranging from southern Florida (USA) to Brazil, and throughout the Caribbean Sea (Cervigón et al. 1992 in Froese and Pauly 2002). Stoplight parrotfish inhabit clear water coral reefs, occurring from 3-49 m depth. Juveniles may be found in seagrass beds and other heavily vegetated bottoms. This species is strictly diurnal, and spends the night resting on the sea bottom. It occurs singly or in small groups.

Life History

Maximum reported size is 64 cm TL (male); maximum weight, 1,600 g. Size at maturity is estimated in Froese and Pauly (2002) as 36.1 cm TL; natural mortality rate, 0.66. Size at 50% maturity estimated from a survey conducted off Puerto Rico is 20.5 cm FL (females) (Figuerola and Torres 1997) . A Bermuda study reports that males mature at 16-20 cm SL and females at 16.3 cm SL (Reeson 1975b).

Diet

This fish feeds primarily on soft algae, but also has been observed to graze on live corals, such as Montastrea annularis. It produces a significant amount of sediment through bioerosion using its strong beak-like jaws and constantly regrowing teeth (Cervigón et al. 1992 in Froese and Pauly 2002).

Reproduction and Spawning

This fish is a protogynous hermaphrodite, functioning first as a female and, later, as a male (Cervigón et al. 1992 in Froese and Pauly 2002). Spawning period is protracted. According to Figuerola and Torres (1997), no peaks are apparent in the U.S. Caribbean, but spawning activity appears to decrease during the summer (May through August). Paired spawning has been observed in May off the Virgin Islands (Reeson 1975b).

Redband parrotfish, *Sparisoma aurofrenatum*

Distribution and Habitat

Redband parrotfish occur in the Western Atlantic, ranging from Bermuda to Brazil, and throughout the Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002). Redband parrotfish inhabit coral reefs, occurring from 2-20 m depth. Juveniles are usually found in adjacent seagrass beds. It is often observed resting on the sea bottom, either solitary or in small groups.

Life History

This species is moderately resilient, with a minimum population doubling time of 1.4 - 4.4 years (K=0.20). Maximum reported size is 28 cm TL (male) (Robins and Ray 1986 in Froese and Pauly 2002). Size at maturity is estimated as 17.4 cm TL; natural mortality rate, 1.14 (Froese and Pauly 2002).

Diet

Redband parrotfish feed on plants (Robins and Ray 1986 in Froese and Pauly 2002).

Reproduction and Spawning

Reeson (1975b) reports that spawning has been observed to occur off the Virgin Islands in the months of March, April, June, and August. Erdman (1976) reports that individuals also have been observed in spawning condition in the northeastern Caribbean in February and December (Erdman 1976). Ripe fishes have been caught in both the nearshore and offshore environment. Paired spawning has been observed (Reeson 1975b).

Striped parrotfish, *Scarus iseri*

Distribution and Habitat

Striped parrotfish occurs in the Western Atlantic, ranging from Bermuda to northern South America (and possibly Brazil), including the Gulf of Mexico and Caribbean Sea (Böhlke and Chaplin 1993). Striped parrotfish is found over shallow, clear waters, from 3-25 m depth. It is a schooling species, and generally occurs over seagrass (Thalassia) beds, but also is found in rocky or coral areas.

Life History

Maximum reported size is 35 cm TL (male) (Böhlke and Chaplin 1993). Size at maturity is estimated in Froese and Pauly (2002) as 21.2 cm TL; natural mortality rate, 0.61. A study conducted in Bermuda reports that males mature at 11-13 cm SL and females, at 9-10 cm SL (Reeson 1975b).

Diet

Striped parrotfish feed on plants (Böhlke and Chaplin 1993).

Reproduction and Spawning

Supermales spawn individually with striped females, while sexually mature males in the striped phase spawn in aggregations (Böhlke and Chaplin 1993) of up to 400 individuals (Reeson 1975b). One spawning aggregation site has been documented off the southwest coast of Puerto Rico. Striped parrotfish have been observed to spawn at that site in winter months at about 20-30 m depth (Rielinger 1999). This species has been observed to spawn in the Virgin Islands in February, March, April, June, and August. Deeper reef fronts (15- 20 m) appear to be the focal points for spawning groups. It has been observed to migrate daily among specific routes (Reeson 1975b).

Redfin parrotfish, *Sparisoma rubripinne*

Distribution and Habitat

Redfin parrotfish occur in the Western Atlantic from Massachusetts (USA) to Brazil, and throughout the Caribbean Sea. Redfin parrotfish inhabit coral reefs and seagrass beds to depths of 15 m.

Life History

Maximum reported size is 47.8 cm TL (male) (Randall 1990 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated as 28.3 cm TL and 1.2 years, respectively. Approximate life span is 4.9 years; natural mortality rate, 1.05 (Froese and Pauly 2002).

Diet

The redfin parrotfish feeds on benthic algae and seagrasses (Randall 1990 in Froese and Pauly 2002).

Reproduction and Spawning
Spawning usually occurs in small groups (Randall 1990 in Froese and Pauly 2002), but also in pairs. Deeper reef fronts (15-20 m) appear to be the focal points for spawning groups. Data collected in a Jamaican study indicate that the highest proportion of active and ripe fishes occurs between January and May. Ripe males and females have been collected in all months of the year off the Virgin Islands (Reeson 1975b).

White grunt, *Haemulon plumieri*

Distribution and Habitat
Also known simply as, the "grunt," this species occurs in the Western Atlantic, ranging from Chesapeake Bay (USA) to Brazil, including the Gulf of Mexico and Caribbean Sea. White grunt are found from 3-40 m depth, in dense aggregations during the day on patch reefs, around coral formations, or on sandy bottoms. Juveniles commonly inhabit seagrass (Thalassia testudinum) beds.

Life History
This fish is moderately resilient, with a minimum population doubling time of 1.4 - 4.4 years (K=0.16-0.35; tm=2; tmax=13; Fec=64,000). Maximum reported size is 53 cm TL (male); maximum weight, 4,380 g (Courtenay and Sahlman 1978 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated in Froese and Pauly (2002) as 27.2 cm TL and 2.6 years, respectively. A study in Jamaican waters reported mean size at maturity as about 20 cm FL and 22 cm FL for males and females, respectively. Males and females appeared to be fully mature at 24-24.9 cm FL and 26-27.9 cm FL, respectively (Gaut and Munro 1974). Approximate life span is 11 years; natural mortality rate, 0.375 (Ault et al. 1998).

Diet
White grunt feed on crustaceans, small mollusks, and small fishes.

Reproduction and Spawning
Peak breeding season appears to be between January and April in Jamaican waters, with a secondary, minor peak in September-November (Gaut and Munro 1974). In the northeastern Caribbean, individuals in spawning condition have been observed from February through April, and in September and November (Erdman 1976). Frequently exhibits a territorial "kissing" display, in which two contenders push each other on the lips with their mouths wide open (Courtenay and Sahlman 1978 in Froese and Pauly 2002).

Bluestriped grunt, *Haemulon sciurus*

Distribution and Habitat

Bluestriped grunt occur in the Western Atlantic, ranging from Florida (USA) to Brazil, including the Gulf of Mexico and Caribbean Sea. Bluestriped grunt are found in small groups over coral and rocky reefs to 30 m depth. Juveniles are abundant in seagrass (Thalassia) beds.

Life History

This species is moderately resilient, with a minimum population doubling time of 1.4 - 4.4 years (K=0.22-0.30; tm=2; Fec=47,000). Maximum reported size is 46 cm TL (male); maximum reported weight, 750 g (Courtenay and Sahlman 1978 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated in Froese and Pauly (2002) as 23.6 cm TL and 2.3 years, respectively. A Jamaican study reported, based on a small sample size, that few fishes mature before 18 cm FL and that full maturity is probably at about 22 cm FL. For a sample size of just 3, mean length was 24.2 cm, mean weight was 283 g, and mean fecundity was 32,000 (Gaut and Munro 1974). Approximate life span is 9.5 years; natural mortality rate, 0.50 (Ault et al. 1998).

Diet

Bluestriped grunt feeds on crustaceans, bivalves and, occasionally, on small fishes (Courtenay and Sahlman 1978 in Froese and Pauly 2002).

Reproduction and Spawning

Peak breeding season in Jamaican waters appears to be between January and April, with a secondary, minor peak in September-November (Gaut and Munro 1974). In the northeastern Caribbean, individuals in spawning condition have been observed in January and March (Erdman 1976). Off Cuba, bluestriped grunt are reported to be in spawning condition during October through April with a peak during December and January (Garcia-Cagide et al. 1994).

Margate, *Haemulon album*

Distribution and Habitat

Also known as the "white margate," this species occurs in the Western Atlantic, from the Florida Keys (USA) to Brazil, including the Caribbean Sea. Margate are found in pairs or larger schools, over seagrass beds, sand flats, coral reefs, and wrecks from 20-60 m depth.

Life History

This fish is moderately resilient, with a minimum population doubling time of 1.4 - 4.4 years (K=0.19-0.20; tm=3.5; Fec=800,000). Maximum reported size is 79 cm TL (male); maximum weight, 7,140 g (Cervigón 1993 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated in Froese and Pauly (2002) as 40.2 cm TL and 3.2 years, respectively. A Jamaican study reports mean size at maturity as about 24 cm FL, and size of full mature as 26-27.98 cm FL (Gaut and Munro 1974). Approximate life span is 14.3 years. Estimated natural mortality rate is 0.374 (Ault et al. 1998).

Diet
This fish feeds on benthic invertebrates, and has been observed to nose into the sand to eat such subsurface invertebrates as peanut worms and heart urchins (Cervigón 1993 in Froese and Pauly 2002).

Reproduction and Spawning
Peak breeding season appears to be between January and April in Jamaican waters, with a secondary, minor peak in September-November. But spawning is not necessarily synchronous in different localities (Gaut and Munro 1974). In the northeastern Caribbean, individuals in spawning condition have been observed in February, March, April, and September (Erdman 1976). Garcia-Cagide et al. (1994) have reported that margate off Cuba are in spawning condition throughout the year with a peak occurring during March and April.

Sea bream, *Archosargus rhomboidalis*

Distribution and Habitat
Also known as the "Western Atlantic sea bream," this species occurs in the western Atlantic, ranging from New Jersey (USA) to the northern coast of South America, including the Gulf of Mexico (Robins and Ray 1986 in Froese and Pauly 2002) and Caribbean Sea. This species is reportedly absent in the Bahamas. The sea bream is commonly found over mud bottoms in mangrove sloughs and on vegetated sand bottoms, sometimes in brackish water and, occasionally, in coral reef areas near mangroves.

Life History
This fish is highly resilient, with a minimum population doubling time of less than 15 months (K=1.27; tm=0.4; tmax=2). Maximum reported size is 33 cm TL (male); maximum weight, 550 g (Robins and Ray 1986 in Froese and Pauly 2002). Estimated size at maturity and age at first maturity are 16.6 cm TL and 0.6 years, respectively (Froese and Pauly 2002). Maximum reported age is 2 years (Robins and Ray 1986 in Froese and Pauly 2002). Natural mortality rate is estimated as 2.10 (Froese and Pauly 2002).

Diet
The sea bream feeds on benthic invertebrates, such as small bivalves and crustaceans, and of plant material (Robins and Ray 1986 in Froese and Pauly 2002).

Reproduction and Spawning
Erdman (1976) reports that over 100 sea breams crowded into one fish pot set in less than 3.7 m of water at La Parguera in February 1954, the majority of which were ripe females measuring 20- 22 cm SL. He notes that February continued to be the peak spawning month of this species in continuing years, although spawning extended from November to March. In the southern Gulf of Mexico, Chavance et al. (1986) reported that sea bream were in spawning condition from October to July with greater spawning activity occurring during February through May.

Jolthead porgy, *Calamus bajonado*

Distribution and Habitat
The jolthead porgy occurs in the Western Atlantic, ranging from Rhode Island (USA), southward to Brazil, including parts of the Gulf of Mexico and Caribbean Sea. An excellent food fish, this species is taken in both commercial and recreational fisheries (Robins and Ray 1986 in Froese and Pauly 2002). According to Lieske and Myers (1994), in Froese and Pauly (2002), it can be ciguatoxic. The jolthead porgy inhabits coastal waters, from 3-200 m depth. It can be found on vegetated sand bottoms, but occurs more frequently on coral bottoms. Large adults are usually solitary.

Life History
This fish is moderately resilient, with a minimum population doubling time of 1.4 - 4.4 years (tm=3). Maximum reported size is 76 cm FL (male); maximum weight, 10.6 kg (Robins and Ray 1986 in Froese and Pauly 2002). Estimated size at maturity is 42 cm FL (Froese and Pauly 2002).

Diet
Sea urchins, crabs, and mollusks are primary prey items (Robins and Ray 1986 in Froese and Pauly 2002).

Reproduction and Spawning
Jolthead porgy have been reported to spawn during October through June off Cuba with a peak during March and April (Garcia-Cagide et al. 1994).

Sheepshead porgy, *Calamus penna*

Distribution and Habitat
The sheepshead porgy occurs in the Western Atlantic, ranging from Florida (USA) to Brazil, including the Gulf of Mexico and Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002). This species is fished commercially, and is marketed both fresh and frozen (Robins and Ray 1986 in Froese and Pauly 2002). Olsen et al. (1984), in Froese and Pauly (2002), report that

it can be ciguatoxic. This species occurs from 3-87 m depth, in clear reef areas over soft or semi-hard bottoms. Juveniles are encountered in seagrass (Thalassia) beds.

Life History

Maximum reported size is 46 cm TL (male); maximum weight, 1,000 g (Robins and Ray 1986 in Froese and Pauly 2002). Estimated size at maturity is 27 cm TL; natural mortality rate, 0.72 (Froese and Pauly 2002).

Diet

The sheepshead is an omnivorous fish, feeding on invertebrates, small vertebrates and occasional plant material. Large juveniles and adults prey on blue crab, oysters, clams, crustaceans, and small fish. The diet of juveniles includes zooplankton, polychaetes, and chironomid (midges) larvae.

Reproduction and Spawning

In the northeastern Caribbean, individuals have been observed in spawning condition in February and March (Erdman 1976).

Saucereye Pluma, *Calamus calamus*

Distribution and Habitat

Saucereye porgy are found only in the western Atlantic ocean, from North Carolina, east to Bermuda, and south to Brazil. Adults are commonly found around coral reefs, while juveniles are common to beds of seagrass (mainly Thalassia). Depth range of saucereye porgy is 1 - 75 m.

Life History

Saucereye porgies can grow up to 56 cm TL, but commonly 30 to 45 cm TL. Max weight is 680 grams.

Diet

Saucereye porgies feed on a variety of animals, such as molluscs, sea worms, brittle stars, hermit crabs, crabs and sea urchins.

Reproduction and Spawning

No information available.

Blue runner, *Caranx crysos*

Distribution and Habitat

The blue runner occurs in both the Eastern and Western Atlantic. In the Western Atlantic, it ranges as far north as Nova Scotia (Canada), south to Brazil, including the Gulf of Mexico and throughout the Caribbean Sea. A pelagic species, the blue runner is found to 100 m depth, but generally stays close to the coast. Juveniles often occur in association with floating Sargassum.

Life History
This species is highly resilient, 114 with a minimum population doubling time of less than 15 months (K=0.32-0.38; tmax=11; Fec=41,000). Maximum reported size is 70 cm TL (male); maximum weight, 5,050 g (Smith-Vaniz et al. 1990 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated as 39.1 cm TL and 2.5 years, respectively (Froese and Pauly 2002). Maximum reported age is 11 years (Smith-Vaniz et al. 1990 in Froese and Pauly 2002). Estimated natural mortality rate is 0.49 (Froese and Pauly 2002).

Diet
Prey items include fishes, shrimps, and other invertebrates (Smith-Vaniz et al. 1990 in Froese and Pauly 2002). Froese and Pauly (2002), reports that it can be ciguatoxic.

Reproduction and Spawning
This fish is thought to form spawning aggregations (Thompson and Munro 1974c). Spawning period is protracted (Erdman 1976). Some studies suggest that spawning activity peaks from January through August. One estimated that the spawning season extends from February to September (Thompson and Munro 1974c). Erdman reported in 1976 that, historically, more adults captured off La Parguera were in spawning condition from March through May than at other times of the year.

Blue tang, *Acanthurus coeruleus*

Distribution and Habitat
In the Western Atlantic, blue tang range from New York (USA) to Brazil, including the Gulf of Mexico and Caribbean Sea. Blue tang are generally encountered in coral reef, or inshore grassy or rocky habitats, from 2-40 m depth (Robins and Ray 1986 in Froese and Pauly 2002). Characterized as a suprabenthic nomad, this species is generally solitary in the evening hours (Reeson 1975a), but also has been observed in small and large groups.

Life History
This fish is moderately resilient, with a minimum population doubling time of 1.4 - 4.4 years (K=0.11-0.50). Maximum reported size is 39 cm TL (male) (Robins and Ray 1986 in Froese and Pauly 2002). Length and age at first maturity is estimated as 23.3 cm TL and 6.3 years, respectively. Approximate life span is 25.8 years; natural mortality rate, 0.32 (Froese and Pauly 2002).

Diet
Blue tang feed almost entirely on algae (Robins and Ray 1986 in Froese and Pauly 2002), but also consumes organic detritus and seagrasses (Reeson 1975a).

Reproduction and Spawning
A study conducted in Jamaican waters reported the occurrence of high proportions of active and/or ripe fishes during most months of the year on the oceanic banks, and few fishes with active gonads in the nearshore environment (Reeson 1975a). Rielinger (1999) describes one aggregation site documented off Puerto Rico, which is located south of Salinas de Ensenada & Guanica. About 6000-7000 individuals reportedly spawn at that site in association with the full to new moon. These aggregations occur at 10-30 m depth (Rielinger 1999). Studies in the Bahamas also have observed what appeared to be pre-spawning aggregations late in the day (Reeson 1975a).

Ocean surgeonfish, *Acanthurus bahianus*

Distribution and Habitat
In the Western Atlantic, ocean surgeonfish range from Massachusetts (USA), southward to Brazil, including the Gulf of Mexico and Caribbean Sea. Ocean surgeonfish inhabit shallow bottom habitats with coral or rocky formations, in depths from 2-40 m (Robins and Ray 1986 in Froese and Pauly 2002). It also may be encountered over algal plains and seagrass beds that lie adjacent to reef habitats. Characterized as a benthic resident (Reeson 1975a), this species usually occurs in groups of five or more individuals (Robins and Ray 1986 in Froese and Pauly 2002), and commonly schools with the doctorfish, Acanthurus chirurgus (Reeson 1975a).

Life History
Maximum reported size is 38.1 cm SL (male) (Robins and Ray 1986 in Froese and Pauly 2002). Size at first maturity is estimated in Froese and Pauly (2002) as 22.8 cm SL. But Reeson (1975b) provides a smaller estimate of 11 cm FL based on a study conducted in Jamaican waters.

Diet
This fish feeds primarily on algae and seagrasses, but also consumes a great deal of inorganic material (e.g., sand, small shells, etc.), which is believed to aid in the digestive process. It also has been observed to feed on dead fish both in traps and in fish pens (Reeson 1975a).

Reproduction and Spawning
Breeding is believed to occur year round off Jamaica, with peak spawning activity occurring from January to February and from August to September (Reeson 1975a). In the northeastern Caribbean, individuals in spawning condition have been observed in February, April, and November (Erdman 1976). One spawning aggregation composed of about 20,000 individuals

has been documented south of Salinas de Ensenada and Guanica, Puerto Rico, at 15-18 m depth, from November through April (Rielinger 1999).

Doctorfish, *Acanthurus chirurgus*

Distribution and Habitat

In the Western Atlantic, doctorfish range from Massachusetts (USA) to Brazil, including the Gulf of Mexico and Caribbean Sea. Doctorfish are generally found in loose aggregations from depths of 2-24 m in shallow reefs or rocky areas (Robins and Ray 1986 in Froese and Pauly 2002), but may also be encountered over adjacent algal plains and seagrass beds (Reeson 1975a). It is characterized as a suprabenthic nomad, and commonly schools with the ocean surgeonfish, Acanthurus bahianus (Reeson 1975a).

Life History

This fish is moderately resilient, with a minimum population doubling time of 1.4 - 4.4 years (K=0.25-0.50). Maximum reported size is 35 cm TL (male); maximum weight, 5,100 g (Robins and Ray 1986 in Froese and Pauly 2002). Length and age at first maturity is estimated as 19.4 cm TL and 2.7 years, respectively (Froese and Pauly 2002). The approximate life span of the doctorfish is 10.9 years. Estimated natural mortality rate is 0.64 (Froese and Pauly 2002).

Diet

It feeds primarily on algae but, like the ocean surgeonfish, ingests inorganic material in the process (Reeson 1975a; Robins and Ray 1986 in Froese and Pauly 2002).

Reproduction and Spawning

A study conducted in Jamaican waters observed the occurrence of ripe individuals in catches taken from September to November, and the highest proportions of active fish from January to May (Reeson 1975a). In the northeastern Caribbean, individuals in spawning condition have been observed in January, February, and June (Erdman 1976).

Hogfish, *Lachnolaimus maximus*

Distribution and Habitat

Hogfish occur in the Western Atlantic from Nova Scotia (Canada) to northern South America, including the Gulf of Mexico and Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002). Hogfish are found from 3-30 m depth, over open bottoms or coral reef habitats. It is often encountered where gorgonians are abundant.

Life History

This species is of low resilience, with a minimum population doubling time 4.5 - 14 years (K=0.09; Fec=100,00). Maximum reported size is 91 cm TL (male); maximum weight, 10,000 g

(Robins and Ray 1986 in Froese and Pauly 2002). Size at maturity and age at first maturity are estimated as 46.1 cm FL and 6.9 years. Approximate life span is 31.9 years (Froese and Pauly 2002). Natural mortality rate is estimated at 0.25 (Ault et al. 1998).

Diet

Mollusks constitute the primary prey item, but this species also feeds on crabs and sea urchins (Robins and Ray 1986 in Froese and Pauly 2002). It can be ciguatoxic (Robins and Ray 1986 in Froese and Pauly 2002).

Reproduction and Spawning

Spawning aggregations have been documented to occur at 16+ m depth off La Parguera, Puerto Rico from December through April (Rielinger 1999). Garcia-Cagide et al. (1994) reported that hogfish spawn off Cuba during May through July. Colin (1982) found that peak spawning of hogfish off Puerto Rico is during December through April.

Queen angelfish, *Holacanthus ciliaris*

Distribution and Habitat

The queen angelfish occurs in both the Western and Eastern Central Atlantic Oceans. In the Western Atlantic, its range extends from Florida (USA) and the Bahamas to Brazil, including the Gulf of Mexico and Caribbean Sea. Queen angelfish are found on coral reefs primarily in shallow waters, but have been observed at depths of 80 m (Humann and DeLoach 2014). Juveniles are solitary and live primarily in and around colonies of finger sponges and coral (Feddern 1968).

Life History

Maximum reported size for the queen angelfish is 45 cm (18 in) (Humann and DeLoach 2014) and common length is 30 cm (12 in) TL (Carpenter 2002). Maximum weight reported is 1,600 g (Claro 1994 in Froese and Pauly 2017). Estimated size at maturity is 26.5 cm TL; natural mortality rate, 0.4; approximate life span 13 years (Froese and Pauly 2011). Based on empirical models, Froese and Pauly (2011) estimate the queen angelfish to be a medium resilience fish, with a minimum population doubling time of approximately 1.4 - 4.4 years.

Diet

The queen angelfish has been reported to prey almost exclusively on sponges, supplemented by small amounts of algae, tunicates, hydroids and bryozoans (Randall and Hartman 1968; Andrea et al. 2007). Juveniles eat algae until they reach sexual maturity (DeLoach 1999) and have been observed cleaning ectoparasites from other fishes (Randall 1967). This species poses a low risk for ciguatera poisoning (Olsen et al. 1984; Böhlke and Chaplin 1993) and recent surveys conducted in Puerto Rico do not list angelfish as fish species that induced ciguatera poisoning (Azziz-Baumgartner et al. 2012).

Reproduction and Spawning

Queen angelfish are protogynous hermaphrodites (Nottingham et al. 2003), meaning they are born male and at some point switch sexes to female. Their courtship structure consists of male-dominated harems, although spawning only occurs in pairs (Moyer et al. 1983) and no large spawning aggregations have been observed (Aiken 1975). Ripe queen angelfish were observed within one year from January to August with a peak in April (Munro et al. 1983) although Aiken (1975) observed over a 5-year period that the majority of ripe fish were observed in September-October and that all fish were inactive during November-December. Spawning occurs at sunset, and throughout the lunar cycle (DeLoach 1999; Moyer er al. 1983) and in Puerto Rico, spawning activity has been observed near the shelf edge (Moyer et al. 1983; Colin and Clavijo 1988). Queen Angelfish are pelagic spawners (Thresher 1984; Colin and Clavijo 1988), releasing their gametes into the water column. Larvae hatch after 15-20 hours and within three to four weeks the juveniles settle in the shallow water habitats (DeLoach 1999). Hybridization has been known to occur between *H. ciliaris* and *H. isabelita* (Feddern 1968).

Gray angelfish, *Pomacanthus arcuatus*

Distribution and Habitat

The gray angelfish occurs in the Western Atlantic, ranging from New England (USA) to Brazil, including the Gulf of Mexico and Caribbean Sea. Gray angelfish swim about coral reefs, often in pairs, at depths ranging from 10 to 80 m and juveniles are usually found on shallow-water patch reef and grass flats (Humann and DeLoach 2014). Gray angelfish spend the day roaming their territories, with their mates at their side, and seldom take shelter (DeLoach 1999).

Life History

Maximum reported size for the gray angelfish is 60 cm (24 in) TL (Humann and DeLoach 2014) and common length is 36 cm (14 in) TL (Carpenter 2002). Maximum weight reported is 2,550 g and a maximum observed age from otoliths was 24 years (Steward et al. 2009). Growth equations from that study indicated rapid growth during the first five years and estimated that females would reach their asymptotic length of 325mm TL at age six, and males would reach 388mm TL at age nine. Estimated size at maturity is 34.1 cm TL; natural mortality rate, 0.42 (Froese and Pauly 2002).

Diet

Approximately 70% of gray angelfish diet is various species of sponges, followed by tunicates, algae, zoantharians, gorgonians, hydroids, byrozoans, and seagrasses (Randall and Hartman 1968). Visual feeding surveys reported gray angelfish eating small amounts of multiple sponges, moving to a new sponge after only 2.8 bites, notably selecting a different sponge species 92% of the time, indicating active diet diversification and suggesting that gray angelfish have the ability to distinguish sponge species from each other (Wulff 1994). Juveniles mostly eat algae, but they also act part-time as cleaner fish, picking ectoparasites off other reef fishes, until such a time that they reach three inches in length (DeLoach 1999). This species poses a low risk for ciguatera poisoning (Olsen et al. 1984; Böhlke and Chaplin 1993) and recent surveys conducted in Puerto Rico do not list angelfish as fish species that induced ciguatera poisoning (Azziz-Baumgartner et al. 2012).

Reproduction and Spawning

Gray angelfish are not believed to undergo any sex change during growth to maturity (DeLoach 1999). This species is generally observed in pairs, suggesting that they are monogamous (Thresher 1984), but polygamous activity has been reported by Moyer et al. (1983). Regardless of the reproductive orientation, spawning always occurs in pairs and at sunset (Moyer er al. 1983; Colin and Clavijo 1988; DeLoach 1999) and in Puerto Rico, spawning activity has been observed near the shelf edge (Moyer et al. 1983). Over the course of a year, ripe gray angelfish were observed in February through June with a peak in March (Munro et al. 1973). However, Aiken (1983) observed the greatest percentage of ripe gray angelfish in October and January. Fecundity estimates for female gray angelfish range from 16,150 to 126,000 eggs per individual and 50 to 123 eggs per gram body weight (Aiken 1975).

French angelfish, *Pomacanthus paru*

Distribution and Habitat

The french angelfish occurs in both the Western and Eastern Atlantic. In the Western Atlantic, it ranges from Florida (USA) to Brazil, including the Gulf of Mexico and Caribbean Sea. Adult french angelfish swim about coral reefs, often in pairs, at depths ranging from 15 to 80 m and juveniles inhabit reefs and sandy bottoms, often near holes or protective hard bottom crevices (Humann and DeLoach 2014). French angelfish are similar to gray angelfish in their social, feeding and reproductive behaviors (DeLoach 1999) and large, intraspecifically exclusive home ranges with similar patterns of shallow, medium depth, and deep bands of contiguous home ranges up to 2,300 m^2 (Hourigan et al. 1989).

Life History

This fish is moderately resilient, with a minimum population doubling time of 1.4 - 4.4 years (K=0.21). Maximum reported size is 41.1 cm TL (Allen 1985 in Froese and Pauly 2002). Estimated size at maturity and age at first maturity are 26.7 cm TL and 3.2 years, respectively. Approximate life span is 13.6 years; natural mortality rate, 0.50 (Froese and Pauly 2002). French angelfish size ranges from 10-14 inches, with a maximum observed size of 18 inches (Humann and DeLoach 2014).

Diet

This fish feeds on sponges, algae, bryozoans, zoantharians, gorgonians and tunicates. Juveniles tend cleaning stations, servicing jacks, snappers, morays, grunts, surgeonfishes, wrasses, and other reef fish (Allen 1985 in Froese and Pauly 2002). This species poses a low risk for ciguatera poisoning (Olsen et al. 1984; Böhlke and Chaplin 1993) and recent surveys conducted in Puerto Rico do not list angelfish as fish species that induced ciguatera poisoning (Azziz-Baumgartner et al. 2012).

Reproduction and Spawning

In the northeastern Caribbean, individuals in spawning condition have been observed in March and May (Erdman 1976). Feitosa et al. (2015) detected no sign of hermaphroditism in French angelfish collected from fish traps in Brazil and classified the species as a gonochorist fish. French angelfish also form mated pairs but little is known about their actual spawning behavior.

Queen triggerfish, *Balistes vetula*

Distribution and Habitat

Queen triggerfish occur in the Western Atlantic from Massachusetts (USA) to southeastern Brazil, including the Gulf of Mexico and Caribbean Sea (Robins and Ray 1986 in Froese and Pauly 2002). Erdman (1976) reported that this species is commonly caught in fish pots in the northeastern Caribbean. Queen triggerfish are generally found over rocky or coral areas, from depths of 2-275 m. It also has been observed over sand and grassy areas (Robins and Ray 1986 in Froese and Pauly 2002). There is some evidence that juveniles tend to inhabit shallower waters, then move into deeper water as they mature (Aiken 1975b). This fish may school, but also has been observed alone and in small groups (Aiken 1975b; Robins and Ray 1986 in Froese and Pauly 2002).

Life History

The queen triggerfish is reportedly moderately resilient, with a minimum population doubling time of 1.4 - 4.4 years (K=0.15-0.57). Maximum reported size is 60 cm TL (male); maximum weight is 5,440 g (Robins and Ray 1986 in Froese and Pauly 2002). Size at maturity, and age at first maturity, are estimated in Froese and Pauly (2002) as 40.8 cm TL and 2.8 years, respectively. Aiken (1975b) estimates mean size at maturity as 26.5 cm fork length (FL) and 23.5 cm for males and females, respectively, collected in a Jamaican study. Fecundity measured in 3 individuals averaged 73 eggs per gram body weight. Approximate life span is 12.5 years. Estimated natural mortality rate is 0.48 (Froese and Pauly 2002).

Diet
Approximate life span is 12.5 years. Estimated natural mortality rate is 0.48 (Froese and Pauly 2002). It is considered to be an excellent food fish, but its liver is poisonous (Robins and Ray 1986 in Froese and Pauly 2002).

Reproduction and Spawning
Peak spawning occurred from January to February and from August to October (Aiken 1975b). In the northeastern Caribbean, individuals in spawning condition have been observed from February through June (Erdman 1976). This fish primarily feeds on benthic invertebrates, such as sea urchins (Robins and Ray 1986 in Froese and Pauly 2002).

Dolphin, *Coryphaena hippurus*

Please see Appendix I for information about this species.

Wahoo, *Acanthocybium solandri*

Please see Appendix I for information about this species.

Sea Urchins

Please see Appendix I for information about these species.

Sea Cucumbers

Please see Appendix I for information about these species.

Corals

The Council intends to manage all species of corals, whether described in this section or not. Corals included in the St. Thomas/St. John FMP include the phylum Cnidaria (formerly Coelenterata) 1) Class Hydrozoa: Subclass Hydroidolina - Order Anthoathecata - Family Milleporidae and Family Stylasteridae; 2) Class Anthozoa: Subclass Octocorallia (soft corals, gorgonians, sea pansies, sea pens) - Order Alcyonacea (soft corals), and Order Pennatulacea (sea pens); Subclass Hexacorallia - Order Scleractinia (stony corals), and Order Anthipatharia (black corals).

Hydrocorals, Class Hydrozoa

Two families within the Class Hydrozoa, Order Anthoathecata are included for management in the St. Thomas/St. John FMP: Milleporidae (fire corals) and Stylasteridae (lace corals).

Milleporidae species represented in the St. Thomas/St. John FMP are the fire corals (*Millepora* spp.). Their name derives from the powerful stinging cells they possess, which enable them to paralyze and capture prey. These colonial corals are found from deep fore reef areas to back reefs (Colin 1978), and are considered to play a significant role in coral reef construction, particularly in shallow windward substrates, where they have a buffering effect (Goenaga and Boulon 1992).

Three described species of western Atlantic Millepora exist: *M. alcicornis*, *M. complanata*, and *M. squarrosa*. They differ only in the morphology of the skeleton and are often considered ecological variants of a single species. The branched form, *M. alcicornis*, occurs somewhat deeper than the others, while *M. squarrosa* is found in heavy surf or in areas exposed to air in the troughs of waves. Under extreme wave conditions or when covering the remains of another organisms, Millepora can be encrusting. Colonies sometimes cover entire sea fans and may also grow on the outer portion of the stalks of dead gorgonians. Barnacles and serpulid worm tubes may occur on the sides of the blade-like forms of Millepora (Colin 1978).

Stylasteridae species are also colonial but do not contain zooxanthallae. They have been used frequently as ornamental pieces (Goenaga and Boulon 1992. The rose lace coral (*Stylaster roseus*) occur at depths of 6 m to at least 30 m. These small, fragile, fan-like colonies reach 10 cm in height. They commonly occur in caves or crevices, often growing on inverted surfaces and occasionally (as at Mona Island) on open vertical rock faces (Colin 1978).

Anthozoans, Class Anthozoa

Anthozoans in the St. Thomas/St. John FMP include black corals (Order Antipatharia), soft corals (Subclass Octocorallia, Order Alcyonacea), sea pansies, and sea pens (Subclass Octocorallia, Order Pennatulacea), as well as the true reef-building corals (Subclass Hexacorallia, Order Scleractinia). Anthozoans has its life cycle restricted to the polyp phase exclusively, with no medusa stage occurring. They typically attach to a substrate and have the oral end expanded into a flattened oral disk. A calcareous skeleton may be constructed. Further, a planula larvae may be produced, which is capable of being transported some distance by ocean currents.

Soft corals, Order Alcyonacea

Alcyonacea, also known as soft corals, includes species with skeletons consisting of spicules but no axial skeleton (Goenaga and Boulon 1992). Gorgonacea is the more dominant group of Octocorallia, occurring in abundance on Caribbean reefs (Colin 1978). All gorgonian colonies possess an axial skeletal structure of either a horny or calcareous central cylinder or a zone of tightly bound spicules. Most species have an erect skeletal structure attached to a solid substrate by a holdfast, by a smaller number of species may occur as an encrusting mat (Colin 1978). Gorgonians may live for more than 20 years with annual growth rates ranging from 0.8 - 4.5 cm/yr for 13 species studied in southeastern Puerto Rico over a five-year period (CFMC 1995).

At study sites on southeastern Puerto Rico, mortality was found to be higher in small colonies, as compared to larger specimens, the major causes of death being damage to the colony base or detachment (CFMC 1995). Two species of sea whips, *Ellisella barbadensis* and *E. elongata*, reach sizes of nearly 2 m and can occur in dense stands on rocky, often vertical substrates at about 20 to at least 250 m. Three other smaller species may also occur within diving depths on deep reefs. Most species have wide geographic ranges, generally from southern Florida to the Caribbean.

The common sea fan, *Gorgonia ventalina*, has the widest distribution, both on the reef and geographically, of any gorgonian species. It can be found on nearly ever reef and is a characteristic part of reef environments in the Atlantic. It can occur near shore in areas of extreme wave action and on deeper outer reefs at 15 m or more in depth. It can reach a height of nearly 2 m and shows a somewhat "clumped" (non-random) distribution of individuals on a reef (Colin 1978). This species is known from Bermuda to Curacao, including the Florida Keys and western Caribbean.

The Venus sea fan, *G. flabellum*, is often restricted to shallow water with very strong wave action. It occurs in areas generally somewhat shallower and rougher than *G. ventalina* where the two occur in the same geographic area. It is seldom found below 10 m depth and can reach sizes near those of *G. ventalina*. Its known geographic distribution is somewhat odd. It is abundant and easily distinguished from *G. ventalina* in the Bahamas, but becomes scarce and less distinctive in Florida and the Lesser Antilles. It is common on the windward reef flats and back reef zones where fire corals are abundant. This species is known to fall prey to the flamingo tongue snail (Sefton and Webster 1986).

G. mariae, the wide-mesh sea fan, is the smallest of the sea fans, the fan-like form reaching only about 30 cm in height. There are two other growth forms of this species. One has short free branchlets form one or both faces, while the plumose form, which may reach 40 cm in height, has the inner and lower branches anastomosed, but the terminal branches free. This is generally a deeper water species than the *G. ventalina* and *G. flabellum* and has been encountered as deep as 47 m and as shallow as 5 m. Known from Cuba, Jamaica, Puerto Rico, the Virgin Islands, and the northern Lesser Antilles (Colin 1978).

There are several species of Pseudopterogorgia (sea plumes) on Caribbean reefs. Most are tall, plume-like colonies. On the leeward side of some islands in the Caribbean, a zone of dense growth of these species can occur at 7-10 m, with colonies reaching heights over 1.5 m. They are pinnately branched, with no interconnections between branches, and some are slimy to the touch with abundant mucus. *Pseudopterogorgia* spp. may be so common as to be the dominant feature of some reefs. Flamingo tongue snails are also common predators of sea plumes (Sefton and Webster 1986). The bipinnate plume produces planulae in Jamaica in late January an dearly

February. Unlike stony coral planulae, those of the bipinnate plume do not contain zooxanthellae. In the laboratory, they settle 11 days after release and must acquire their initial zooxanthellae from the environment, as these plant cells are abundant in the adult colonies (Colin 1978).

The genus Eunicea (sea rods) is an important group of reef-dwelling alcyonarians. Most occur from a few meters depth to a maximum of about 30 m (Colin 1978). *Eunicea* spp. occur at shallow and moderate depths. These gorgonians have single-celled algae (zooxanthellae) in the tissues of the polyps, as do most other gorgonians, corals, and anemones of the reef community. These symbiotic algae aid in the nutrition of the host colony (Sefton and Webster 1986). Muricea spp. are common at moderate depths, particularly in spur and groove systems of the reef. They may also be attached to coral rubble in sandy areas (Sefton and Webster 1986). Sea rods, *Plexaura* spp., occur to depths of 50 m. *P. homomalla* has recently been the subject of much study since it was discovered to contain high amounts of a type of chemical (prostaglandins) valuable in the pharmaceutical industry. Advances in chemical synthesis of prostaglandins have not made such considerations less important. This species is tan in color and can reach nearly 12 m in height. Trumpet fishes sometimes hide by aligning themselves with the branches of *Plexaurella* colonies (Sefton and Webster 1986). Most *Plexaurella* spp. in the Caribbean commonly occur from about 10 to 50 m depth.

Gorgonian life history is noted by low and variable recruitment of small specimens. Given this uncertain recruitment, the predictable survival of adults is critical to the persistence of gorgonian populations (CFMC 1995). Further, gorgonian species can play an important role as habitat for other managed species. Fire coral, *Millepora* spp., may encrust entire colonies, particularly the sea fans of the genus Gorgonia. Bivalve mollusks, sponges, and algae may grow upon dead sections of gorgonian skeletons; whether these organisms simply take advantage of already dead substrate or themselves kill a portion of the gorgonian is not known. The gastropod mollusk, *Cyphoma gibbosum*, feeds on gorgonian polyps by crawling slowly over the skeleton, grazing at will. Other organisms, such as basket starfishes and brittlestars, climb tall gorgonians to reach a position more advantageous for filter-feeding in reef areas (Colin 1978). These factors warrant the prohibition on their harvest.

Hard or stony corals, Order Scleractinia

Due to the numerous scleractinian species included in the St. Thomas/St. John FMP, and that the ecological importance of corals is widely accepted and understood by the public, the following is only a survey of the major species and species groups.

Scleractinians are the principal reef builders. They are calcium secreting, anemone-like animals that can form colonies comprised of many physically and physiologically linked polyps or else can be solitary or consisting of one polyp. Tentacles occur in multiples of six and the digestive cavities are divided by partitions (sclerosepta and sarcosepta) that radiate from the center of the polyp. The polyps of stony corals are somewhat similar to those of sea anemones but produce a calcium carbonate cup (the corallite) and are usually colonial, producing a massive calcareous skeleton (the corallum) from the many corallites. In contrast to anemones they produce calcium carbonate, aragonitic skeletons that can reach considerable sizes (e.g., over 5 m in diameter and height in individuals of *Montastrea annularis*). The skeleton is internal, in contrast to other skeleton forming cnidarians (Goenaga and Boulon 1992). Often scleractinians are considered in two informal groups, the hermatypic or reef-building corals (those making a significant contribution to reef structure) and ahermatypic or non-reef building corals (often small, solitary species without large skeletons) (Colin 1978).

Many stony corals, particularly those that are hermatypic, contain small unicellular plants called zooxanthellae (dinoflagellata) in their gastrodermis. These zooxanthellae are pigmented, giving corals most of their color, and play a role in the production of calcium carbonate by the coral polyp. The exact nature of their contribution is not known and seems to vary within species of corals. Generally, however, ahermatypic corals lack zooxanthellae while hermatypic species possess large numbers. The zooxanthellae can be expelled by a coral (usually termed bleaching) when under stress (Colin 1978).

It is believed that the requirement of light for the zooxanthellae is the reason why coral reefs are limited to fairly shallow waters. With increasing depth below about 30 m corals are generally less heavily calcified than in shallower water and the ability to form reef structures is much less than in shallow water. Reef corals may occur to depths approaching 90-100 m in extremely clear water, but below 45-50 m in their constructional abilities are severely limited and may be surpassed by those of other groups of organisms such as the sclerosponges (Colin 1978).

Within a colony, all reproduction is asexual. New polyps are budded from other polyps as the colony increases in diameter or length. The rate of growth is variable between species, with branched species generally growing faster than massive species, and is strongly influenced within each species by environmental conditions. Sexually produced larvae, termed planulae, result in the establishment of new colonies. Larvae may either swim (entering the plankton and covering large distances) or crawl (staying close to the parent) until they attach to the bottom to initiate a new colony (Colin 1978).

A number of organisms prey directly on corals. Certain fishes pick polyps from the surface of the colony (butterflyfishes) while others ingest or scrape portions of skeleton with their attached polyps (puffers, parrotfishes). Some gastropod mollusks feed on coral polyps by inserting their proboscis into the polyp, and a few polychaete worms feed on branched corals by engulfing the tip of a branch in their mouth (Colin 1978). Boring sponges and clams occur in the skeleton and weaken it by their mechanisms of removing calcareous material (Colin 1978).

Acropora cervicornis (staghorn coral), found throughout the Caribbean, is characteristic of seaward facing reefs, but generally occurs on reefs below 6 to 9 m depth. It occurs from low water to 50 m but is most common at 12 to 22 m. This is one of the most rapidly growing corals. Length increases of nearly 30 cm per year have been recorded for single branches under optimal conditions. This species can also occur in shallow, quiet back reef areas where the water is fairly clear. Damselfishes frequently stake out their territories in staghorn, as well as elkhorn coral (Sefton and Webster 1986).

A. palmata (elkhorn coral) is also characteristic of seaward facing reefs. It is the most abundant stony coral in shallow water areas, often growing up to low water levels. The "*A. palmata* zone" is a characteristic component of most West Indian reefs, and it thrives where wave conditions are rough. Severe storms such as hurricanes can have disastrous effects on reefs comprised of this species. Entire reefs may be reduced to rubble, much of this transported over the reef crest or piled above low water levels. Large colonies may be overturned and often renew their growth in the inverted position. A. palmata is strictly a shallow-water coral. Seldom are colonies found below 15 m, and its greatest abundance is in the top 6 m of the water. It can occur in surprisingly turbid water, but may be limited in some areas by low winter temperatures. The fast-growing branching colonies of A. palmata are sometimes 4 m or more across. One of the dominant corals in the Caribbean, elkhorn coral competes by growing rapidly and by shading or over-topping its neighbors. Entire barrier reefs, with no adjacent reef flat, may be built of this coral. The famous barrier reef at Buck Island, St. Croix, is an excellent example of such a situation, but similar reefs are found in many areas of the Caribbean. Occasionally, the branches of *A. palmata* will have lumpy growths of polyps, termed "neoplasms," on the normally flattened branches. If any portion of the coral surface dies this provides a site of attachment for a wide variety of organisms, and branches of *A. palmata* with algae, hydroids, and actinians in sections have been observed. Certain crabs, such as *Domecia acanthophora*, form cavities in the junctions of branches by preventing the coral from growing in these areas (Colin 1978).

Corals of the genus Agaricia and Leptoseris, commonly known as the "lettuce corals," are among the most fragile corals occurring on reefs. However, they play an important role in reef construction, particularly in the deeper sections. Various species are also important elements of the shallow reef environment (Colin 1978). While *Agaricia tenuifolia* is generally restricted to depths shallower than 18 m, other species are found on reefs down to 80 m in depth.

Two species of Caryophyllidae are in the coral reef resources stock complex, *Eusmilia fastigiata* (flower coral) and *Tubastrea aurea* (cup coral). *E. fastigiata* colonies, found widely in the Caribbean, grow up to 50 cm in diameter. This species has a wide depth range from 1-65 m, but is most common at 3-30 m depth. It can occur in a variety of habitats from back reefs to fore reefs, and under overhanging sides of larger corals. Encrusting sponges, algae, and tubeworms often grow on the dead branches from which the polyps grow (Sefton and Webster 1986). *T. aurea* is non-reef building (ahermatypic) but is, on occasion, abundant on reefs in the proper habitat. It is not solitary, with clumps containing a few to hundreds of polyps occurring on undercut wave-swept rocks, on overhanging faces in deeper water and in fairly dimly lit caves.

One pier off western Puerto Rico has all the area available on the inside of the pilings, beneath a platform providing shade, completely covered by this coral to a depth of 1.5 m. This species lacks zooxanthellae.

Diploria spp. include *D. clivosa* (knobby brain coral), *D. labyrinthiformis* (grooved brain coral), and *D. strigosa* (symmetrical brain coral). In Bonaire, *D. clivosa* is one of the dominant corals on the leeward side of a fringing reef of *Acropora palmata*, but is not as significant a constructor on reefs as are the other two species of Diploria. It does not occur as deep as *D. strigosa,* with its maximum depth begin about 15 m and its distribution centered around 1 to 3 m. This species grows in shallow to moderately deep areas, often in quiet back reef and lagoon habitats. Where wave action is stronger, it exhibits a more plate-like growth and becomes an important structural element of the reef community in some locations (Sefton and Webster 1986). *D. labyrinthiformis* forms sizeable heads over 1 m in diameter. This species is a minor reef constructor on the seaward slope of reefs and is the most restricted species of Diploria in its distribution on reefs. It occurs as deep as 43 m, but is most common at 2-15 m depth. This common coral is found from shallow to deep locations, but is most abundant at moderate depths on windward reef terraces (Sefton and Webster 1986). *D. strigosa* can form immense heads well over 2 m across and is capable of making a significant contribution to reef structure. This species, like most brain corals, is slow growing, with an annual increase of size of a head estimated at up to 1 cm per year. This means specimen of 2 m in diameter would be at least 100 years old and probably several hundred with all factors considered. This species occurs from low water to at least 40 m but is most abundant above 10 m. It is perhaps the most widely distributed species of Diploria on the reef and has even been reported from muddy bays where few other corals grow. This species occurs at all scuba depths from shallow nearshore reefs to moderately deep fore reef slopes (Sefton and Webster 1986).

Montastrea annularis (boulder star coral) and *Montastrea cavernosa* (great star coral) are generally the most common species of coral on Atlantic reefs at moderate depths (Colin 1978). *M. annularis* forms massive boulders or heads reaching several meters across in shallow water (1-20 m) and flattened heads or plate-like colonies in deeper water (below 20 m). It reaches depths of at least 60 m (Colin 1978). There is great variation in this species, and much of it seems related to depth. This species is slow growing compared to branching corals such as *A. cervicornis*, but rates of 1.0-2.5 cm per year increase in height have been recorded. *O. annularis* is attached by a wide variety of organisms other than corals. Boring sponges are quite abundant in this species, gastropod mollusks of the genus Coralliophila feed either on the polyps or on plankton ingested by the polyps, and filamentous algae occur on areas where coral tissue was removed by mechanical action. This star coral often forms massive mounds that are important structural elements of buttresses and other fore reef elements at moderate depth. Colonies become more plate-like as depth increases. This is frequently the dominant reef-builder in buttresses and fore reef slopes (Sefton and Webster 1986).

In many localities at moderate depths, *M. cavernosa* is the predominant species of coral present. Either this species or *M. annularis* is generally the most common coral between 10-30 m in buttressed or sloping areas of Atlantic reefs lacking sizable thickets of *A. cervicornis.* Below 30 m, *M. cavernosa* clearly predominates over *M. annularis*, but increasing importance of agariciid corals and sclerosponges in reef construction somewhat diminishes its contribution. *M. cavernosa* is one of the most effective zooplankton feeders among stony corals. It is one of the deepest occurring hermatypic corals, found at depths from only a few meters to at least 90 m (Colin 1978). *M. cavernosa* is somewhat less common than *M. annularis* but, nevertheless, is an important reef-builder in many areas (Sefton and Webster 1986).

Dendrogyra cylindricus (pillar coral) is one of the most spectacular stony corals found on West Indian reefs. Colonies may contain dozens of upright cylindrical branches and reach a total height of nearly 3 m. If a single one of the "pillars" is broken off and comes to rest in a position where it continues to live, the branch will give rise to several new pillars which again grow vertically. This species is unusual in that the polyps with their tentacles are expanded in the daytime unlike most other stony corals. Pillar coral varies considerably in abundance throughout its range and is a very minor constructor of reefs. It is found on flat or gently sloping reef bottoms between 1 and 20 m. Colonies form spires 3 m or more tall. Distribution is spotty throughout the Caribbean (Sefton and Webster 1986).

Porites astreoides (mustard hill coral); *Porites branneri* (blue crust coral); *Porites divaricata* (small finger coral); and *Porites porites* (finger coral) are four poritidae species in the Puerto Rico FMP. *P. astreoides* can occur in a variety of growth forms. In shallow water it can be encrusting, while at deeper depths the colonies are either rounded or flattened with the surface facing towards the light. Fam worms often occur with *P. astreoides* and the sponge *Mycale laevis*, which grows on the undersurfaces of certain corals, can also be associated with it. Asexual reproduction is accomplished either through extratentacular budding or intratentacular budding. *P. astreoides* occurs abundantly in nearly all reef zones to depths of over 50 m. *P. branneri* colonies are encrusting and found from 0.1-12 m of depth, generally associated with bank reef types. *P. divaricata* is a delicate species of Porites. The branches are about 6 mm in diameter and form, at most, a small clump with widely spaced branches. *P. divaricata* are typical of back reef areas in shallow water, but occur rarely as deep as 15 m (Colin 1978). *P. porites* have thick branches, often 25 mm in diameter, that resemble stubby fingers, hence the name. *P. porites* can occur in many reef situations including back and clear water fore reef areas, It common throughout the Caribbean, but is rare below 20 m (Colin 1978).

Black corals, Order Antipatharia

Entire colonies are harvested for artisanal purposes in some regions of the Caribbean. In 1970, the local precious coral jewelry industry (black and pink coral) was estimated to have a retail value of more than 4 million dollars. Their axial skeleton is polished and attains considerable thickness in some species, rendering them commercially valuable in the jewelry trade to humans. In Puerto Rico and the USVI, commercial harvesting is apparently uncommon but is known to occur (Goenaga and Boulon 1992). However, harvest of all managed corals is prohibited in the Puerto Rico FMP.

The ecology and life history of these organisms is, for the most part, unknown. Taxonomy, to a large extent, is also unknown. Two of the genera included in the coral reef resources stock complex are Antipathes spp. (bush black corals) and Stichopathes spp. (wire corals) (Goenaga and Boulon 1992). Black corals are typically deep sea, slow growing colonial anthozoans usually occurring under ledges, possibly because their larvae is negatively phototactic. The axial skeleton is black, spiny and scleroproteinaceous, and is secreted in concentric layers around a hollow core. The polyps overlay the horny skeleton, are interconnected and possess six non-retractile, unbranched tentacles. They usually contain a diverse array of internal and external unstudied commensal organisms that include palaemonid crustaceans, lichomolgid copepods, and pilargiid polychaetes. Available evidence suggests that recruitment is infrequent.

Thick stemmed, branched, and large (i.e., potentially important economically) bush black corals occur in water depths below 50 m in La Parguera, Puerto Rico. Unbranched, thin stemmed wire corals are present at depths of 20 m. Both genera can also occur sparsely in very shallow, turbid waters off Mayaguez, western Puerto Rico and in La Parguera, southwestern Puerto Rico. Individual Antipathes spp. have been observed above depths of 8 m south of Arrecife La Gata, La Parguera, indicating that adult colonies of these species do not require deep waters.

Appendix K. Summary of Endangered Species Act Consultations on the Reef Fish, Spiny Lobster, Queen Conch, and Coral Fishery Management Plans (FMPs)

The St. Thomas/St. John FMP will subsume some of the activities currently managed under the FMP for the Reef Fish of Puerto Rico and the U.S. Virgin Islands (USVI) (Reef Fish FMP), the FMP for the Spiny Lobster of Puerto Rico and the USVI (Spiny Lobster FMP), the FMP for the Queen Conch Resources of Puerto Rico and the USVI (Queen Conch FMP), and the FMP for the Corals and Reef Associated Plants and Invertebrates of Puerto Rico and the USVI (Coral FMP). Activities under these FMPs may affect ESA listed species and designated critical habitat and ESA Section 7 consultations have been completed in the past. The following summarizes the consultation history for each FMP.

Queen Conch and Coral

Fishing authorized under the Queen Conch and Coral FMPs occurred mainly via hand harvest of queen conch and coral reef-associated organisms (harvest of corals was prohibited), and previous consultations determined that ESA-listed species in the action area were not likely to be adversely affected by either of these fisheries. Additionally, potential effects to the two listed *Acropora* species and designated critical habitat for *Acropora* were determined to be extremely unlikely to occur and discountable.

Reef Fish

On October 4, 2011, NMFS completed its most recent biological opinion evaluating the effects of the continued authorization of the U.S. Caribbean reef fish fishery, managed under the Reef Fish FMP, on ESA-listed species and designated critical habitat. In the opinion, NMFS concluded that its continued authorization is not likely to jeopardize the continued existence of green, hawksbill, or leatherback sea turtles, or elkhorn or staghorn corals (*Acropora*), or destroy or adversely modify *Acropora* critical habitat. The opinion also concluded that the continued authorization of the U.S. Caribbean reef fish fishery is not likely to adversely affect ESA-listed whales (humpback, fin, sei, and sperm) or Northwest Atlantic distinct population segment (DPS) of loggerhead sea turtle, or the critical habitat for green, hawksbill or leatherback sea turtles.

Spiny Lobster

On December 12, 2011, NMFS completed its most recent biological opinion evaluating the effects of the continued authorization of the U.S. Caribbean spiny lobster fishery, managed under the Spiny Lobster FMP, on ESA-listed species and designated critical habitat. In the opinion, NMFS concluded that the spiny lobster fishery's continued authorization is not likely to destroy or adversely modify Acropora critical habitat in the U.S. Caribbean, or to jeopardize the continued existence of staghorn coral, or green, hawksbill, or leatherback sea turtles. NMFS also concluded that the continued authorization of the U.S. Caribbean spiny lobster fishery is not likely to adversely affect ESA listed whales (humpback, fin, sei, and sperm), loggerhead sea turtles, elkhorn coral, or critical habitat for green, hawksbill, or leatherback sea turtles.

Reinitiation of Consultation (Reef Fish and Spiny Lobster)

As provided in 50 CFR 402.16, reinitiation of formal consultation is required if discretionary federal action agency involvement or control over the action has been retained, or is authorized by law, and, if among other things, a new species is listed or critical habitat designated that may be affected by the action.

On September 10, 2014, NMFS listed 20 new coral species under the ESA. Five of those new species (rough cactus coral [*Mycetophyllia ferox*], pillar coral [*Dendrogyra cylindrus*], lobed star coral [*Orbicella annularis*], mountainous star coral [*Orbicella faveolata*], and boulder star coral [*Orbicella franksi*]) occur in the Caribbean and all are listed as threatened. In a September 26, 2014, memorandum, NMFS Sustainable Fisheries Division determined that the continued authorization of the Caribbean reef fish and spiny lobster fisheries may affect these five newly-listed species and requested reinitiation of ESA Section 7 consultation to evaluate these fisheries' potential impacts on them.

In addition, NMFS has published five final rules listing a total of six additional species that may be affected by the continued authorization of the reef fish and spiny lobster fisheries under the Reef Fish FMP and Spiny Lobster FMP in the U.S. Caribbean and, has expanded the ongoing reinitiation to consult on the effect to these species. These listings include the following:

- On July 3, 2014, NMFS published a final rule listing the Central and Southwest Atlantic DPS of scalloped hammerhead shark (*Sphyrna lewini*) as threatened under the ESA (79 FR 38213). This DPS occurs in the Caribbean;
- On April 6, 2016, NMFS and the U.S. Fish and Wildlife Service published a final rule removing the range-wide and breeding population ESA listings of the green sea turtle (*Chelonia mydas*), and in their place, listing eight DPSs of green sea turtle as threatened and three DPSs as endangered (81 FR 20058). Two of the green sea turtle DPSs, the North Atlantic DPS and the South Atlantic DPS, occur in the U.S. Caribbean and are listed as threatened;
- On June 29, 2016, NMFS published a final rule listing the Nassau grouper (*Epinephelus striatus*) as threatened (81 FR 42268);
- On January 22, 2018, NMFS published a final rule listing the giant manta ray (*Manta birostris*) as threatened (83 FR 2916);
- On January 30, 2018, NMFS published a final rule listing the oceanic whitetip shark (*Carcharhinus longimanus*) as threatened (83 FR 4153).

NMFS has expanded the scope of the reinitiated consultation to include the above-listed species. Since reinitiating consultation, NMFS has prepared various memoranda documenting its determination that allowing the fisheries managed under the Reef Fish and Spiny Lobster FMP to continue operating during the reinitiation period would not violate Section 7(a)(2) or Section 7(d) of the ESA. Most recently, in an October 31, 2018 memorandum, NMFS updatedthose ESA Section 7(a)(2) and Section 7(d) determinations. That memorandum addressed all listed species for which one or more reinitiation triggers for these FMPs have been met (see above). This memorandum analyzed theeffects of the continued operation of these fisheries during the reinitiation period on the recently listed giant manta ray and oceanic whitetip shark listings for the first time. NMFS also reviewed analysis from previous findings relative to Nassau grouper, the North Atlantic and South Atlantic DPSs of green sea turtle, the Central and Southwest Atlantic DPS of scalloped hammerhead shark, and the five corals listed in 2014 (rough cactus coral, pillar coral, lobed star coral, mountainous star coral, and boulder star coral) to ensure that those findings still apply. Based on the analyses, NMFS determined that allowing fishing managed under the Reef Fish and Spiny Lobster FMPs to continue during the reinitiation period, which extended through December 2019, would not violate Section 7(a)(2) of the ESA with respect to any of the above-references species or violate 7(d) of the ESA.

Appendix L. Bycatch Practicability Analysis

Introduction

Fishery Management Councils are required by the Magnuson-Stevens Fishery Conservation and Management (Magnuson-Stevens) Act § 303(a)(11) to establish a standardized bycatch reporting methodology to assess the amount and type of bycatch occurring in the fishery and to include in its fishery management plans (FMP) conservation and management measures that, to the extent practicable and in the following order, (A) minimize bycatch and (B) minimize the mortality of bycatch that cannot be avoided. The Magnuson-Stevens Act defines "bycatch" as fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch-and-release fishery management program" (Magnuson-Stevens Act § 3(2)). Economic discards are fish that are discarded because they are undesirable to the harvester. This category of discards generally includes certain species, sizes, and/or sexes with low or no market value. Regulatory discards are fish that are required by regulation to be discarded, but also include fish that may be retained but not sold. National Marine Fisheries Service (NMFS) outlines at 50 CFR § 600.350(d)(3)(i) ten factors that should be considered in determining whether a management measure minimizes bycatch or bycatch mortality to the extent practicable, including:

A. Population effects for the bycatch species;

B. Ecological effects due to changes in the bycatch of that species (effects on other species in the ecosystem);

C. Changes in the bycatch of other species of fish and the resulting population and ecosystem effects;

D. Effects on marine mammals and birds;

E. Changes in fishing, processing, disposal, and marketing costs;

F. Changes in fishing practices and behavior of fishermen;

G. Changes in research, administration, and enforcement costs and management effectiveness;

H. Changes in the economic, social, or cultural value of fishing activities and non-consumptive uses of fishery resources;

I. Changes in the distribution of benefits and costs; and,

J. Social effects.

Agency guidance provided at 50 CFR § 600.350(d)(3)(ii) advises the Councils adhere to the precautionary approach found in the Food and Agriculture Organization of the United Nations (FAO) Code of Conduct for Responsible Fisheries (Article 6.5) when faced with uncertainty concerning these ten practicability factors. According to Article 6.5 of the FAO Code of Conduct for Responsible Fisheries, using the absence of adequate scientific information as a reason for postponing or failing to take measures to conserve target species, associated or dependent species, and non-target species and their environment, would not be consistent with a precautionary approach.

Bycatch Practicability Analysis

Background

A bycatch practicability analysis (BPA) was first addressed in the Caribbean Sustainable Fisheries Act Amendment/Final Environmental Impact Statement (Caribbean SFA Amendment [CFMC 2005]), which was approved by the agency on September 13, 2005 and the final rule published in the *Federal Register* on October 28, 2005, effective November 28, 2005 (70 FR 62073). The Caribbean SFA Amendment BPA evaluated the biological, ecological, social, economic, and administrative impacts associated with a wide range of alternatives including those required for achieving the bycatch mandates of the Magnuson-Stevens Act. In summary, four alternatives including a "No Action" alternative were presented, and impacts were described regarding bycatch reporting. Those alternatives are included herein by reference and summarized below. Those alternatives, in addition to the No Action alternative, would to a greater or lesser degree: develop a federal permit system for commercial and charter boat fishermen participating in Council-managed fisheries, with an associated mandatory monthly reporting requirement; utilize the Marine Recreational Fisheries Statistics Survey database to provide additional bycatch information on the recreational and subsistence sectors; and, consult with Puerto Rico in an effort to modify the trip ticket system currently in place in the U.S. Caribbean to require standardized collection of bycatch data.

Additional measures were included in the Caribbean SFA Amendment to minimize bycatch and bycatch mortality to the extent practicable. The analysis of the practicability of those measures can be found in Section 6.6.2 of that amendment and is included by reference and summarized as follows: four alternatives, including a "No Action" alternative, were presented and are included herein by reference. Impacts were described regarding minimizing bycatch and bycatch mortality. Those alternatives proposed to: increase the minimum allowable mesh size for fish traps; establish a minimum mesh size of two inches and a maximum mesh size of six inches, stretched mesh, for gill and trammel nets; gill and trammel nets must be tended at all times; and, amend current requirements for trap construction such that only one escape panel is required, which could be the door.

The BPA in the Caribbean SFA Amendment discussed that beach seines, the gear with the highest rate of discard mortality, are not used in the U.S. Caribbean exclusive economic zone (EEZ). Trammel nets, which were banned from the EEZ in 2005 (CFMC 2005), were reported to produce little bycatch.

Anecdotal information suggested that the vast majority of fish harvested in the U.S. Caribbean are retained for the market or for personal use – including species with low market value. With the exception of species that are commonly believed to be ciguatoxic, economic discards in this region appear to be minimal.

Species identified as potential regulatory discards in the Caribbean SFA Amendment BPA (CFMC 2005), based on the laws that existed at that time, and the rational for inclusion, included:

- Nassau grouper: Federal and USVI territorial laws require that Nassau grouper landed in the U.S. Caribbean be returned unharmed to the water;
- Goliath grouper: Federal and USVI territorial laws require that Goliath grouper landed in the U.S. Caribbean be returned unharmed to the water;
- Juvenile yellowtail snapper: Federal law requires that catches of yellowtail snapper under 12 inches (30.5 cm) in total length be returned to the water;
- Juvenile and berried spiny lobster: Federal and USVI territorial laws prohibit the harvest of spiny lobster under 3.5 inches (8.9 cm) in carapace length and berried spiny lobsters (this size limit also applies to *Panulirus argus* imports into the U.S. Caribbean (CFMC 2008); and,
- Red hind, yellowfin, yellowedge, red, tiger, and black groupers; silk, black, blackfin, and vermilion snappers; lane and mutton snappers: federal law prohibits fishing for and possession of these species during their respective EEZ closed seasons. USVI territorial laws also prohibits fishing for and possession of these species during the territorial closed seasons to varying degrees (note that the silk, blackfin, black, and vermilion snapper closure applies only in St. Thomas/St. John territorial waters) (See DPNR 2019). Depending on the species and depth of the fishing activity, bycatch mortality could be high.

The Caribbean SFA Amendment BPA noted that the extent of those regulatory discards has not been quantified. In the past, the regulatory requirements forcing fishermen to discard these species were difficult to enforce because regulations were generally less restrictive in state waters. The mortality rates associated with commercial and recreational bycatch also have not been quantified, but generally increase with depth (e.g., finfish taken from deeper water generally have a lower survival rate when returned to the water).

The BPA concluded that, due to the nature of U.S. Caribbean fisheries, it was unlikely that any of the alternatives proposed in the Caribbean SFA Amendment would significantly reduce bycatch. Most Caribbean fishermen utilize all they catch, and those fisheries that are noted for producing large amounts of bycatch (e.g., trawling) are essentially absent from the U.S. Caribbean. Thus, bycatch is not as significant an issue in the U.S. Caribbean compared to other regions. What little bycatch occurs is generally confined to regulatory discards, which would be minimally affected by the gear restriction alternatives evaluated in the BPA. The BPA also concluded that the direct effects to the biological environment from any of those proposed alternatives would be minimal. Additionally, one or more alternatives may result in a direct, but relatively minor, effect to the socio-economic and administrative environment, due to the required modifications of fishing gear. In contrast, anecdotal information suggests that the only reason for large-mesh net fisheries is to illegally fish for turtles. Similarly, most trap fishermen already employ only one escape panel. Regardless, the Caribbean Fishery Management Council (Council) also opted to prohibit the use of gill and trammel nets in the U.S. Caribbean EEZ (excluding some bait and species not managed by the FMP), primarily to reduce fishing mortality, though it will also have ancillary benefits in the reduction of bycatch. The effects of the management regime implemented in 2005 have not been fully assessed to determine the impact of bycatch. The alternatives implemented for the U.S. Caribbean EEZ in 2005 were to varying degrees also implemented in USVI territorial waters in the U.S. Caribbean. Moreover, the USVI implemented additional regulations for the commercial and recreational harvest. To date, the Council has not implemented a federal permit system for commercial and charter boat fishermen participating in the harvest of Council managed species, as proposed in the Caribbean SFA Amendment.

A BPA was also included in the 2010 Caribbean Annual Catch Limit (ACL) Amendment (CFMC 2011a) and supplemented in the 2011 Caribbean ACL Amendment (CFMC 2011b) (2010/2011 BPA). The 2010/2011 BPA is herein included by reference and summarized below. Bycatch considerations for measures evaluated in that BPA that are consider to still be valid and applicable in this FMP also are noted below.

In the 2010/2011 BPA and in the St. Thomas/St. John FMP, bycatch in commercial and/or recreational fisheries may be affected through alternatives presented and described to revise or establish management reference points and status determination criteria, revise or establish ACLs and accountability measures (AM), allocate resources (based on stock complexes, recreational and commercial sectors, and geographic criteria), establish species-specific management measures (e.g., parrotfish measures in the 2010 ACL Amendment), and establish harvest limits (e.g., establishment of recreational bag limits in the 2010 and 2011 ACL Amendments). The Council considered the list of 10 factors (50 CFR §600.350(d)(3)(i)) discussed above to gauge if their management measures minimize bycatch or bycatch mortality. Their findings are summarized below.

A. Population effects for the bycatch species: the 2010/2011 BPA discussed that management measures may have an indirect but slight impact on minimizing bycatch. If those measures redefining management reference points result in more conservative estimates of MSY and OY along with, conservative establishment of OFLs and ACLs, and if with these measures there is a high compliance to regulations, fishing effort would be expected to be reduced in proportion to the more conservative catch allowances, resulting in a reduction in bycatch and bycatch mortality. In general, the findings of the 2010/2011 BPA would also be applicable to the St. Thomas/St. John FMP, as actions included in this FMP and analyzed in the EA included in this document also redefine and/or establish management refence points, and redefine or establish ACLs. However, those findings differ because the 2010/2011 BPA pertained to a shift from no ACL-based management to ACL-based management. Here, it is instead a change in the magnitude of an already established ACL. In this latter case, if the ACL for a stock or stock complex established in this FMP is lower than the previously established ACL for that stock or stock complex, bycatch would be expected to increase in proportion to the more conservative catch allowance. In contrast, if the newly established ACL is higher than the previously established ACL, bycatch would be expected to decrease in proportion to the more liberal catch allowance. For stocks new to federal management, the reduction in bycatch would be expected to be similar to the findings of the 2010/2011 BPA because of the similar shift in management (from no ACL-based management to ACL-based management).

B. Ecological effects due to changes in the bycatch of a stock (effects on other species in the ecosystem): the 2010/2011 BPA discussed that if management develops conservative measures as cited in (A) above, less bycatch and bycatch mortality would be expected, although natural variation may mask such a result. Theoretically, in response to such conservative management, the coral reef ecosystem would become better balanced as a result of more intact trophic and predatory interactions due to fewer non-target individuals being extracted or dying from the impacts of capture and release. Similar to the discussion in (A) above, species caught in concert with stocks that are new to federal management would experience a reduction in bycatch proportional to the more conservative catch allowances (newly established ACLs). Bycatch of species that are caught in concert with federally managed stocks for which the ACLs were revised under the St. Thomas/St. John FMP would be expected to increase as ACLs were reduced, and decrease as ACLs were increased.

C. Changes in the bycatch of other species of fish and the resulting population and ecosystem effects: Same as (B) above. This determination would continue to apply in the St. Thomas/St. John FMP.

D. Effects on marine mammals and birds: The 2010/2011 BPA discussed that, because fishermen in the U.S. Caribbean region traditionally utilize most resources harvested, the amounts of bycatch resulting from proposals included in the 2010 and 2011 ACL Amendments were not expected to change, so little to no affect to mammals or birds was expected. This determination can also be applied to actions in the St. Thomas/St. John FMP and remains valid.

E. Changes in fishing, processing, disposal, and marketing costs: The 2010/2011 BPA noted that, if management chooses the most conservative and restrictive proposals in the respective amendments, one might expect changes to fishing in that more fishing effort might take place after implementation of each amendment to hedge against closure once limits are reached. Such a change may result in a proportionate change in bycatch or bycatch mortality. If that were to occur, AMs would be triggered to reduce the length of the fishing season in subsequent fishing years, thereby minimizing bycatch. This determination is also applicable to measures implemented in the St. Thomas/St. John FMP.

F. Changes in fishing practices and behavior of fishermen: The 2010/2011 BPA discussed that, regardless of the conservative degree management takes in responding to the proposals of that amendment, changes to fishing practices were not expected to result in greater or lesser degrees of bycatch. The BPA noted that fish traps, hook-and-line, and spearfishing have been the most successful fishing practices and these practices were not expected to change without further regulations. Bycatch was not expected to change from its current level. In the St. Thomas/St. John FMP, changes to fishing practices also are not expected to result in greater or lesser degrees of bycatch as fishing methods would not change in the regulations implementing this FMP.

G. Changes in research, administration, and enforcement costs and management effectiveness: The 2010/2011 BPA discussed that research and monitoring is needed to understand the effectiveness of proposed management measures in reducing bycatch. Additional work is needed to determine the effectiveness of measures being developed in those amendments and by future actions being considered by the Council to reduce bycatch. A Data Collection Improvement Program is being developed in the region in cooperation with local governments and NMFS, which if funded should begin accumulation of information needed to assess bycatch questions. Additional administrative and enforcement efforts will be needed to implement and enforce these regulations.

H. Changes in the economic, social, or cultural value of fishing activities and non-consumptive uses of fishery resources: The 2010/2011 BPA noted that proposed management measures, including those that are likely to increase or decrease discards, could result in social and/or economic impacts and that those are discussed in Chapter 4 of each one of the 2010 and 2011 Caribbean ACL Amendments. In the St. Thomas/St. John FMP, socio-economic impacts of measures that would be likely to increase or decrease discards are discussed in Sections 4.1.3, 4.1.4, 4.2.3., 4.2.4, 4.3.3, 4.3.4, 4.4.3, 4.4.4, 4.5.3, 4.5.4, 4.6.3, 4.6.4, 4.7.3, and 4.7.4.

I. Changes in the distribution of benefits and costs: The 2010/2011 BPA noted that attempts were made to ensure reductions provided by proposed management measures were equal in the commercial and recreational sectors. The extent to which those management measures would increase or decrease the magnitudes of discards was not clear. Potential increases in dead discards were taken into consideration in bag and size limits, setting commercial quotas, and determining the effectiveness of a seasonal closure. It is unlikely that the magnitude of discards will be the same in the commercial and recreational sectors.

J. Social effects: In the 2010 and 2011 Caribbean ACL Amendments, the social effects of all the management measures, including those most likely to reduce bycatch, were described in Chapter 6 of each amendment. In the St. Thomas/St. John FMP, social effects are described in Sections 4.1.4, 4.2.4, 4.3.4, 4.4.4, 4.5.4, 4.6.4, and 4.7.4.

Commercial and Recreational Bycatch

Trip tickets used by commercial fishermen operating in St. Thomas/St. John waters include an area for reporting. The amount of recreational bycatch including catch and release is unknown. However, as mentioned in the Caribbean SFA Amendment BPA, anecdotal information suggests that the vast majority of fish harvested in St. Thomas/St. John are retained for the market or for personal use – including species with low market value. Those fisheries that are noted for producing large amounts of bycatch (e.g., trawling) are essentially absent from the U.S. Caribbean. Thus, bycatch is not as significant an issue in the U.S. Caribbean, including St. Thomas/St. John, compared to other regions. With the exception of species that are commonly believed to be ciguatoxic, economic discards in this region appear to be minimal. What little bycatch occurs is generally confined to regulatory discards. Under both the historic region-based management approach and the island-based management approach, regulatory discards from both the recreational and commercial sectors may potentially include:

- Nassau grouper: federal and USVI territorial laws require that Nassau grouper caught must be released immediately with a minimum of harm;

- Goliath grouper: federal and USVI territorial laws require that goliath grouper caught must be released immediately with a minimum of harm;
- Midnight, rainbow, and blue parrotfish: federal laws prohibit the harvest and possession of these species in federal waters off the USVI and the U.S. Caribbean and any fish caught must be released immediately with a minimum of harm;
- Juvenile yellowtail snapper: federal law requires that catches of yellowtail snapper under 12 inches (30.5 cm) in total length be released immediately with a minimum of harm;
- Juvenile and berried spiny lobster: federal and USVI territorial laws prohibit the harvest of spiny lobster under 3.5 inches (8.9 cm) in carapace length and berried spiny lobsters (this size limit also applies to *Panulirus argus* imports into the U.S. Caribbean (CFMC 2008);
- Red hind grouper, red, black, tiger, yellowfin or yellowedge groupers; vermilion, black, silk, black, and blackfin snappers; lane and mutton snappers: Federal law prohibits fishing for and possession of these species during their respective closed seasons or area closures, as applicable. USVI territorial laws also prohibit fishing for and possession of some of these species during the closed seasons to varying degrees (DPNR 2019). Depending on the species and depth of the fishing activity, there might be high bycatch mortality;
- Reef fish with recreational bag limits: any Council-managed reef fish that is harvested over their specified bag limit should be returned to the water;
- Spiny lobster with recreational bag limits: any spiny lobster that is harvested over its specified bag limit should be returned to the water;
- Stocks for which AMs apply: any stocks for which AMs are applied should not be retained.

Interactions with Protected Species

Protected species and critical habitat located within the St. Thomas/St. John management area (See Section 3.3.1) would be potentially affected by activities authorized under the St. Thomas/St. John FMP.

Protected species and critical habitat under the Endangered Species Act (ESA) are potentially subject to effects from boating activities occurring in the management area, including vessel strikes (e.g., turtles), contaminants/pollution from boating activities, and damage through anchoring (e.g., corals, coral critical habitat).

Listed turtle and fish species are potentially subject to effects from fishing activities that would occur under the St. Thomas/St. John FMP, most notably hooked as bycatch. Listed turtles and mammals could be entangled in line, trap, and net fishing gear. Corals are potentially physically impacted by fishing gear/activities, for example through crushing (by gear or vessel anchors), abrasion (by gear/anchor line or trap gear), and snagging (breaking of coral by gear/anchor).

Additionally, Nassau grouper could potentially be caught in traps or speared by fishermen. Several fishing related activities could potentially startle turtles, fish, and marine mammals.

Additionally, the harvest of herbivorous fish or invertebrates (e.g., sea urchins) would be expected to indirectly affect both *Acropora* critical habitat and listed coral species through impacts to the grazing and the related control of algae.

Since this is a new, island-based FMP, specific numbers of protected species bycatch for the fishery as it would be promulgated are not available. However, bycatch estimates from the previous Reef Fish FMP and Spiny Lobster FMP biological opinions are available (NMFS 2011a and NMFS 2011b, respectively). While they do not represent the exact numbers expected to be taken during fishing activities authorized under in this new St. Thomas/St. John FMP (since fishing effort is not expected to be identical under the new FMP and since those opinions provided take estimates for actions throughout the U.S. Caribbean), they are presented here to provide context to the approximate magnitude of bycatch that could occur. The actual bycatch expected to occur would be estimated and analyzed as part of the ongoing ESA Section 7 consultation. The most recent biological opinion for the Reef Fish FMP (NMFS 2011a) stated that up to 75 green, 48 hawksbill, and 18 leatherback sea turtles could be taken lethally over three year periods, and 3 hawksbill sea turtles would be non-lethally taken over three year periods. Take of *Acropora* (staghorn and elkhorn, combined) coral was calculated for three one-year periods at 0.0041 square miles per year. Indirect effects to *Acropora* coral via reduced sexual/asexual reproductive success were noted also. The most recent biological opinion for the Spiny Lobster FMP (NMFS 2011b) stated that up to 12 green, 12 hawksbill, and nine leatherback sea turtles could be taken lethally over three one-year periods. Take of staghorn coral was calculated for one three-year period at 93 square feet.

Recently listed species (i.e., rough cactus coral, pillar coral, lobed star coral, mountainous coral, boulder star coral, the Central and Southwest Atlantic DPS of scalloped hammerhead shark, Nassau grouper, oceanic whitetip shark, giant manta ray, and the North Atlantic and South Atlantic DPS of green sea turtles) could also be taken under activities authorized under the St. Thomas/St. John FMP, however previous calculations of take for these species under the Reef Fish or Spiny Lobster FMPs do not exist (they would be estimated in the ongoing Section 7 consultation).

Previous analyses of effects to ESA-listed species are summarized in Section 7 consultations for the Reef Fish and Spiny Lobster FMPs (see Appendix K) and were determined for each fishing sector (i.e., Puerto Rico commercial, Puerto Rico recreational, St. Thomas/St. John, and St. Croix). It would be expected that those determinations accurately reflect known effects to listed marine mammals, sea turtles, and *Acropora* corals in the St. Thomas/St. John management area. Similarly, NMFS' effects analyses for Nassau grouper, the Central and Southwest Atlantic DPS of scalloped hammerhead shark, giant manta ray, oceanic whitetip shark, lobed star, mountainous star, boulder star, rough cactus, and pillar coral, and the North Atlantic and South Atlantic DPS of green sea turtle described in NMFS' October 31, 2018 memorandum, should accurately reflect potential effects to these species through the extended reinitiation period of December 2019.

A formal consultation is currently in process to comprehensively package all analyses for all actions under the St. Thomas/St. John FMP into one document (i.e., biological opinion) and update information/analyses as appropriate. This biological opinion would also outline any expected take, and its effect to populations, and determine whether the FMP jeopardizes the continued existence of any ESA-listed species, or destroys or adversely modifies designated critical habitat.

Summary

This section evaluates the need and efficacy of taking additional action to minimize bycatch and bycatch mortality in the fisheries that comprise the St. Thomas/St. John FMP using the ten factors provided at 50 CFR 600.350(d)(3)(i). Management measures mentioned above, as well as past measures implemented by the Council to reduce fishing mortality that were migrated to this FMP as a result from Action 1, indirectly minimize bycatch in St. Thomas/St. John fisheries. Fish traps, hook-and-line, and spearfishing have been the most successful fishing practices and these practices are not expected to change without further regulations. Changes to those gear types or their operations are not considered in this FMP, thus bycatch is not expected to change from its current level. These measures continue to be applicable to fishery management in the St. Thomas/St. John EEZ. It is possible that management measures such as redefined ACLs and AMs could increase the number of discards. However, this depends primarily on how well the reference points and particularly the ACLs reflect actual fishing activity, and secondarily on if fishermen shift effort to other species, seasons, or fisheries and if effort decreases in response to more restrictive management measures. The extent to which community structure and age/size composition respond to ending overfishing also will influence bycatch. Bycatch minimizing measures taken in previous Council actions (e.g., 2010 and 2011 Caribbean ACL Amendments) as discussed above, which would still be applicable in the St. Thomas/St. John FMP, took into consideration potential increases in dead discards when setting bag and size limits, commercial quotas, and when determining the effectiveness of a seasonal closure. In addition, the effect that overlapping seasonal closures could have on reducing bycatch and fishing mortality of many co-occurring species is also expected to continue in the St. Thomas/St. John FMP.

Finally, the relative abundance, size structure, and age structure of other species in reef communities could be expected to change in response to changes in fishing pressure, for example as a result of changing predator/prey relationships or habitat characteristics. Such ecological changes could occur in the community structure of reef ecosystems through actions that would end overfishing. These ecological changes could affect the nature and magnitude of future patterns of bycatch. As appropriate and necessary, the St. Thomas/St. John FMP could be amended to further reduce bycatch as additional information becomes available.