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# *The Puerto Rico* **Breeding Bird Atlas**

Jessica Castro-Prieto, Joseph M. Wunderle, Jr., José Salguero-Farías,  
Sandra Soto-Bayó, Johann D. Crespo-Zapata, William A. Gould



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J. Castro-Prieto contributed to data analyses; prepared figures, tables, and appendices; wrote species descriptions; and wrote and edited the different sections of this atlas. J.M. Wunderle, Jr. initiated the atlas project by organizing the first meetings with lead participants; served as the science advisor for the atlas; contributed to field data gathering, data reviewing, and some initial analyses; advised on data presentation; edited the atlas; provided citations of key publications; and wrote sections of the introduction in chapter 1. J.A. Salguero-Faría coordinated field data collection, data entry, and review; and edited species accounts, figures, and tables, as well as major sections of this atlas. S. Soto-Bayó organized and updated the database, contributed to data analyses, and prepared figures and maps for the atlas and for the species accounts. J.D. Crespo-Zapata described, edited, and reviewed the species accounts including figures, tables, and cited literature. W.A. Gould was one of the participants in the first meeting that led to the development of the atlas, contributed to the development of most of the spatial layers used in this atlas to estimate species distribution, and served as a reviewer of the document and the species accounts.

## *Abstract*

The Puerto Rico Breeding Bird Atlas (PRBBA) project collected and summarized information on the timing of breeding and geographic distribution of 130 breeding bird species on Puerto Rico, and its associated satellite islands and cays. Fieldwork coordinated by the Puerto Rican Ornithological Society (SOPR) involved 344 volunteer observers who contributed to more than 45,500 individual observations of birds from 2004 through 2009. Following standard breeding bird atlas protocol, observers searched for breeding evidence in 479 hexagons while recording bird behavior. Each observed behavior was classified within a hierarchy of behaviors indicating increased likelihood of breeding from simply “observed” (i.e., no evidence for breeding), to “possible,” “probable,” or “confirmed” breeding evidence. Bird observations and breeding status were plotted in a geographic information system (GIS) layer with 479 hexagons (each 24 km<sup>2</sup>) covering Puerto Rico and its satellite islands and cays. For each species, the highest ranked breeding likelihood category (i.e., observed, possible, probable, or confirmed) was plotted for each hexagon to depict the species’ breeding distribution and probability of breeding in an area covered by the hexagon. In addition, breeding distribution and timing of breeding for each species were related to ecological life zones (or Holdridge life zones) on the islands and the protected areas to estimate the level of protection of the hexagons where the species breeds. Breeding distribution maps are depicted for terrestrial and aquatic birds including 73 native residents, 26 nonnative residents, 16 endemic species, 13 endemic subspecies, and 2 native migrant breeding species. The breeding distributions summarized in this atlas facilitate comparisons with earlier published descriptions of distribution for each species and will serve as a baseline for future studies of avian distributions and their responses to land use and climate change on Puerto Rico, satellite islands, and cays.

**Keywords:** Avian distribution, biogeography, Caribbean, citizen science, endemic bird species, geographic range, land use change, nonnative bird species, resident bird species, timing of breeding.

## *Preface*

Planning for the Puerto Rico Breeding Bird Atlas (PRBBA) began in July 2003 at a meeting of the Society for the Conservation and Study of Caribbean Birds (now BirdsCaribbean) on the island of Tobago. Although no breeding bird atlas had ever been completed for an island in the Caribbean, or for any country or territory in the Neotropics, I wanted to encourage an atlas effort for Puerto Rico to quantify avian distribution and facilitate conservation efforts on the island. A challenge at that time, however, was how to organize such an effort. At the conference hotel, I was assigned a roommate, Rick West, whom I had not met previously. Fortunately, my assigned roommate was an expert on conducting breeding bird atlases, having coauthored the breeding bird atlas for the State of Delaware as well as serving as a co-leader for State breeding bird atlases for Florida and Alabama. Rick was enthusiastic about the idea of helping to organize a breeding bird atlas for Puerto Rico but emphasized that we needed to identify a leader to organize the many observers required to conduct the fieldwork to document avian breeding status throughout the island and associated satellite

islands and cays. As luck would have it, the ideal leader was at the Tobago meeting, and so I introduced Rick to José A. Salguero-Farías, former President of the Puerto Rican Ornithological Society (Sociedad Ornitológica Puertorriqueña, Inc., or SOPI) and an avid field ornithologist well acquainted with bird distribution on the island. José had spoken with me in the San Juan airport on the way to the Tobago conference about his desire to summarize and analyze the bird observations from throughout the island. The three of us met in Tobago and agreed that Rick would provide the guidance on breeding bird atlas procedures as well as provide the atlas database required for summarizing the field observations. José, in turn, volunteered to organize and coordinate the army of observers required to survey the island and to supervise data entry. Although my colleague William (Bill) Gould from the International Institute of Tropical Forestry of the U.S. Department of Agriculture Forest Service was absent from our Tobago meeting, I suggested that he would be enthusiastic about plotting avian atlas data on the hexagonal grid system and associated geographic information system (GIS) layers he and his lab developed for the Puerto Rico Gap Analysis

Project (PRGAP). Rick, José, and I subsequently met with Bill at the International Institute of Tropical Forestry in 2004, who indeed was enthusiastic to have the breeding bird data plotted on the gap hexagonal grid cells. We therefore initiated the atlas project with José organizing field observers through SOPI and entering field observations with assistance from Rick, both of whom also contributed substantial numbers of field observations. As a result of the 2004 atlas organizing meeting, the organizers agreed to use 2004 as a pilot year to sample 20 hexagons, produced maps of each hexagon to help regional coordinators plan sampling, and established data entry and management methods integrating PRGAP and PRBBA data. After the 2004 pilot year, the PRBBA recruited more atlas volunteers and increased atlas surveying efforts in 2005 and continued yearly until terminated in 2009. By the end of the atlas fieldwork in 2009, over 45,500 bird observations had been tallied by over 340 observers, making this atlas project the largest citizen scientist effort conducted to date in the Caribbean. The results of this volunteer effort provide a “snapshot” of the 2004–2009 breeding distributions of birds, which can serve as a baseline for future comparisons of avian responses to changes in land use and climate on Puerto Rico.

*J.M. Wunderle, Jr.*

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This atlas could not have been possible without the contribution of 343 volunteers who registered a total of 45,558 observations (see app. A for the full list of volunteers). In addition to J.A. Salguero-Faría and J.M. Wunderle, Jr., coauthors of this atlas, 10 volunteers registered more than 500 observations including: R.L. West, C. Roig-Bachs, B.D. McKay, E. Font, M. Collins, S.A. Colón-López, M. Forehand, R. Christen, D. Ware, and M. Morales. A special thanks to C. Roig-Bachs for her continuous support to this project. The authors want to thank all the photographers who shared their photos and passion for birds with us. The atlas benefited from the constructive comments and suggestions from Mark W. Oberle, Herbert A. Raffaele, Adrienne G. Tossas, and Ariel E. Lugo. A special thanks to Alberto C. Cruz Mendoza for his assistance organizing the species accounts in phylogenetic order. Thanks to the Puerto Rico Department of Natural and Environmental Resources and the Puerto Rico Conservation Trusts. This project was funded with support from the U.S. Department of the Interior Fish and Wildlife Service Interagency Agreement number 16-IA-11120101-031; U.S. Department of Agriculture (USDA) Forest Service, International Institute of Tropical Forestry Research and Development and State and Private Forestry; USDA Caribbean Climate Hub and the Office of the Chief Economist; National Wildlife Refuge Association; Society for the Conservation and Study of Caribbean Birds (now BirdsCaribbean); and Department of Economic Development and Commerce of Puerto Rico Youth Development Program (Juvempleo in Spanish). All research conducted at the International Institute of Tropical Forestry is in collaboration with the University of Puerto Rico.

## *Acronyms and Abbreviations*

**ELZ:** ecological life zones (Holdridge life zones)

**GIS:** geographic information system

**IBA:** Important Bird and Biodiversity Areas

**IUCN:** International Union for the Conservation of Nature

**PRBBA:** Puerto Rico Breeding Bird Atlas

**PR-BBS:** Puerto Rico Breeding Bird Survey

**PRDNER:** Puerto Rico Department of Natural and Environmental Resources

**PRGAP:** Puerto Rico Gap Analysis Project

**SOPI:** Puerto Rican Ornithological Society (Sociedad Ornitológica Puertorriqueña, Inc.)

**USFWS:** U.S. Department of the Interior Fish and Wildlife Service



Red-footed Boobies in Monito Island, Puerto Rico. (Photo by J.P. Zegarra)

# Chapter 1: Introduction to the Puerto Rico Breeding Bird Atlas

## BACKGROUND

Breeding bird atlases provide an opportunity for birders at all levels of expertise to contribute to the knowledge of breeding bird distributions, reproductive behavior, and conservation status in different regions of the world. The first breeding bird atlas was published in 1976 for birds in Britain and Ireland (Sharrock 1976), while in the United States, many States have completed breeding bird atlases for their respective jurisdictions, and some States have already published results of second atlas surveys.

Although breeding bird atlases have been developed for much of Europe and North America, no breeding bird atlases have been published previously for tropical regions including the Caribbean. The Puerto Rico Breeding Bird Atlas (PRBBA) is thus the first atlas project conducted in the Caribbean, and as presented here is the most comprehensive database available for breeding birds in Puerto Rico. The PRBBA compiled data from 2004 through 2009 and involved the participation of more than 350 volunteers.

Because breeding bird atlases have been mostly developed for temperate and continental regions, some modifications had to be made to the standard protocols in order to monitor breeding birds in the Caribbean where seasonality, climatic, floristic, and biodiversity

characteristics are very different from those in continental and/or temperate regions.

## *Birds of Puerto Rico*

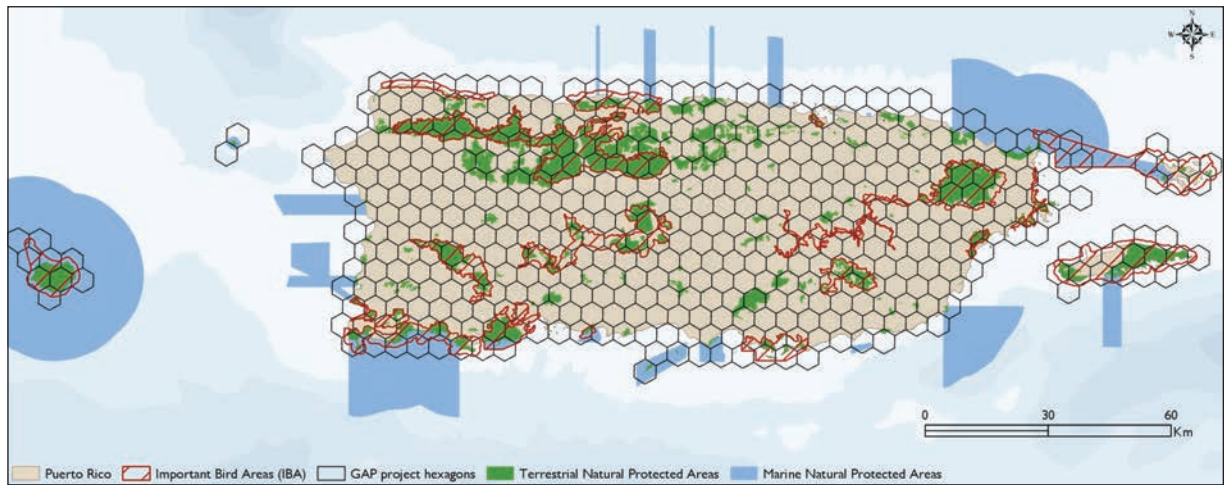
Due to the geographical position of Puerto Rico, the island's avifauna is derived from the Greater and Lesser Antilles, and North America. The heterogeneous mosaic of land cover types in Puerto Rico provides habitat for approximately 354 species (~309 native, ~45 nonnative), of which 133 reproduce on the island (Anadón-Irizarry and others 2009). Furthermore, 34 species of birds are endemic to the Caribbean, and at least 17 are restricted to the archipelago of Puerto Rico representing a Global Biodiversity Hotspot (BirdLife International 2010, Myers and others 2000).

Currently, 20 native bird species included in this atlas are at risk of extinction or threatened in one or more categories according to the International Union for the Conservation of Nature (IUCN), the U.S. Department of the Interior Fish and Wildlife Service (USFWS), and the Puerto Rico Department of Natural and Environmental Resources (PRDNER). Among the most important threats facing the Puerto Rican avifauna are habitat loss and degradation, whereas other important threats include predation and introduced species (Anadón-Irizarry and others 2009).

Important Bird and Biodiversity Areas (IBAs) in Puerto Rico (fig. 1) have been identified in an area of 1973 km<sup>2</sup> of land and sea (Anadón-Irizarry and others 2009). These areas include sites of international significance for biodiversity conservation, particularly endangered, endemic, and migratory birds. About 65 percent (926 km<sup>2</sup>) and 49 percent (267 km<sup>2</sup>) of the IBAs' terrestrial and marine portions, respectively, are within protected areas (fig. 1). This information plus summarized reports, published literature, and other sources of information have been used for developing avian conservation plans for the island (Nytch and others 2015).

## *Puerto Rico's Physical, Ecological, and Landscape Characteristics*

Puerto Rico occupies 8937 km<sup>2</sup> and includes three inhabited islands (the main island, Vieques, and Culebra), as well as several uninhabited islands, islets, and cays (fig. 2). It has a tropical climate, with a mean annual precipitation ranging between 700 and 4600 mm (fig. 3) and mean annual temperatures that range between 19.4 and 29.7 °C (Daly and others 2003). The Luquillo Mountains within El Yunque National Forest (also known as the Luquillo Experimental Forest) in northeastern Puerto Rico receive the highest annual rainfall and hence contain the only large



**Figure 1**—Important Bird and Biodiversity Areas (Anadón-Irizarry and others 2009) (diagonal red stripes) in relation to terrestrial and marine protected areas (in green and blue, respectively) on Puerto Rico and satellite islands (PACAT 2018).



**Figure 2**—Puerto Rico, including the main island and satellite islands, within the Caribbean Archipelago.

tracts of rain forest on the island. In contrast, southern Puerto Rico and the satellite islands of Vieques, Culebra, and Mona are dominated by dry forest due to low annual precipitation and high average temperatures. The complex topography of Puerto Rico includes coastal plains, cliffs, hills, and mountains up to 1300 m in elevation (fig. 4).

Six ecological life zones (ELZ or Holdridge life zones) have

been identified in Puerto Rico including: the subtropical dry forest, subtropical moist forest, subtropical wet forest, subtropical lower montane wet forest, subtropical rain forest, and subtropical lower montane rain forest (Ewel and Whitmore 1973). The ELZ classification map (fig. 5) provides information about vegetation based on climatic, latitudinal, and elevation features (Ewel and Whitmore 1973).

The most recent land cover map available for Puerto Rico classifies 56 percent of the island as upland forest, 9 percent as impervious surface, 8 percent as scrub or shrubland, 6 percent as pasture and hay, and 5 percent as open water. Other less abundant classes include grassland (3 percent), cultivated crops (3 percent), developed and open space (3 percent), and estuarine and palustrine forested wetlands (1 and 2 percent,

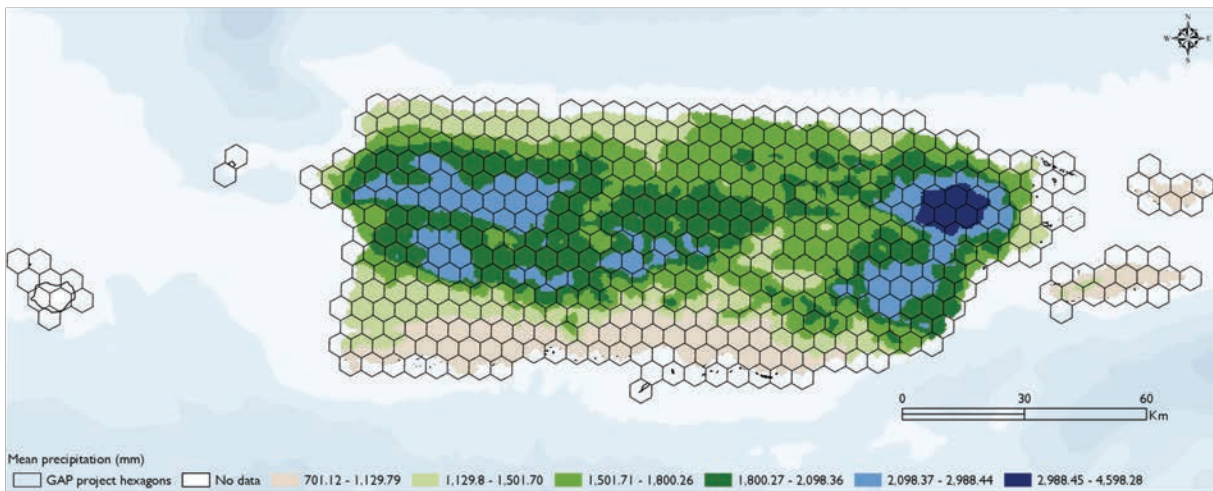


Figure 3—Mean annual precipitation of Puerto Rico (in mm) (Daly and others 2003).

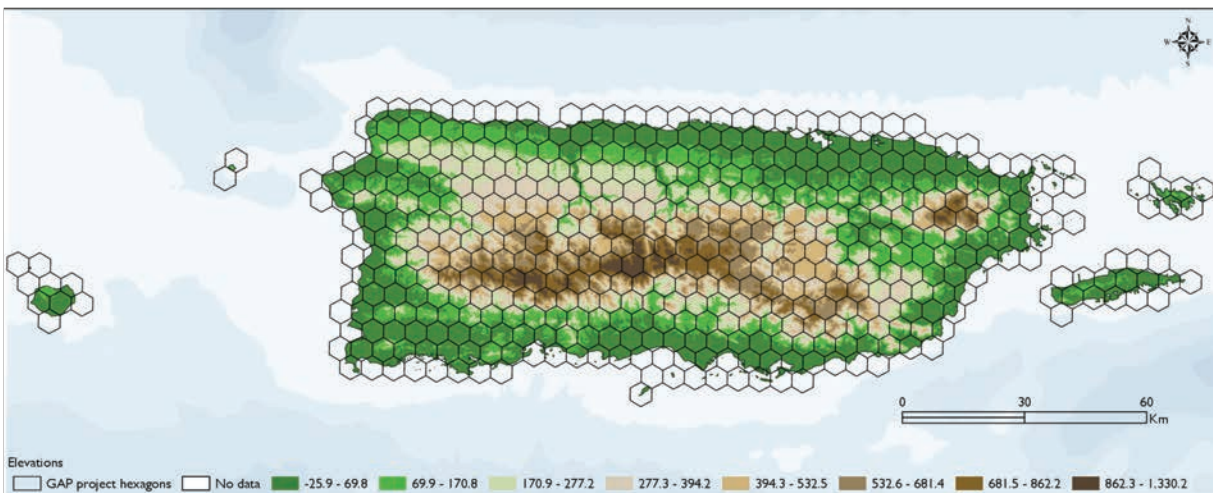


Figure 4—Elevation of Puerto Rico (in m above mean sea level) (USGS 2019).

respectively), among others (fig. 6, NOAA Office for Coastal Management 2010). The mature forest is mostly distributed in the mountains and at higher elevations, whereas the lowlands are characterized by patches of grasslands, shrublands, wetlands, and younger forests embedded in an urbanized landscape (Helmer and others 2008, Kennaway and Helmer 2007, Parés-Ramos and others 2008).

### Previous Breeding Bird Studies

The Puerto Rico Breeding Bird Survey (PR-BBS) was the first systematic survey of breeding birds on Puerto Rico (Pardiek and Peterjohn 1997, 2005). It was initiated in 1997 as a program to monitor the population status and trends of the island's birds, recognizing that only approximately 13 percent of the island's bird species benefited from island-wide monitoring

programs (Pardiek and Peterjohn 2005). Prior to the PR-BBS, monitoring focused primarily on game birds (e.g., Rivera-Milán 1993) and threatened or endangered species (e.g., Snyder and others 1987), while the majority of species were not monitored on the island. The PR-BBS is similar to the Bird Breeding Surveys (BBS) of the United States and England (Peterjohn 1994). The PR-BBS, which occurs between

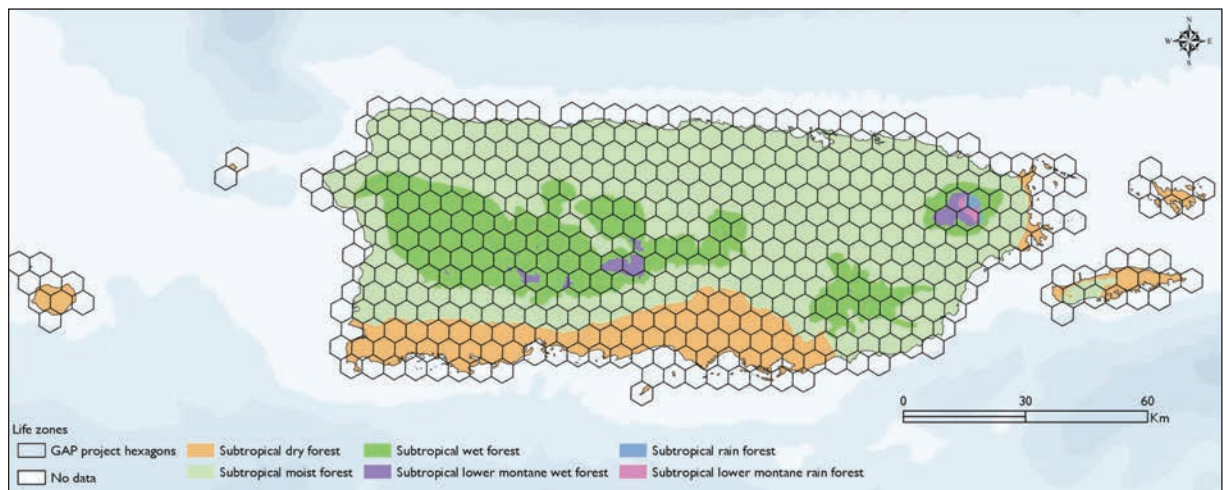


Figure 5—The six ecological life zones identified in Puerto Rico (Ewel and Whitmore 1973).

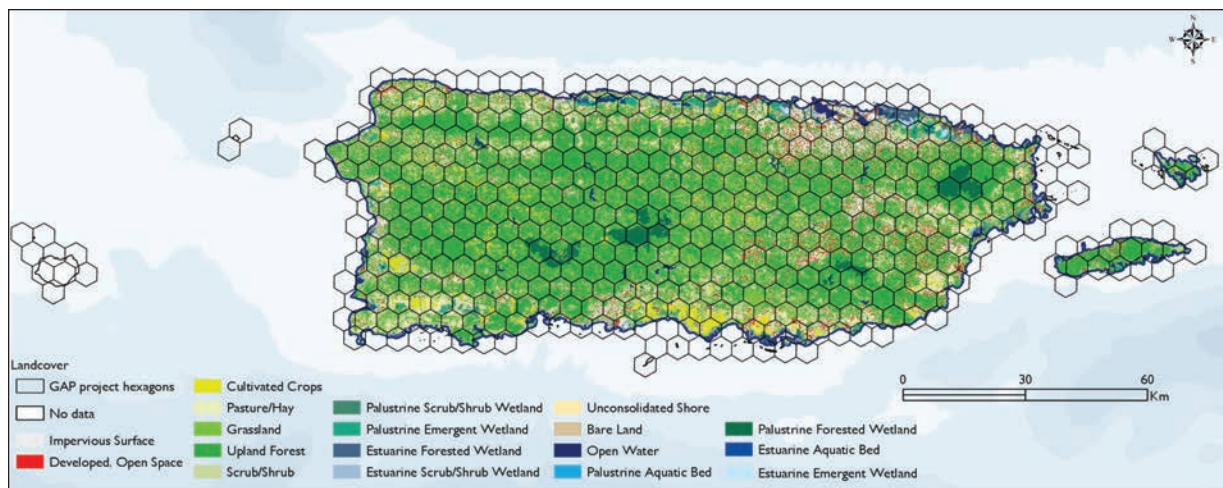


Figure 6—Puerto Rico land cover (NOAA Office for Coastal Management 2010).

15 April and 15 May, involves point counts along 44 routes distributed randomly across the island. Each route, visited once per year, consists of 8-km sections of road where an observer conducts 5-minute point counts every 0.8 km and records every bird heard or seen within a 400-m radius. Routes were classified into the Holdridge life zones (Ewel and Whitmore 1973), and those routes crossing a life zone boundary were assigned to the life zone with the majority of the route path. For analyses by Pardiek and Peterjohn (2005), the wettest life zones, because of their limited area, were combined, thereby leaving just three life zones (subtropical dry forest, subtropical moist forest, and subtropical wet forest). Although direct comparisons between the results of the PR-BBS (Pardiek and Peterjohn 2005) and the PRBBA are difficult given different objectives, survey

years, time periods of surveys, and methodologies, overall distribution results are similar for most species as shown in the individual species accounts of this atlas.

**Objectives of this Atlas**

The objectives of the PRBBA are to:

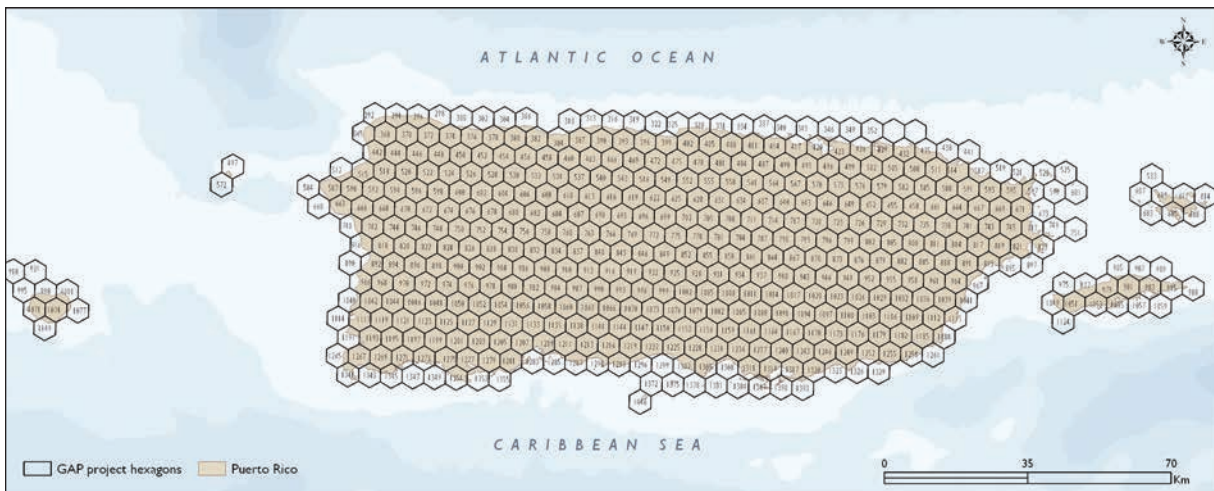
- Collect and summarize information on the timing of breeding and the geographic distribution of breeding birds on Puerto Rico and its associated satellite islands and cays
- Summarize breeding distribution and reproduction of Puerto Rico’s birds to serve as a baseline for future comparative studies of the island’s avifauna
- Provide information for conservation planning and development

**METHODS**

**Hexagons**

A hexagon grid was developed by the Puerto Rico Gap Analysis Project (PRGAP) for mapping the island’s biological diversity (Gould and others 2008).

Puerto Rico was divided into 479 individual hexagons with 309 occurring only over land, 160 over coastal areas, and 10 over open marine areas with small reefs and cays (fig. 7). Each hexagon covers an area of 24 km<sup>2</sup>, and the grid was superimposed on a 7.5-minute topographic map of the U.S. Department of the Interior Geological Survey (USGS). In this atlas, the data collected in each hexagon were used to generate a map of species richness and distribution for individual bird species.



**Figure 7**—Grid of 479 hexagons covering mainland Puerto Rico, Vieques, Culebra, Desecheo, and Mona islands (Gould and others 2008).

## *Bird Surveys*

Bird surveys were conducted throughout the year but were concentrated between February and July when many species were previously known to breed (Biaggi 1997, Reagan and Waide 1996, Wetmore 1916). Most nesting activity in Puerto Rico ends by July and August when most terrestrial species are molting (replacing feathers), an energetically demanding activity, which rarely coincides with breeding. In addition, most breeding is completed by hurricane season (July to November). Bird surveys were conducted during morning hours from sunrise to noon; surveys for nocturnal birds were conducted at various times between sunset and sunrise.

### **Safe Dates (Adaptation for the Tropics)**

Breeding bird atlases in the temperate zone use species-specific safe dates, which identify the time period (i.e., dates) in which breeding of a species is expected to occur and the likelihood of documenting breeding in a location is highest. The safe dates are used to prevent observers from searching in grid cells or hexagons during time periods when breeding is unlikely to occur. In general, most temperate zone bird species do not breed in the winter months; thus, safe dates for these temperate zone species do not include the winter months, and atlas fieldwork for these species is curtailed in the winter.

The situation is very different in the subtropics and tropics where breeding can potentially

occur throughout the entire year and breeding biology of many species is poorly known relative to the temperate zone. Therefore, for the PRBBA, the standard safe date protocol was modified to capture the entire breeding season. Safe dates were assigned to those species whose juveniles and/or adults move away from their natal or reproductive sites (e.g., some waterfowl and shorebirds) and to resident populations that emigrate after nesting and are subsequently replaced by migrant individuals of the same species that arrive in Puerto Rico from elsewhere, especially between August and January (e.g., Antillean Nighthawk, Black-whiskered Vireo; see app. B for scientific and common names).

### **Breeding Codes**

In Puerto Rico, 24 breeding codes were used to describe avian behavior during the breeding season (table 1). These codes were modified from the breeding codes developed by eBird, an online program launched in 2002 by the Cornell Lab of Ornithology and the National Audubon Society for compiling bird observations in real time throughout the world (<http://ebird.org>).

In the PRBBA, the field evidence for breeding of a species in a hexagon was classified into one of three categories based on the strength of the evidence supporting reproduction, which ranged in increasing likelihood from possible, probable, and confirmed. A fourth category, observed, indicated that the

species was present in a hexagon, but there was no evidence of breeding. Most analyses of breeding distribution and timing of breeding in the PRBBA use the combined categories of possible, probable, and confirmed, as they provide at least some indication of breeding.

### ***Breeding Bird Data Preparation, Processing, and Analysis***

Bird survey data were entered into Microsoft® Excel® and were organized and edited for consistency. Pivot tables were then generated to extract information for individual species. All maps were produced using ArcGIS 10.5.1. Species distribution maps for individual species accounts were created using all breeding codes, while analyses that related breeding evidence with ELZ and by month were created using the highest breeding codes (confirmed, probable, and possible). Breeding evidence (highest breeding code by hexagon) by ELZ was quantified by hexagon, whereas number of records by hexagon and by month (highest breeding code by hexagon by month) were used to plot breeding activity across the year for individual species.

Hexagons with evidence of breeding (confirmed, probable, and possible) were related to the land portion of the 2016 protected areas inventory (CLCC 2016). This analysis provided a very general understanding of the amount of the breeding habitat that occurs within



**Table 1**—Breeding categories and codes (24) used in the Puerto Rico Breeding Bird Atlas for describing bird behavior during the breeding season

Category <sup>a</sup> (code)	Description
<b>Observed (OB)</b>	
(O)	Observed during breeding season
(J)	Independent juvenile individual
(M)	Migrant
<b>Possible (PO)</b>	
(X)	Species seen or heard within safe dates
(H)	Singing males within safe dates
<b>Probable (PR)</b>	
(B)	Nest building (most songbirds) or excavation (e.g., woodpeckers)
(P)	Pair during safe dates
(T)	Evidence of territorial behavior (male singing in the same place in consecutive weeks, aggression among males)
(C)	Behavior associated with courting, such as copulation or feeding a mate (Note that some species copulate or have courtship outside the nesting area, which is why this code is not included under confirmed.)
(A)	Agitated behavior of adults not provoked by humans
(7)	Seven or more pairs seen in a day, within safe dates
<b>Confirmed (CO)</b>	
(NY)	Nest with young seen or heard
(NE)	Nest with eggs
(ON)	Occupied nest presumed by parent seen entering and remaining, exchanging incubation duties, etc. (cannot see content)
(FL)	Recently fledged or downy young observed while still dependent upon adults
(CN)	Adult carrying material for the construction of a nest without observing the nest
(NB)	Nest building (except bananaquits and woodpeckers)
(IP)	Adult in an incubation position but cannot determine if there are chicks or eggs only
(BG)	Chicks heard begging for food without visual confirmation
(CF)	Adult that regularly carries food for courtship or other purposes seen carrying food for young (code should not be used for raptors, terns, and certain other species)
(UN)	Inactive nest or eggshells found [Do not use term “abandoned” nest, because a bird may abandon a nest after predator disturbance, but before bird produced egg(s).]
(DD)	Distraction display, including feigning injury
(CO)	Copulation by a resident species
(FS)	Adult carrying fecal sac

<sup>a</sup> Sequence of categories is from lowest to highest probability of breeding.

protected areas. Since this analysis was conducted at the hexagon scale, the results are useful for comparison among species, but are not intended to represent the actual breeding habitat protected.

### *Limitation and Potential Biases*

As in any study based on field data collection, the results and hence the species breeding distribution maps in the PRBBA are the result of the methodology, scale, survey effort, and observers' abilities to detect elusive species. In addition, observers likely searched more thoroughly in coastal and lowland areas, which are easily accessible in contrast to the interior mountains and offshore areas. Besides topography and distance, the number of records by hexagon may also be affected by land tenure since permits are required to conduct surveys on private property but not on most public lands (e.g., natural reserves and State forests) or public areas along roads. Another limitation is the scale of analysis, with a minimum mapping unit of 24 km<sup>2</sup> that can be too coarse for a species that uses very restricted habitats within a hexagon, and hence the hexagon approach overestimates the actual size of the habitat used for a species to reproduce. Our analyses of the timing of breeding by month for each species did not relate breeding times to geographic locations on the island, only to ELZ. For some species (e.g., Ruddy Duck, White-crowned Pigeon), breeding may not be synchronized between the southwest and northeast portions

of Puerto Rico (H. Raffaele, personal communication 2019) and therefore our hexagon-based analyses may have missed geographic differences in breeding seasons. In addition, our analyses of timing of breeding were based on data pooled for several years, and we did not attempt to compare year-to-year differences in breeding seasons, which for some species may vary among years (e.g., seabirds; H. Raffaele, personal communication 2019).

## **ATLAS RESULTS AND DISCUSSION**

Overall, the atlas includes breeding data for 130 species of birds, representing 98 percent of the total bird species known to reproduce in Puerto Rico. The species most frequently reported breeding were the Gray Kingbird, Bananaquit, White-winged Dove, Northern Mockingbird, and Zenaida Dove, all native resident species (table 2). The most frequently reported

**Table 2**—Top five most frequently reported species by category and the percentage of hexagons in which breeding evidence was found

<b>Most frequently reported species</b>	<b>Percentage of hexagons (N = 479) with evidence of breeding</b>
<b>Native resident species</b>	
Gray Kingbird	91
Bananaquit	87
White-winged Dove	86
Northern Mockingbird	85
Zenaida Dove	85
<b>Endemic species</b>	
Puerto Rican Woodpecker	81
Puerto Rican Spindalis	69
Puerto Rican Tody	64
Puerto Rican Flycatcher	63
Puerto Rican Owl	59
<b>Nonnative species</b>	
Rock Pigeon	72
House Sparrow	64
Scaly-breasted Munia	52
Orange-cheeked Waxbill	49
Bronze Mannikin	44



Bananaquits are the second most frequently reported species breeding in Puerto Rico. (Photo by Marconi Campos-Cerqueira)

breeding of native resident, endemic, and nonnative species is also shown in table 2.

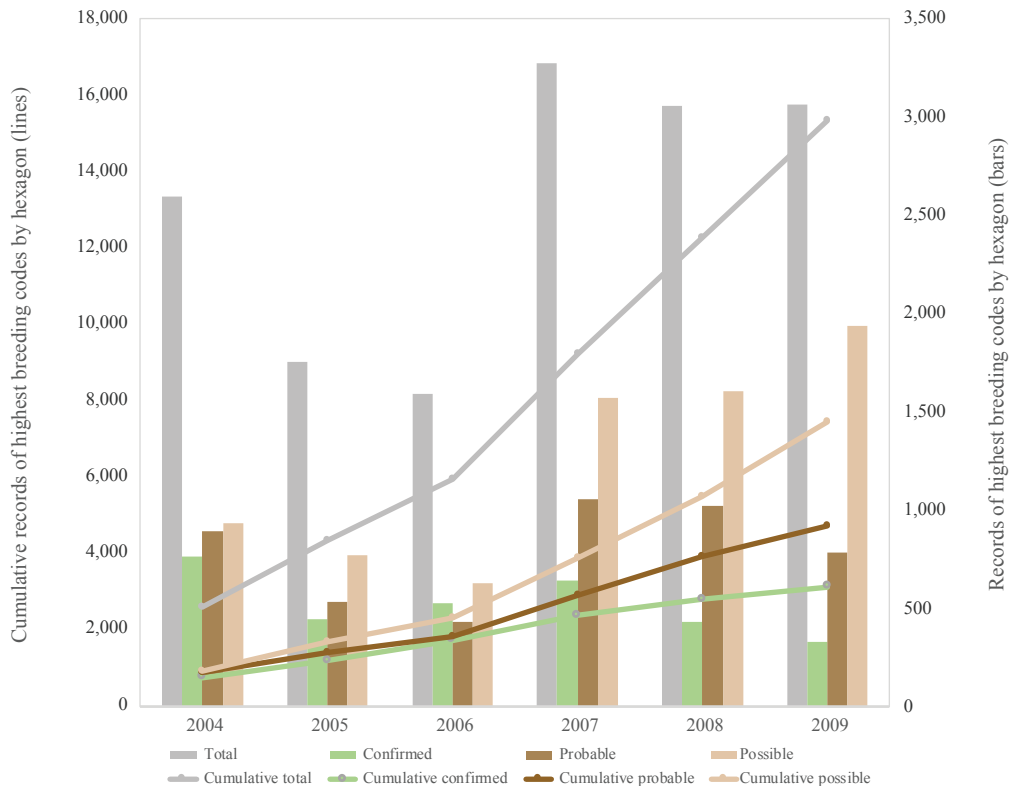
The atlas database contains about 45,500 bird observations from which 32,364 records (i.e., an observation with date, location, and behavioral code) were extracted for analysis. Eighty-two percent (26,582) of the records correspond to 87 terrestrial species and 18 percent (5,782) to 45 aquatic species. Although the Puerto Rican Parrot

(*Amazona vittata*) and the Black-noddy (*Anous minutus*) were included in the database, these species were not included in this atlas as records for the Puerto Rican Parrot were restricted to the aviary where this species is bred in captivity, while there was only one record for the Black-noddy.

The highest breeding code (possible, probable, confirmed) records accounted for 91 percent (29,509) of all records; the

lowest code (observed) records, which do not provide breeding evidence, accounted for only 9 percent (2,855).

Overall, the cumulative records of the total highest breeding codes calculated by hexagon and by year increased annually (fig. 8). The same pattern was observed for the cumulative confirmed, possible, and probable code records. Over the course of the atlas fieldwork from 2004 through 2009, the



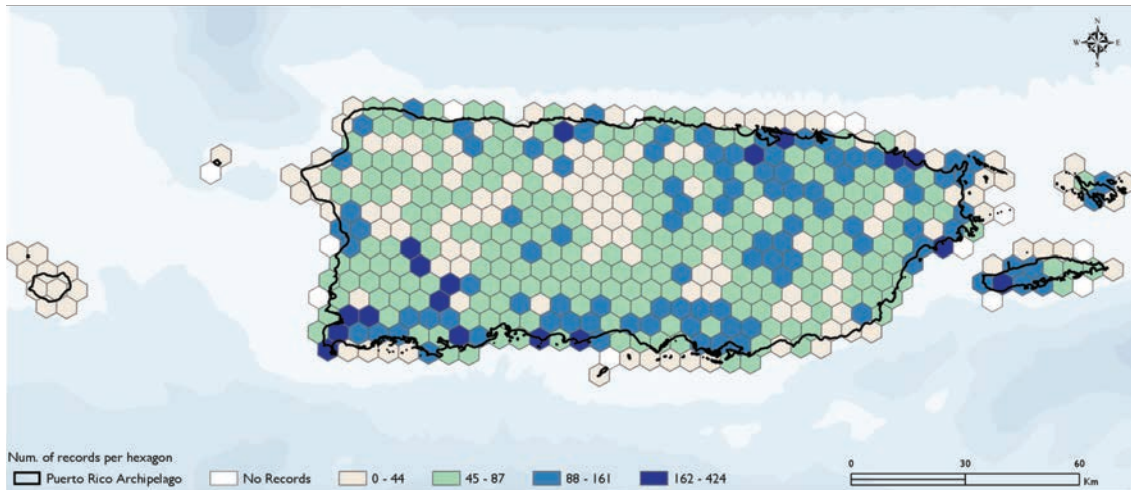
**Figure 8**—Cumulative records and annual total records with highest breeding codes (confirmed, probable, and possible) by hexagon and by year for Puerto Rico and associated satellite islands for the duration of fieldwork for the atlas project.

strength of breeding evidence for species in a hexagon was continually upgraded, indicating an increase in the effort and quality of fieldwork as observers worked to obtain better or higher ranked breeding evidence for a hexagon (fig. 8). It is evident that the point of diminishing returns was not reached by the final year (2009), suggesting that if the project had continued for an additional year at the same

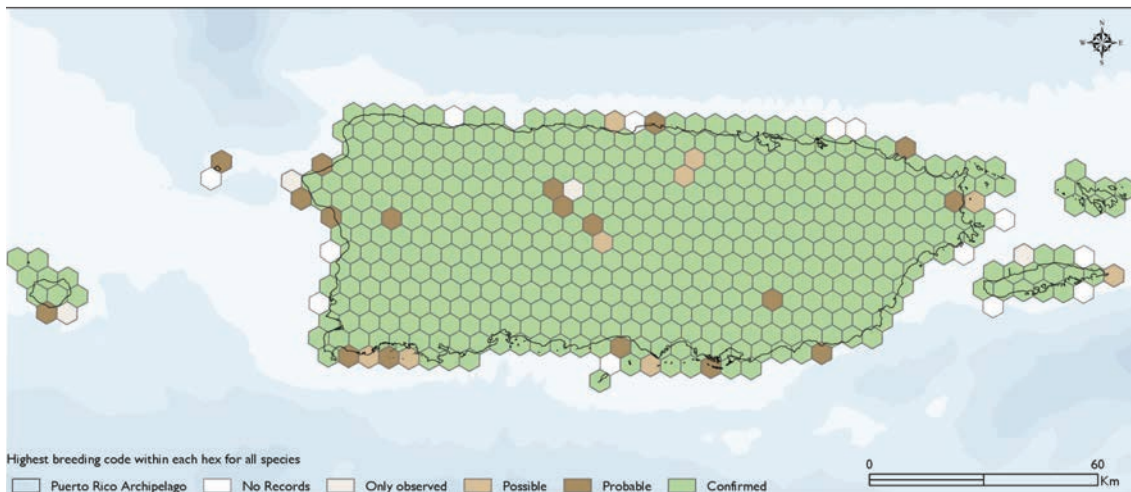
level of effort, new breeding records would have been reported for some of the species and hexagons.

The number of records by hexagon (fig. 9) ranged from 0 to 424 (mean = 68). The hexagons with the highest number of records (dark blue) occurred in the lowlands, close to metropolitan San Juan, in Vieques, and in the southwest

of the main island, whereas the hexagons in the mountains or distant from settled areas (e.g., Mona) had the lowest number of records (fig. 9). When species were analyzed together by hexagon, there was evidence of breeding with the highest breeding code (confirmed) for the majority of the hexagons (fig. 10). The map of species richness by hexagon shows a



**Figure 9**—Number of records for all breeding codes (confirmed, probable, possible, observed) by hexagon.



**Figure 10**—Highest breeding code by hexagon and for all species analyzed together.

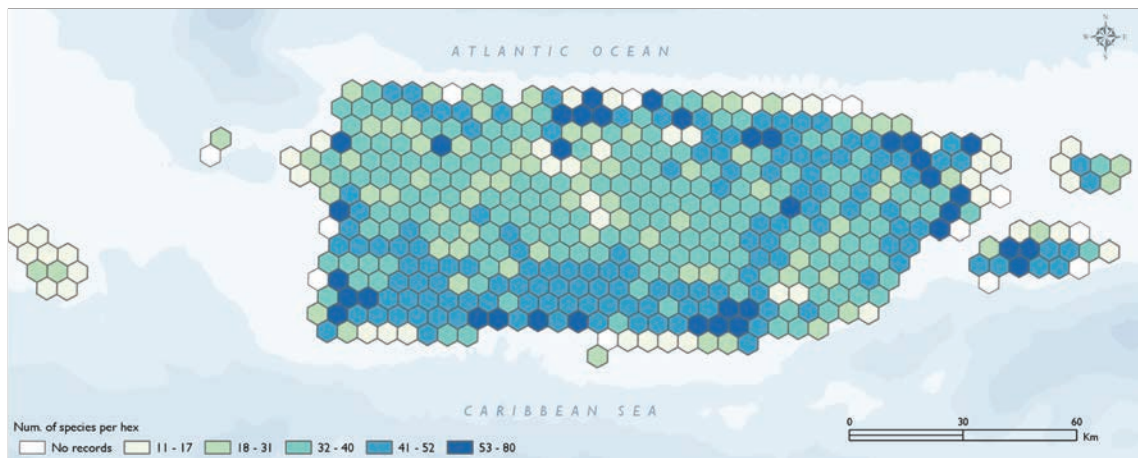
combination of search effort (i.e., number of visits) with the actual richness within the hexagon (fig. 11). For example, hexagons with the highest number of species detected (53–80 species) mostly occur in the lowlands and within protected areas located in the coast. By contrast, hexagons with fewer species detected (11–17 species) occur in remote or in less accessible areas (e.g., Mona, Desecheo).

Breeding evidence was reported for between zero to 67 species at the level of a single hexagon. Those hexagons with the highest

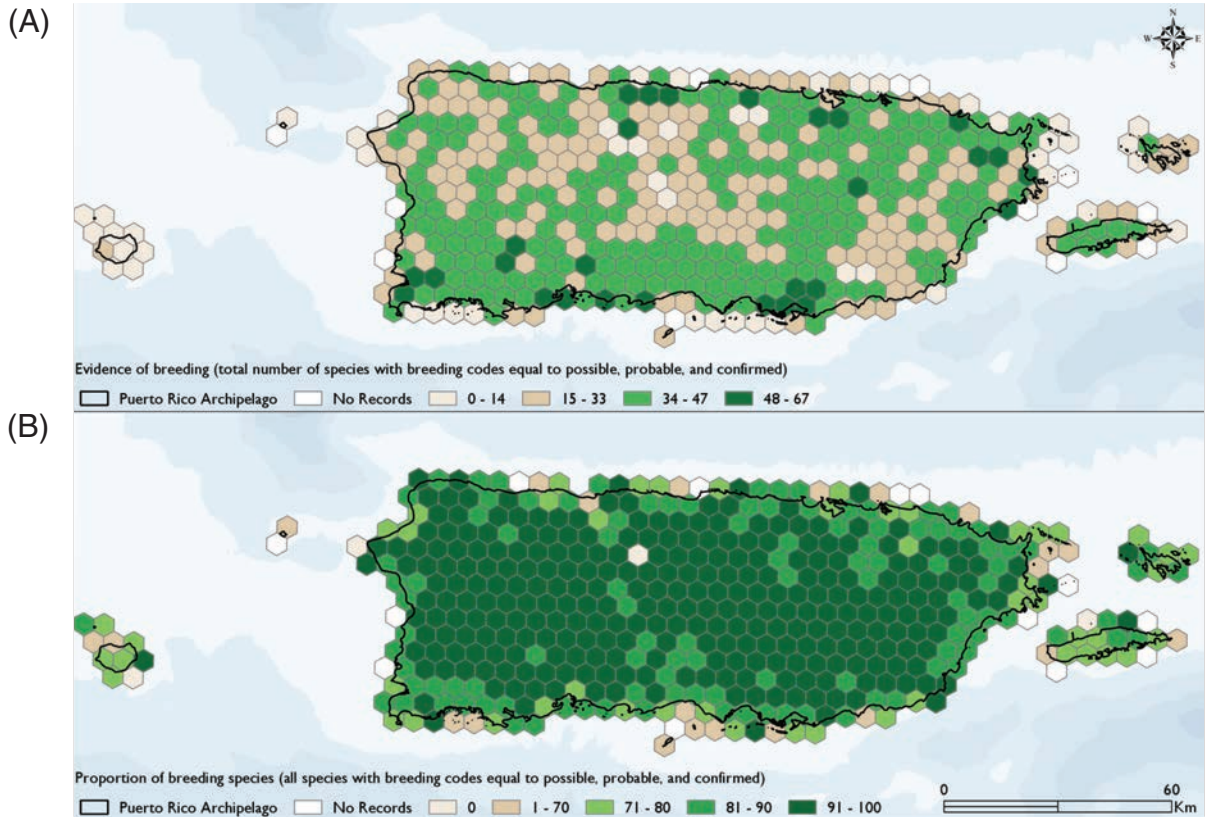
numbers of species reported as breeding occurred in the lowlands and coastal areas in the north, northeast, and south of Puerto Rico (fig. 12A). Nearly all hexagons had a high proportion (>80 percent) of species reported to be breeding relative to the total of all species (fig. 12B). When each breeding code was summarized individually (fig. 13), the category “possible” had the highest percentage representation among species within individual hexagons (fig. 13A), the category “probable” was intermediate in percentage

representation among species within individual hexagons (fig. 13B), and the category “confirmed” had low percentage representation among species within individual hexagons (fig. 13C).

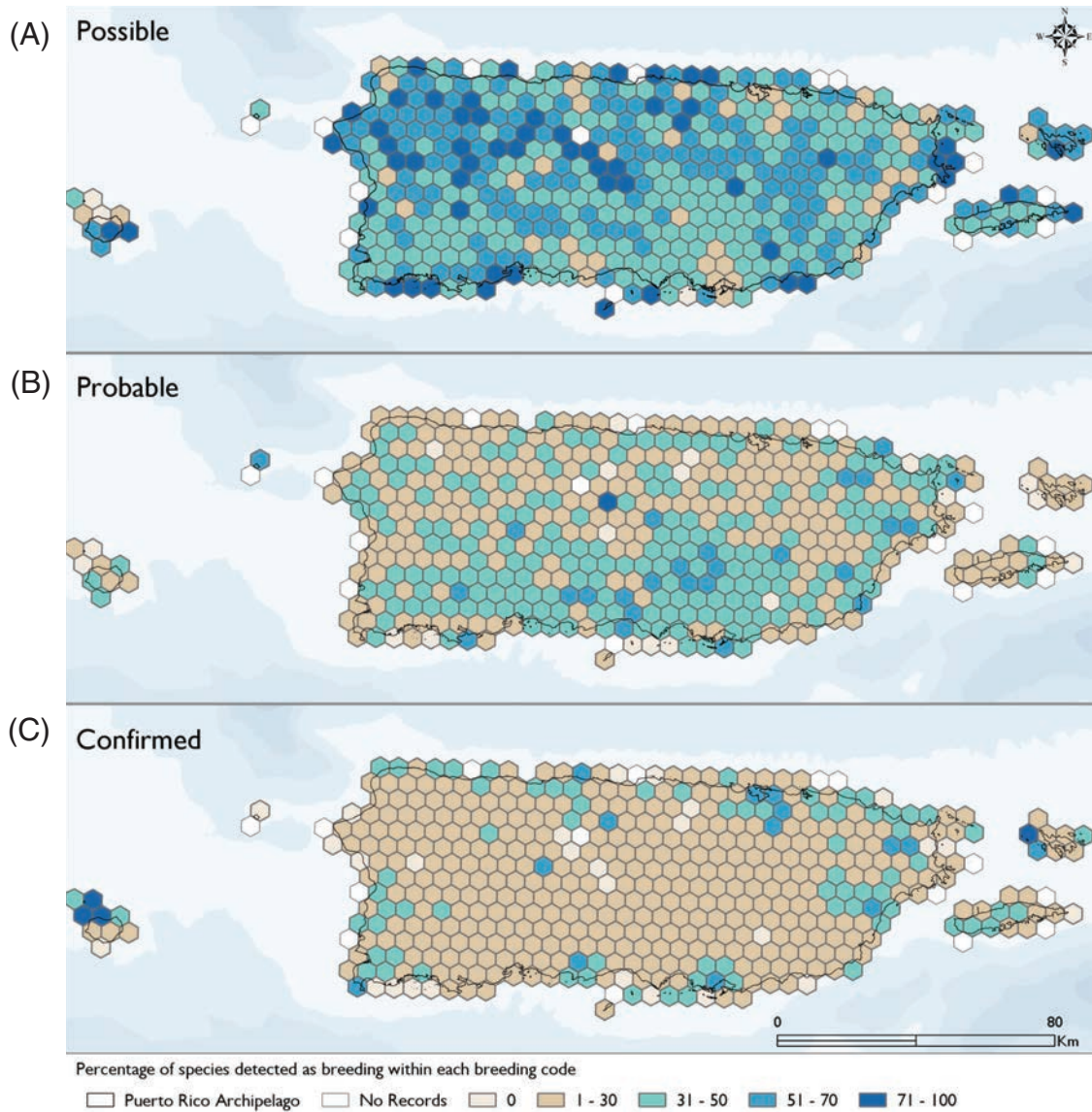
Atlas results indicate that the breeding season for most species peaks from March through June (fig. 14A). However, breeding has also been confirmed outside this period, specifically for several aquatic species (e.g., some egrets/herons) which begin to breed in December (fig. 14B).



**Figure 11**—Species richness by hexagon and for all breeding codes.

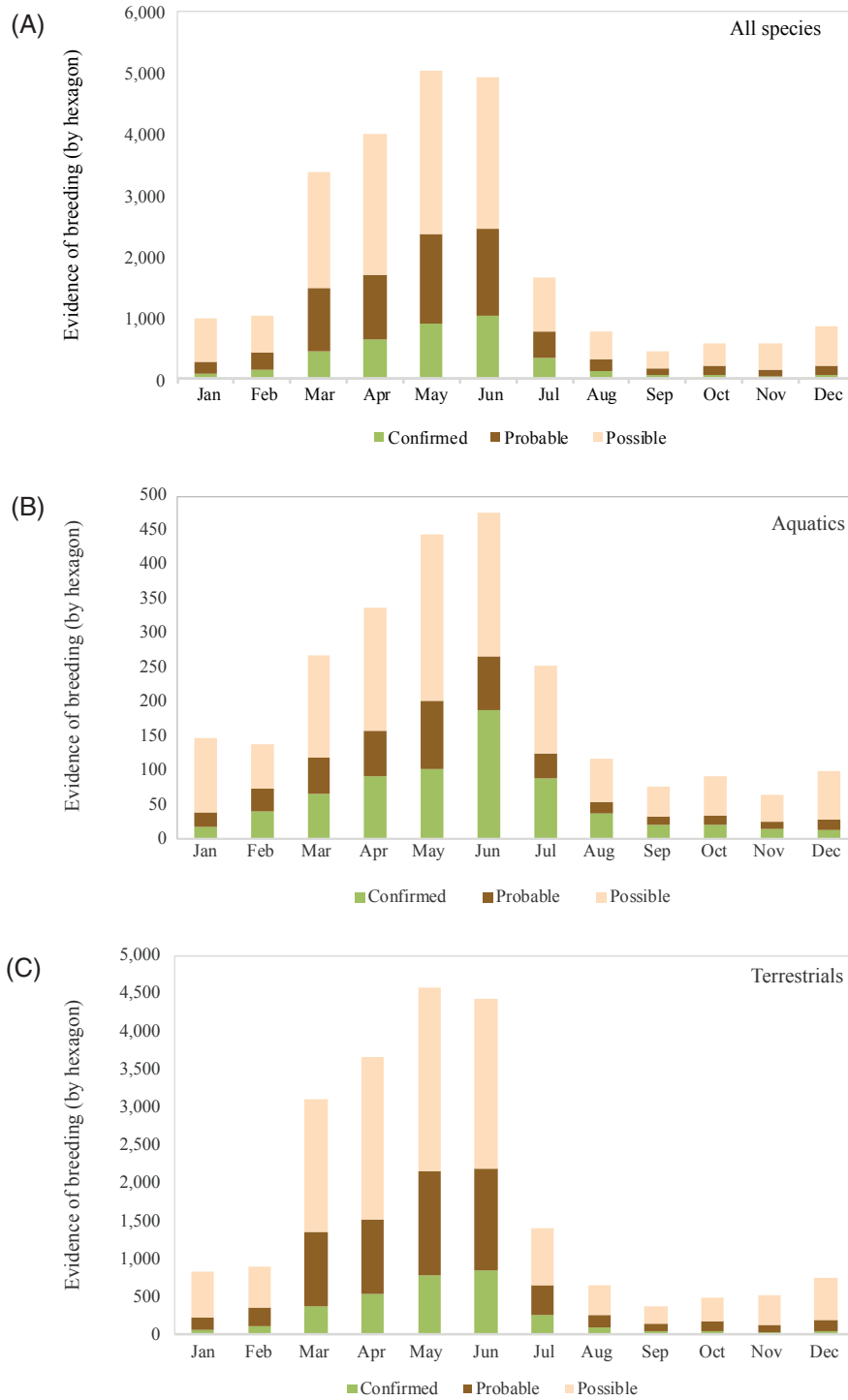


**Figure 12**—(A) Number of species with evidence of breeding (possible, probable, or confirmed) by hexagon and (B) the proportion (percentage) of breeding species detected in a hexagon.



**Figure 13**—Percentage of species in a hexagon with highest breeding code of A) possible, (B) probable, or (C) confirmed.





**Figure 14**—Number of breeding records by hexagon and month for (A) all species, (B) aquatic species (includes shoreline species, such as herons/egrets and shorebirds), and (C) terrestrial species observed in Puerto Rico and associated satellite islands and cays during the Puerto Rico Breeding Bird Atlas project (2004–2009).

## *Chapter 2: Habitat Changes and Avifaunal Change in Puerto Rico*

Puerto Rico was once covered with closed-canopy forests (Wadsworth 1950) but has undergone diverse and relatively rapid land cover changes since the arrival of the Europeans in the 15th century. Following European colonization, large-scale forest conversion to agriculture reduced the cover of natural forest to a low of about 6 percent of the island's land area in the 1940s (Franco and others 1997). Despite this extensive deforestation, avian extinctions or extirpations during this period are believed to have been ameliorated by the availability of remnant forest patches in the central mountain range and shaded coffee plantations (estimated at 7 percent land cover; Brash 1987), which provided habitat for forest birds (Brash 1987, Gleffe and others 2006, Irizarry and others 2018). By the 1950s, however, agricultural lands were abandoned as rural people responded to increased industrialization by migrating to work in factories in urban areas on the main island and in the continental United States. With agricultural abandonment and decrease in tree cutting for charcoal, forest cover expanded so that, by 1990, forest cover had increased to ~32 to 42 percent

of the island's area (Birdsey and Weaver 1987, Franco and others 1997, Helmer and others 2002). While industrialization and associated services increased, Puerto Rico became more urbanized, and farmlands continued to be abandoned (López and others 2001). By 2003, 57 percent of the island was covered in forest, mostly second growth (Brandeis and others 2007).

Puerto Rico's regenerating second-growth forests often have a mix of native and nonnative tree species. Given this mixture at any stage of succession, these have been recognized as new or novel forests (China and Helmer 2003, Hobbs and others 2006). Such novel forests attract avian and bat species that disperse seeds including those of native tree species, which may establish beneath the nonnative species and ultimately replace them on some sites (Abelleira Martínez 2010). Although the suitability of novel forests to provide quality breeding habitat for birds is poorly known, some evidence suggests that birds use these novel forests, at least for foraging. For example, Beltrán and Wunderle, Jr. (2013) showed that the suitability of novel forests for some insectivorous

birds was related to the specific dominant tree species in the forest and the palatability of its leaves to herbivorous insects. In their study, nonnative tree species with an abundance of insect prey were favored by birds for foraging in contrast to other tree species, some with few insects, which were avoided. These results were consistent with previous studies on avian insectivore preferences for foraging in tree species with the greatest abundance of their arthropod prey, which in turn are associated with a tree's foliage nutrition and palatability. Therefore, some nonnative tree species with highly nutritious and palatable leaves may host an abundance of herbivorous insects, which in turn attract insectivorous birds. The addition of fruit-bearing plants can further increase the attractiveness of novel habitats (Wunderle, Jr. 1997) as demonstrated in shade coffee plantations with native fruit-bearing plants (Carlo and others 2004).

Despite increased forest cover on abandoned agricultural lands, mostly in Puerto Rico's uplands, regenerating forests continue to face development and urbanization pressure, particularly in the lowlands

(Helmer 2004), and even in the vicinity of protected areas (Castro-Prieto and others 2017). Riparian, alluvial, and freshwater swamp forests (e.g., dragonsblood tree [*Pterocarpus officinalis*]) once common in the lowlands have been greatly reduced in extent (Lugo 2005), although some exist in small protected fragments. Mangrove cover has also declined as a result of agriculture, urbanization, changes in hydrology, sedimentation, removal of trees, and filling of mangrove wetlands (Martinuzzi and others 2009). Nevertheless, coastal development continues as does the threat to mangroves (Martinuzzi and others 2009).

Many of Puerto Rico's naturally limited freshwater swamps and lagoons have been lost to draining and filling, and degraded due to changes in hydrology resulting in saltwater intrusion, eutrophication, and sedimentation (Yu and others 2019). The loss and degradation of the island's freshwater bodies have had a negative effect on an estimated 22 bird species (Raffaele 1989a). Aquatic birds in freshwater bodies, such as Cartagena Lagoon, have been further stressed by excessive hunting, egg collecting, and predation by rats (Weaver and Schwagerl 2009). Although protection and management of Cartagena Lagoon and reduced hunting pressure have contributed to the recovery

of many bird populations, the lagoon's avian diversity and abundance are still only a fraction of that documented by Danforth (1926).

The anthropogenic changes in land use and habitat availability affecting Puerto Rico's avifauna also occurred on Vieques (Gemmill 2015) and other neighboring islands. On Vieques, Gemmill documented status changes in some bird species as populations changed in concert with land use changes. For instance, Antillean Mango (see app. B for scientific names) was the most abundant hummingbird species on this island in the early 1900s, when the similar-sized Green-throated Carib arrived on the island. By 1957, however, the mango became rare on this island, as it is today, whereas the carib, formerly absent, is now common. This reversal in abundance of the two species occurred as forest cover was lost, with the forest-dwelling mango declining, perhaps to the advantage of the carib which predominates in the human-disturbed habitats (Gemmill 2015). The Green-throated Carib colonized the main island of Puerto Rico sometime after 1911–1912 and, as results of the Puerto Rico Breeding Bird Atlas (PRBBA) indicate, is spreading west from the east coast where first detected (Raffaele 1989a). Atlas results indicate the Antillean Mango persists throughout the main island.

Habitat change is also believed to be a major factor in the increase in Adelaide's Warbler abundance in its endemic range and expansion to the Virgin Islands. For instance, the warbler has increased in abundance on Vieques since 1989 as land use changed from pastures and agriculture to second-growth forest and scrub (Gemmill 2015). Similarly, on mainland Puerto Rico, the eastward range expansion and increase in abundance of the warbler documented in the atlas corresponds to an increase in second-growth forests on abandoned agricultural lands. Consistent with a recent range expansion are observations during 2012 and 2013 of the endemic warbler for the first time on St. Thomas and St. John, U.S. Virgin Islands (Rune and Conlon 2016). It is unknown whether recent range expansion of Adelaide's Warbler represents movement into new areas or simply a recolonization of areas formerly occupied before deforestation due to sugar cane and other agriculture.

On neighboring islands, the conversion of forests to pastures and grasslands for livestock is believed to have facilitated the "stepping stone" colonization by Cattle Egrets and Shiny Cowbirds from South America through the Lesser Antilles into Vieques, mainland Puerto Rico, and other islands (Arendt 1988, Cruz and others 1985, Post and Wiley

1977a). Colonization by other species from the Lesser Antilles, such as Caribbean Elaenia, Green-throated Carib, and Antillean Crested Hummingbird were likely also aided by these land use changes. White-winged Doves and Mourning Doves from North America are believed to have colonized mainland Puerto Rico, Vieques, and other islands in the past 100 years by using pastures and newly created scrublands and edge habitats on adjoining islands to facilitate inter-island movements (Gemmill 2015, Raffaele 1989b). In a similar fashion, increased human settlements on Caribbean islands undoubtedly facilitated stepping stone colonization by human commensals or synanthropic species such as the House Sparrow, Rock Pigeon, and European Starling, although some of the species may have arrived as stowaways on ships (e.g., House Sparrow; Raffaele 1983, 1989b) or were imported as pets or food sources (e.g., Rock Pigeon).

Anthropogenically derived novel grasslands on Puerto Rico provide habitat for an estimated 20 species of introduced seed-eating finches brought to the island in the pet trade (Raffaele 1983, 1989b), although not all species have successfully naturalized. The finches, originally from Africa and Asia, occur exclusively in the island's novel grasslands (including in settlements and urban areas)

where they feed on both native and introduced grass seeds. Like the introduced finches in novel habitats, introduced parrots, parakeets, cockatoos, and macaws (psittacines) have also become naturalized in novel urban, suburban, and forest habitats on Puerto Rico (Raffaele 1989a, 1989b). More recently, Falcón and Tremblay (2018) report that 29 nonnative psittacine species have been observed in the wild on Puerto Rico, of which 12 species have been found breeding, but most with small populations, which are highly localized. In contrast, however, they found that White-winged Parakeets and Monk Parakeets have greatly expanded their range on Puerto Rico in recent years, which is consistent with atlas results indicating that both species are widespread. Although Falcón and Tremblay (2018) found that populations of Red-masked Parakeet and Orange-fronted Parakeet showed only slight range expansions on the island, the atlas results indicate that both species remain localized near their presumed release sites. Similarly, the introduced Java Sparrow described as limited to the San Juan metropolitan area, especially Old San Juan (Oberle 2018, Raffaele 1989a), remains restricted to that area as also documented in the atlas. Other introduced species such as the Venezuelan Troupial and Eurasian Collared-Dove first documented in the western end

of the island are expanding their range eastward as documented in the species accounts of this atlas. To date, all naturalized nonnative species have been found in human-disturbed habitats—in or near urban, suburban, or rural homes or in novel grasslands or second-growth novel woodlands where they feed on seeds and fruits of native and introduced plants (Acevedo and Restrepo 2008, Raffaele 1989b, Vázquez Plass and Wunderle, Jr. 2013). Nowhere is the habitat segregation of nonnative birds more evident than on the borders of El Yunque National Forest where nonnative parakeets and finches occur around buildings and settlements on the edge of the national forest but rarely ever in the native forest (Wunderle, Jr. and Arendt 2011).

Land use and climate were found by Acevedo and Restrepo (2008) to explain most of the variation in native, endemic, and nonnative terrestrial bird species composition and abundance observed in the Puerto Rico Breeding Bird Survey (PR-BBS). Findings from the PRBBA project were generally consistent with those from the PR-BBS in relation to the important role of land use, although the design of the atlas based on individual hexagons of 24 km<sup>2</sup> was too large a scale to quantify land use at sites where birds were recorded. Both studies showed that despite widespread distribution of some

nonnative species (e.g., Rock Pigeon, House Sparrow, Scaly-breasted Munia; table 2), most occurred in the lowlands of the subtropical dry and subtropical moist forest life zones where human habitat disturbances were greatest (see also Suárez-Rubio and Thomlinson 2009, Vázquez Plass and Wunderle, Jr. 2013). Although some endemic species were geographically widespread on the island (e.g., Puerto Rican Woodpecker, Puerto Rican Spindalis, Puerto Rican Tody; table 2) in both the PRBBA and PR-BBS, most endemics occurred in higher elevation wet forest habitats in contrast to nonnative species, which predominated in the lowlands. Endemic species richness and abundance were also found to be low in urban areas (Vázquez Plass and Wunderle, Jr. 2013), declining as urbanization increases (Suárez-Rubio and Thomlinson 2009). Native resident species showed the widest geographic distribution of any group of species in the atlas (e.g., Gray Kingbird, Bananaquit, White-winged

Dove, Northern Mockingbird, Zenaida Dove; table 2). These native species are recognized by Acevedo and Restrepo (2008) as having potentially benefitted from availability of disturbed or open habitats because they are generalists in habitat use, diet, and nesting requirements. These generalist species are best adapted to cope with future changes in land use and climate in Puerto Rico.

As our review indicates, various studies have identified many of the factors that can limit Puerto Rican bird populations, but few studies have investigated the human dimensions of conservation on the island (but see Vázquez-Plass and Wunderle, Jr. 2010). As emphasized by Herbert Raffaele (personal communication 2019), Puerto Rico's birds will survive only if citizens are committed to the conservation of their birdlife. Yet, little is known of Puerto Rican attitudes toward birds and the trends in these attitudes. If attitudes toward birdlife are not improving on the island, this

lack of progress does not bode well for conservation, especially given all the negative economic and societal challenges faced by the citizens. Despite concerted efforts by nongovernmental organizations such as *Para la Naturaleza*, Puerto Rican Ornithological Society. (SOPD), and others, little is known of school-based and informal efforts to improve local attitudes. Unknown is the portion of the population aware that Puerto Rico has endemic species. Without this awareness, why should island residents take pride in their birds? Little, too, is known regarding the potential for introduction of more nonnative organisms to the island and whether wildlife laws and regulations are adequate and well enforced. These and other issues related to human dimensions of conservation management and policy need to be addressed by future research to provide guidance for conservation of Puerto Rico's birdlife.



Endemic species richness and abundance tend to decrease as urbanization increases. The Puerto Rican Nightjar is an example of this. (Photo by Gloria Archilla)

## *Chapter 3: Climate Change Implications for Birds Breeding on Puerto Rico*

Climate change in the Caribbean is expected to include warmer temperatures, rising sea levels, and increases in severe weather events including increasing likelihood of more powerful hurricanes (Comarazamy and González 2011, Emanuel 2005, Gould and others 2018, Hayhoe 2013, Keelings and Hernández Ayala 2019, Knutson and others 2015, Neelin and others 2006, van der Molen and others 2010). Historically, climate changes over the last 10,000 years have included drier conditions at the end of the last deglaciation (10,000–7,000 years BP), wetter conditions in the early Holocene persisting over 4,000 years, and a return to drier conditions in the late Holocene, with changes correlated with orbitally induced variations in seasonal insolation (Hodell and others 1991). However, the current climate is projected to be increasingly variable as levels of greenhouse gases in the atmosphere increase, with much of the planet departing from historical climate analogs by midcentury (Mora and others 2013).

The cumulative effects of rising seas, increasing temperatures, and decreasing rainfall will have significant effects on two components of Puerto Rico's

landscape important to birds: (1) the rich matrix of coastal habitats and (2) wetter montane habitats. Coastal habitats include rocky and sandy shorelines, mangroves and herbaceous wetlands, forested uplands on coastal hills, and developed lands (Gould and others 2008). The high diversity of coastal habitats makes these local hotspots of bird diversity. Sea-level rise may reduce the “green” components of the landscape as infrastructure outcompetes open space in the highly populated coastal plain (Gould and others 2018, Martinuzzi and others 2008). Cloud forests in the higher elevations of the Luquillo and Central Mountains harbor high numbers of endemic plant and animal species (González and others 2013, Gould and others 2006). Modeling efforts looking at precipitation (Bhardwaj and others 2018, Bowden and others 2018, Henareh Khalyani and others 2016), relative humidity (Helmer and others 2019), and cloudiness (Van Beusekom and others 2017) all indicate potential decrease in extent of this important montane habitat.

As global temperatures increase, birds may adapt by shifting their distributional ranges, especially on mountains where

they may move upward in elevation in an effort to remain in their preferred thermal/habitat niche. Range shifts up mountains in association with rising temperatures have been documented in various organisms (Chen and others 2011). Increasing numbers of studies, however, have discovered different response patterns including absence of range shifts or downward range shifts associated with warming, reflecting biotic interactions, stochastic population fluctuations, and land use changes (Deluca and King 2016, Rowe and others 2015, Tingley and others 2012). In Puerto Rico, Campos-Cerqueira and others (2017) evaluated the montane bird community of the Luquillo Mountains in response to an average temperature increase on the island of 2.24 °C from 1950 to 2014 (Méndez-Tejeda 2017). To test for elevation shifts, Campos-Cerqueira and others (2017) compared the distribution of 21 bird species in 1998 and 2015 using occupancy models and found that most species did not show range limit shifts. However, eight (38 percent) of the species showed significant elevation changes in their range limits, which were mostly upward, a pattern more common

for the species with upper or higher elevation range limits (Puerto Rican Lizard-Cuckoo, Black-whiskered Vireo, Puerto Rican Tanager) than those with lower elevation range limits (Antillean Euphonia). In contrast, both the Pearly-eyed Thrasher and Zenaida Dove contracted their ranges by reducing their upper elevation range limit during the period of the study. Other species expanded their ranges by increasing the upper and decreasing the lower elevation range limits (Ruddy Quail-Dove; American Redstart [*Setophaga ruticilla*], a winter resident). The authors concluded that the elevation range limit changes associated with increased average temperature were often species-specific, suggesting that predicting future range shifts along elevation gradients associated with climate change in Puerto Rico will be challenging without knowledge of species-specific habitat requirements.

The frequency of droughts and inter-annual variation in rainfall is expected to increase with warming in the Caribbean (Comarazamy and González 2011, Neelin and others 2006, van der Molen and others 2010). Changes in seasonal patterns and increases in extreme precipitation events are expected to negatively impact some bird species on Puerto Rico. For instance, rainfall extremes have been found to negatively affect

critically endangered Puerto Rican Parrots in the Luquillo Mountains, where annual survival of breeding parrots was lowest in the driest and wettest years (Beissinger and others 2008). Intense rainfall in the first 3 days after fledging can reduce Puerto Rican Parrot fledgling survival (White and others 2014). Droughts in the subtropical dry forest life zone can affect bird populations as documented in long-term mist-netting studies in the Guánica dry forest where drought-associated population declines have occurred in both winter resident migrants (Faaborg and others 2013) and resident birds (Faaborg 1982, Faaborg and others 1984). Drought vulnerability differs among species with population declines most severe for frugivores, seedeaters, and nectarivores, and less severe for insectivores (Faaborg 1982). Populations of birds in Guánica were positively correlated with rainfall in the first 6 months of the year, indicating that without adequate rainfall in the early part of the year, breeding birds cannot successfully rear young during their normal April–July breeding period (Faaborg and others 1984). In these cases, a delay in the arrival of the wet season rains delays avian breeding and has differential effects on the availability of various food resources (e.g., flowers, fruits, seeds, or insects). As demonstrated in the atlas field surveys, most terrestrial birds in

Puerto Rico breed in March–July at the end of the dry season, presumably corresponding to food resource blooms associated with the arrival of the wet season rains. Changes in seasonality of rainfall (e.g., “wet” dry seasons and “dry” wet seasons) will affect seasonality of food resources, such as insects and spiders (Beltrán and Wunderle, Jr. 2014), which in turn will affect timing of breeding and reduce breeding success. Moreover, wetter life zones are predicted to be replaced by drier life zones as the climate changes in Puerto Rico (Henareh Khalyani and others 2016), which will likely reduce the ranges of species restricted to the wetter life zones. As the atlas findings indicate, some endemic species (e.g., Puerto Rican Tanager, Elfin-Woods Warbler, Green Mango) are most common in the wettest life zones and therefore would be expected to show the greatest reductions in breeding distribution on the island.

Although the frequency of hurricanes in the Atlantic and Caribbean is not expected to increase with global warming, the frequency of the most powerful hurricanes (e.g., Category 4, 5) in the region is expected to increase (Emanuel 2005, Knutson and others 2015). Recent evidence also suggests that global warming may have contributed to a decrease in the forward motion of hurricanes and an increase in the rainfall



accompanying hurricanes (Keelings and Hernández Ayala 2019). How these more powerful hurricanes will influence avian distribution on Puerto Rico is currently unknown, although prior studies of hurricane effects on Caribbean birds may provide some insight. Given the frequency of hurricanes in the region and a history of ecological studies providing baseline for comparison, studies in the Caribbean have made major contributions to our understanding of the effects of hurricanes on ecosystems and their biota (Walker and others 1991).

Hurricanes can directly or indirectly influence bird populations (Wiley and Wunderle, Jr. 1993). Direct effects of hurricanes on bird populations include mortality

due to exposure to high winds, rains, and storm surges. Most vulnerable to direct effects are aquatic species, including seabirds, shorebirds, and waterfowl with few or no shelter options, although terrestrial birds, like all birds, can be killed when blown into objects or when struck by falling debris and trees. Although storm-killed birds in the aftermath may indicate both direct and indirect effects of hurricanes, the indirect effects usually have the longest lasting effects on bird populations. Indirect effects include loss of food resources and foraging substrates, loss of nests and nest sites, and increased risk of predation, parasitism, and diseases. The short-term responses of bird species to hurricane damage to habitats include shifts in diet, habitats, foraging heights or locations,

or breeding sites (Rivera-Milán 1995a, Tossas 2006, Waide 1991, Wunderle, Jr. 1995). Terrestrial species most vulnerable to hurricane effects have a diet of nectar, fruit, or seeds (Wauer and Wunderle, Jr. 1992, Wunderle, Jr. and others 1992); roost, nest, or forage in large old trees (Snyder and others 1987); require closed-canopy forests (e.g., quail-doves) (Tossas 2006, Wauer and Wunderle, Jr. 1992, Wunderle, Jr. 1995); have specialized microclimate requirements; and/or use habitats in which vegetation recovers slowly (Wunderle, Jr. and others 1992). Species with these traits are especially vulnerable to risk of hurricane-induced local extinction if they have small populations isolated in small, isolated habitat patches (Wiley and Wunderle, Jr. 1993).



Seabirds, such as these Sandwich Terns, and shorebird nesting colonies are extremely vulnerable to direct effects of climate change (e.g., sea-level rise) as these species have few or no shelter options and lay their eggs on the ground. (Photo by J.P. Zegarra)

## Chapter 4: Postscript

Changes in the distributions of breeding birds of Puerto Rico following cessation of the atlas field surveys (2004–2009) were expected to coincide with changes in habitat availability, climate change, and extreme weather events, as well as the introduction of additional nonnative species. In some instances, however, it may be impossible to identify the factor(s) responsible for a change in a species distribution or status. For example, Limpkins (*Aramus guarauna*), considered rare and local on Puerto Rico and possibly extirpated from the island (Oberle 2018, Raffaele 1989a) and not found during the atlas field surveys, were discovered nesting in Canóvanas in 2013 and have been observed breeding at other locations on the island since (Pérez-Rivera 2015). Another species absent from the atlas surveys but recently confirmed breeding in Puerto Rico is the Barn Owl (*Tyto alba*), which was found breeding in Aguada in 2015 (Pérez-Rivera 2016, Thorstrom and Gallardo 2017).

Hurricanes Irma (September 6, 2017) and María (September 20, 2017) were the two most powerful events expected to have influenced bird populations on Puerto Rico since completion of the atlas fieldwork. Although

the effects of these hurricanes on Puerto Rico's bird populations and distributions are not yet fully known, indications from early studies suggest substantial effects on some populations. For instance, the effects of the 2017 hurricanes on the Puerto Rican Parrot population in the Luquillo Mountains were especially severe as evidenced by a decline from 53–56 parrots to 2 parrots in the wild; the decline was less severe in the wild in Río Abajo where the population fell from 130–136 parrots to 70–80 parrots (Interagency Operational Team 2018). If not for intensive management, the parrot population in the Luquillo Mountains would have been lost to previous hurricanes (Beissinger and others 2008, White and others 2014) as well as to the 2017 hurricanes.

Intensive management was also implemented after populations of the endangered Puerto Rican subspecies of the Sharp-shinned Hawk declined by 75 percent after Hurricane María from a maximum count of 75 hawks before the storm in four forest reserves (Weaver and others 2019). The conservation effort, which involves increasing hawk nesting productivity by incubating wild-produced eggs, hand-rearing chicks, and releasing fledglings, shows

promise for increasing nesting success for the species. Similarly threatened by María were Plain Pigeons which declined by 88 percent  $\pm$  41 percent from a prior count of 4,257 pigeons in the survey region before the storm (Rivera-Milán and others 2019a). In the Luquillo Mountains, the threatened Elfin-Woods Warbler displayed a post-María decline of 81 percent from 3,807 warblers present in 2016 (Rivera-Milán and others 2019b).

Whether other bird species will show marked post-hurricane population declines and range shifts is currently unknown, but the studies conducted shortly after the 2017 storms suggest that changes may be likely for certain species. Post-Hurricane María studies indicate diverse population responses to the hurricanes in the Fajardo Christmas Bird Count circle in northeastern Puerto Rico (Wunderle, Jr. 2017), in mid- to high-elevation broadleaf forests of the Cordillera Central (Lloyd and others 2019), and in the Jobos Bay estuary (Schaffner and others 2019). Although these and previous studies indicate various effects of hurricanes on bird populations, it is unknown how these storms will influence breeding distributions.



# *Species Accounts*

Species accounts are ordered phylogenetically to indicate species evolutionary relationships as traditionally indicated in the *Check-list of North American Birds* (Chesser and others 2020).



Breeding colony of seabirds on Monito Island, Puerto Rico. (Photo by J.P. Zegarra)

# West Indian Whistling-Duck/Chiriría Caribeña

## *Dendrocygna arborea*

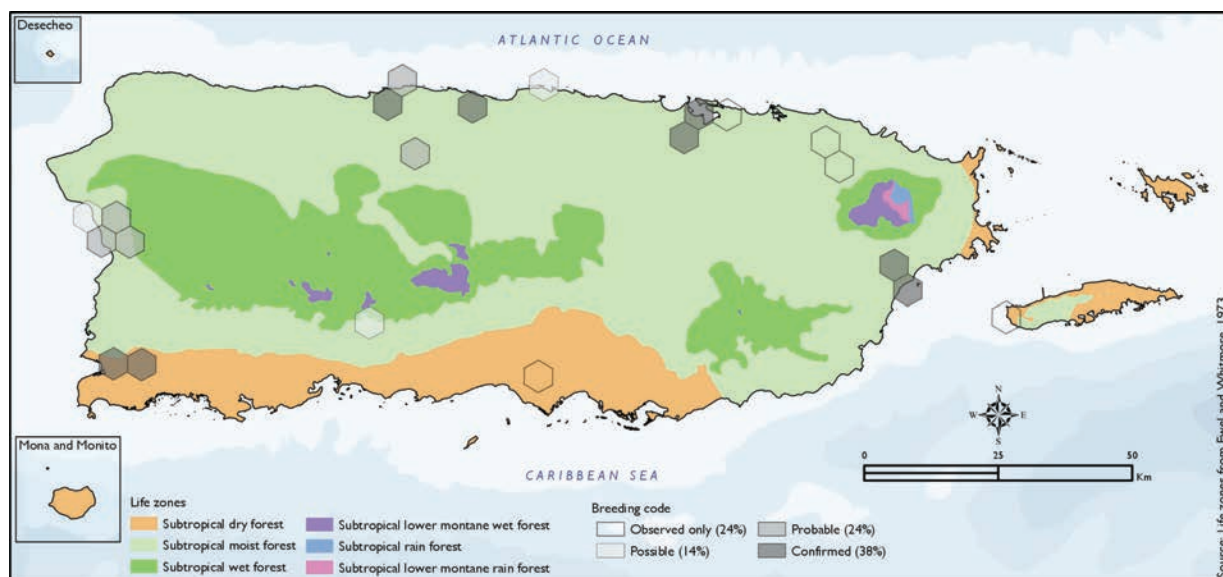


Photo by Guillermo Plaza

### Distribution and Habitat

The West Indian Whistling-Duck occurs through The Bahamas, Greater Antilles, the Virgin and Cayman Islands, Antigua, and Barbuda (Raffaele and others 1998). Nonetheless, it is uncommon to rare throughout most of its distribution range (Raffaele and others 1998). In Puerto Rico, it has been observed in ponds and lagoons at the municipalities of Cabo Rojo, Añasco, Yabucoa, Ceiba, Fajardo, and Humacao (Del Moral 2001, Lewis 2003, Silvestre 2003), as well as in the Caño Tiburones Natural Reserve, Cayures pond and Lagunas de Coloso in Aguada, and the Cucharillas Lagoon in Cataño (Bonilla and others 1992, Rodríguez-Mojica 2003). It also

occurs on Culebra and Vieques, in the latter being an extremely rare, possible breeder (Gemmill 2015). This species' habitat includes mangroves, swamps, lagoons, palm savannas (Oberle 2018, Raffaele and others 1998), and sometimes agricultural fields (Biaggi 1997). The atlas fieldwork yielded a total of 62 records within 21 hexagons or 4 percent of the 479 total hexagons (see map). Of the 21 hexagons where this species was found, breeding met the atlas definition of confirmed in 38 percent (eight) of the hexagons, probable in 24 percent (five), and possible in 14 percent (three), while the species was observed in 24 percent (five) of the hexagons but without evidence of breeding (see map).



West Indian Whistling-Duck distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

The West Indian Whistling-Duck’s nest is made of dry leaves, twigs, and other loose vegetation, and is usually placed on a cluster of palm fronds or a tree cavity (Biaggi 1997, Raffaele and others 1998). Previously published reports indicate that breeding occurs throughout the year, although it seems to vary depending on rainfall (Raffaele and others 1998). Atlas results show that this species’ breeding season extends throughout the year, with the most evidence of breeding activity during August, and to a lesser extent in

April, May, and December (see chart). Results show evidence of breeding activity for this species mostly in the lowlands within the subtropical moist forest life zone (88 percent of the hexagons) and less frequently within the subtropical dry forest life zone (13 percent of the hexagons) (see table and map).

**Population Status and Conservation**

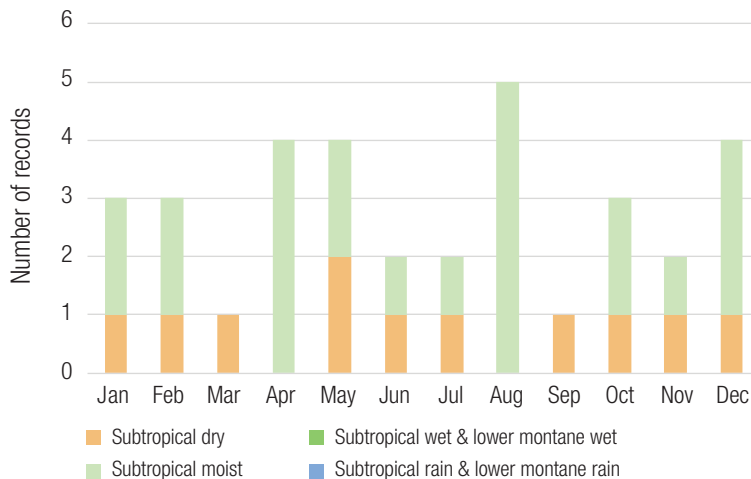
The current population trend of the West Indian Whistling-Duck is described as ‘increasing’ at a moderate rate, thanks to conservation efforts across its range (Levesque and Sorenson

2012). Some populations have suffered declines mostly due to habitat destruction, hunting, and introduced predators (Raffaele and others 1998). This species is currently listed as vulnerable by the IUCN (BirdLife International 2016). In Puerto Rico, the West Indian Whistling-Duck is classified as critically endangered (PRDNER 2016) and has a protected habitat in land of about 16 percent or 61 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (383 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where West Indian Whistling-Duck breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	2	25	6	75	0	0	0	0	8
Probable	0	0	5	100	0	0	0	0	5
Possible	0	0	3	100	0	0	0	0	3
<b>Total</b>	<b>2</b>	<b>13</b>	<b>14</b>	<b>88</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>16</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of West Indian Whistling-Duck records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# White-cheeked Pintail/Pato Quijada Colorada

## *Anas bahamensis*

### Distribution and Habitat

The White-cheeked Pintail occurs generally through The Bahamas, Greater Antilles, Virgin Islands, northern Lesser Antilles, and much of South America (Raffaele and others 1998). The Puerto Rico population is estimated at 3,755 individuals, although seasonal variation in abundance and distribution is variable

due to wetland hydrochemical conditions, which affect food resources (Rivera-Milán and Bonilla-Martínez 2007). Pintails have been documented traveling back and forth between Culebra and the Humacao marshes in the east coast (Collazo and Bonilla-Martínez 2001) but can also be found in mangroves and lagoons throughout the island (Biaggi

1997, Raffaele 1989a). It is a fairly common resident in Vieques (Gemmill 2015). Habitat includes mostly fresh to hypersaline water bodies (Raffaele and others 1998) including ponds, lagoons, and mangrove swamps (Oberle 2018). The atlas fieldwork yielded a total of 123 records within 59 hexagons or 12 percent of the 479 total hexagons (see map). Of the 59 hexagons where this species was found, breeding met the atlas definition of confirmed in 25 percent (15) of the hexagons, probable in 42 percent (25), and possible in 27 percent (16), while the species was observed in 5 percent (3) of the hexagons but without evidence of breeding (see map).

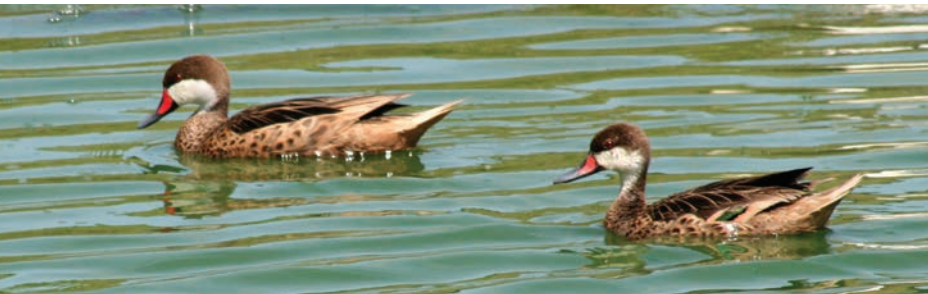
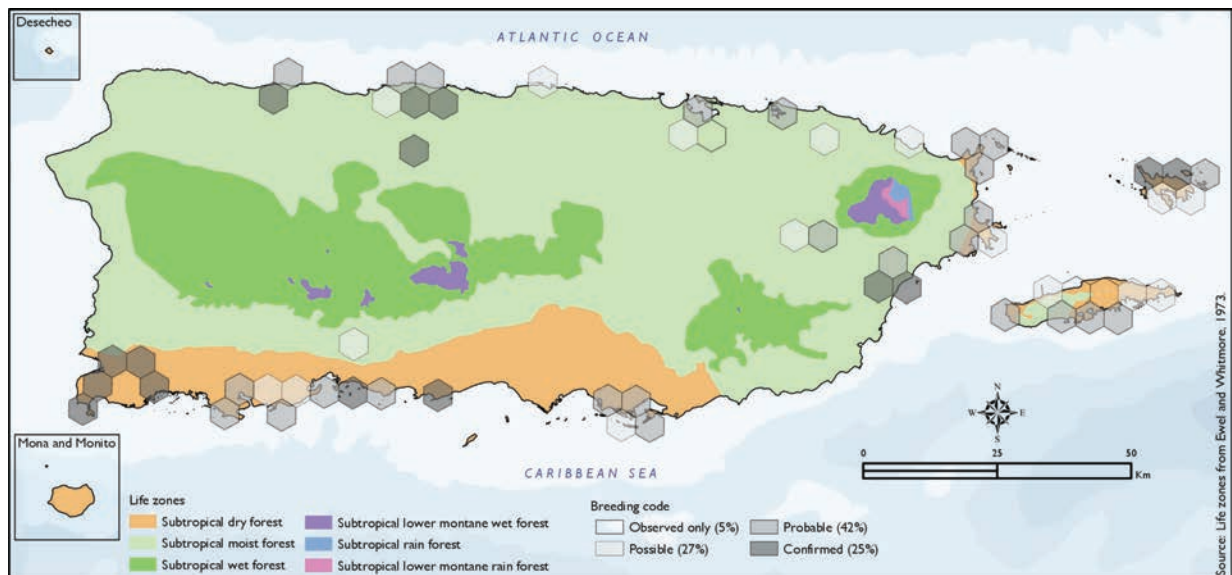


Photo by José Salguero



White-cheeked Pintail distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

The White-cheeked Pintail scrape nest is made on dry land covered by a clump of vegetation, sometimes far from water (Raffaele and others 1998). Previously published reports indicate that this species breeds primarily from February to June, but the season varies depending upon rainfall (Raffaele and others 1998). Atlas results show that this species breeds throughout the year with the most breeding activity from May to July (see chart). The breeding activity peaks in June, and it mostly takes place within the subtropical dry forest life zone (see chart). Results show that this species

breeds mostly in lowlands within the subtropical dry forest life zone (59 percent of the hexagons) and less frequently within the subtropical moist forest life zone (41 percent of the hexagons) (see table and map).

**Population Status and Conservation**

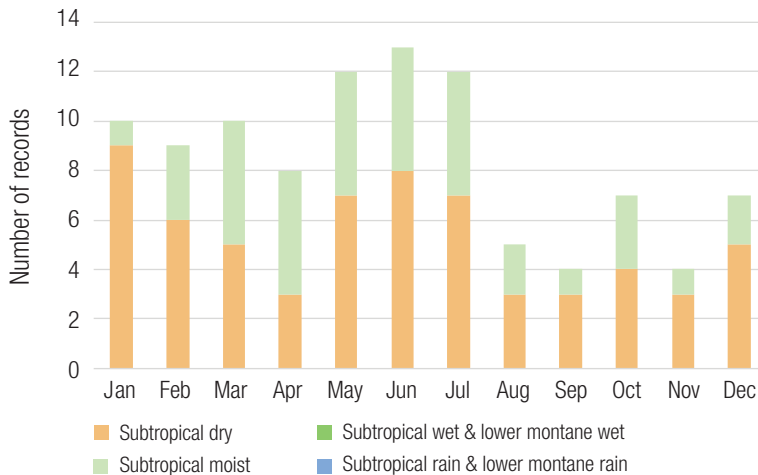
The current global population trend of the White-cheeked Pintail is described as ‘decreasing.’ However, some populations may be stable, and others have unknown trends (Wetlands International 2012). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). In

Puerto Rico, Rivera-Milán and Bonilla-Martínez (2007) note that the pintail is threatened by anthropogenic disturbances including habitat loss and deterioration and illegal hunting, and therefore recommend that more information be obtained on demography and movements and that hunting continue to be prohibited. In Puerto Rico, the White-cheeked Pintail is locally listed as vulnerable (PRDNER 2016) and has a protected habitat in land of 16 percent or 214 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1338 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where White-cheeked Pintail breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	9	60	6	40	0	0	0	0	15
Probable	16	64	9	36	0	0	0	0	25
Possible	8	50	8	50	0	0	0	0	16
<b>Total</b>	<b>33</b>	<b>59</b>	<b>23</b>	<b>41</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>56</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of White-cheeked Pintail records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Masked Duck/Pato Dominicico

## *Nomonyx dominicus*



Photo by Alcides Morales

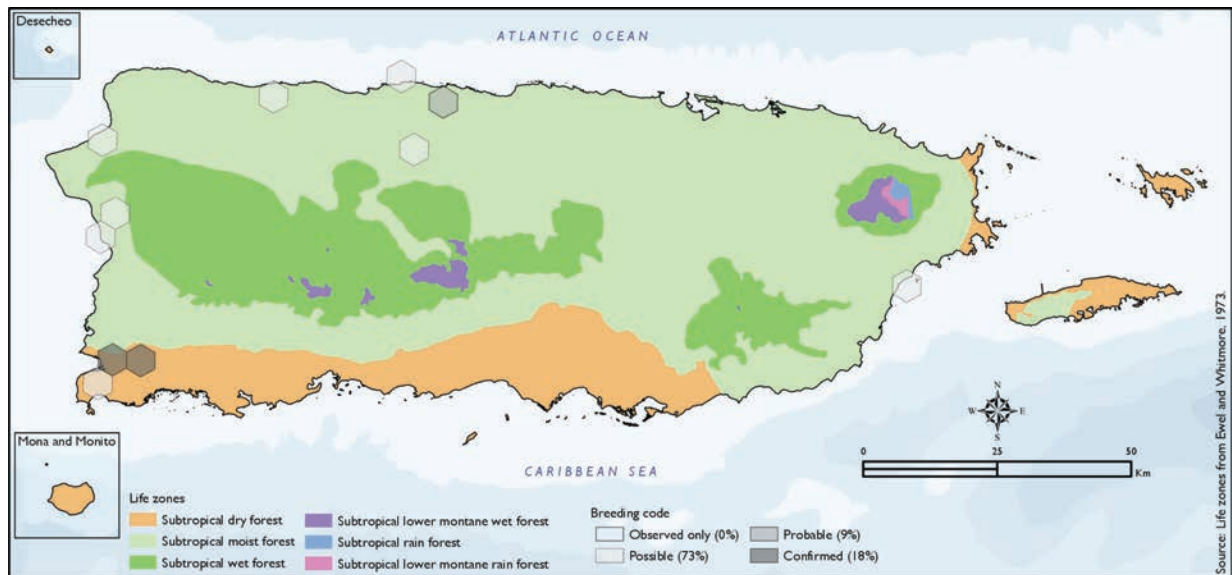
### Distribution and Habitat

The Masked Duck is a rare resident in Puerto Rico (Oberle 2018, Raffaele and others 1998) and a rare visitor in Vieques (Gemmill 2015). The atlas fieldwork yielded a total of 20 records within 11 hexagons or 2 percent of the 479 total hexagons (see map). Of the 11 hexagons where this species was found, breeding met the atlas definition of confirmed in 18 percent (two) of the hexagons, probable in 9 percent (one), and possible in 73 percent (eight) (see map). This species inhabits freshwater swamps and canals with plenty

of floating vegetation, as well as rice fields (Raffaele and others 1998), brackish water ponds, and lagoons (Oberle 2018).

### Breeding Ecology

Previously published reports indicate that the Masked Duck breeds from May to August and nests on swamp vegetation near or over the water (Raffaele and others 1998). Atlas results show that the Masked Duck breeding season extends throughout the year, but the most records were reported in June (see chart). Results show that the Masked Duck mostly breeds within the



Masked Duck distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

subtropical moist (73 percent of the hexagons) and subtropical dry forest life zones (27 percent of the hexagons) (see table and map).

**Population Status and Conservation**

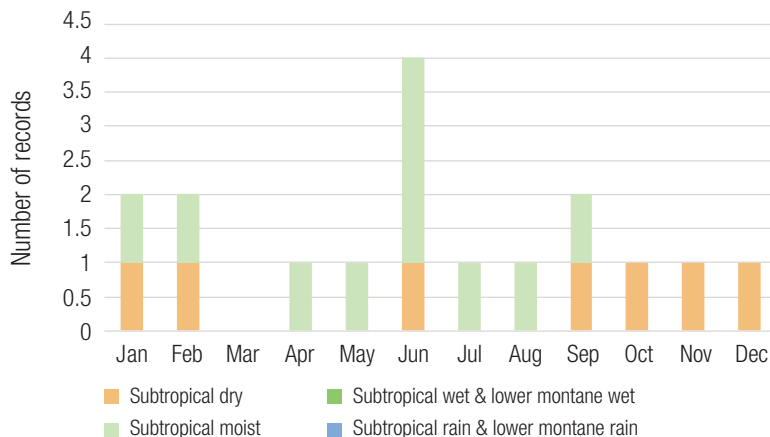
The Masked Duck population is suspected to be declining owing to over-hunting and other human pressure but is listed by the IUCN as a species of least concern (BirdLife International 2016). The Puerto Rican population is composed

of around 50 pairs and is under pressure from illegal hunting and habitat degradation associated with human activities (J.A. Salguero-Farías, personal observation 2009). In Puerto Rico, the Masked Duck is listed as endangered (PRDNER 2016) and has a protected habitat in land of 15 percent or 39 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (264 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Masked Duck breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	2	100	0	0	0	0	0	0	2
Probable	0	0	1	100	0	0	0	0	1
Possible	1	13	7	88	0	0	0	0	8
<b>Total</b>	<b>3</b>	<b>27</b>	<b>8</b>	<b>73</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>11</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Masked Duck records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Ruddy Duck/Pato Chorizo

## *Oxyura jamaicensis*

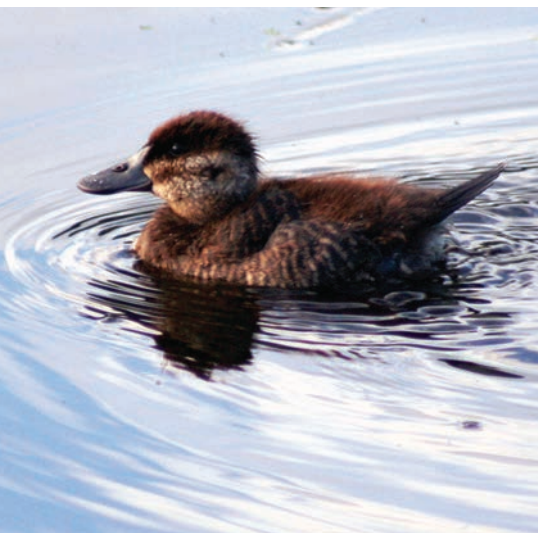
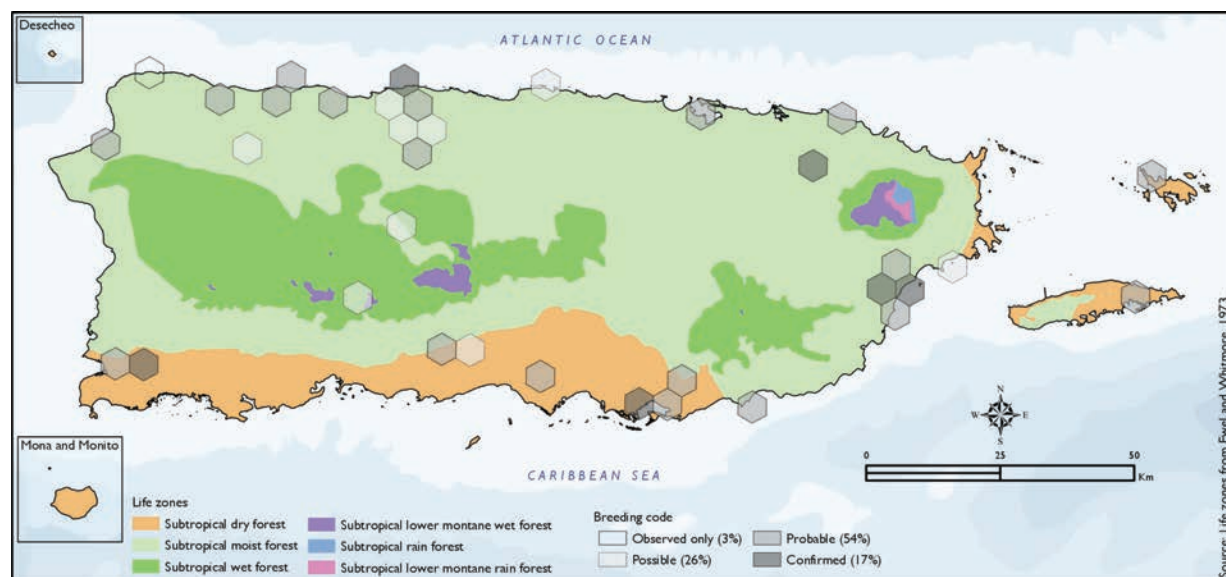


Photo by José Salguero

### Distribution and Habitat

The Ruddy Duck occurs from northern North America down to Central America and northern South America (Oberle 2018), and it is a common resident on New Providence in The Bahamas and the Greater Antilles (Raffaele and others 1998). The resident West Indian subspecies (*O. j. jamaicensis*) has declined in The Bahamas, Puerto Rico, and the Virgin Islands to the point of being threatened (Raffaele and others 1998). In Puerto Rico, it can be seen in the Humacao Natural Reserve, Caño Tiburones Natural Reserve, and the Serrallés Lakes near Ponce (Oberle 2018). In Vieques, it is a rare breeding resident in spring, and it is extremely rare in winter

and summer (Gemmill 2015). Habitat includes open freshwater bodies such as lakes, lagoons, and alkaline marshes, as well as saline wetlands and mangrove edges adjacent to water (Bond 1961, Raffaele and others 1998). The atlas fieldwork yielded a total of 77 records within 35 hexagons or 7 percent of the 479 total hexagons (see map). Of the 35 hexagons where this species was found, breeding met the atlas definition of confirmed in 17 percent (6) of the hexagons, probable in 54 percent (19), and possible in 26 percent (9), while the species was observed in 3 percent (1) of the hexagons but without evidence of breeding (see map).



Ruddy Duck distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

### Breeding Ecology

Previously published reports indicate that the Ruddy Duck breeds primarily from June to August (Raffaele and others 1998), although breeding seasons in the southwest may not be synchronized with breeding seasons in the northeast part of Puerto Rico (H. Raffaele, personal communication 2019). The nest is built over water in swamp vegetation (Raffaele and others 1998). Atlas results suggest that this species breeds

throughout the year with the most breeding activity from March to June and a peak during May and June (see chart). Results show that this species mostly breeds in the lowlands within the subtropical moist forest life zone (68 percent of the hexagons) (see table and chart). However, results indicate that it also breeds within the subtropical dry forest life zone (29 percent of the hexagons) (see table and map).

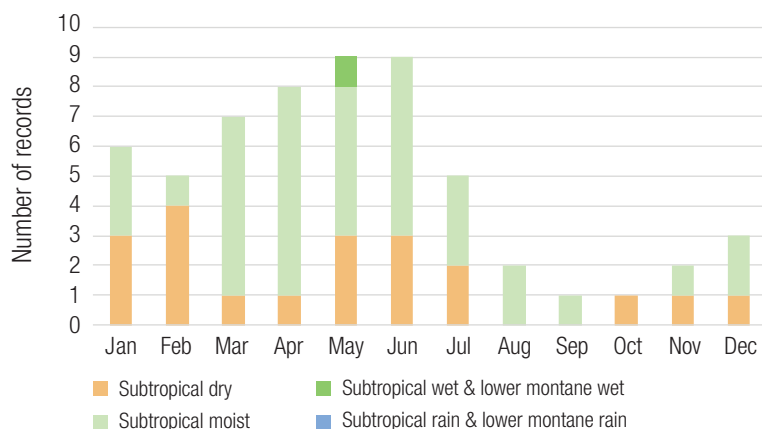
### Population Status and Conservation

The current population trend for the Ruddy Duck is described as decreasing (Wetlands International 2012). However, this species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). In Puerto Rico, the Ruddy Duck is classified as vulnerable (PRDNER 2016) and has a protected habitat in land of 16 percent or 127 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (813 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Ruddy Duck breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	2	33	4	67	0	0	0	0	6
Probable	7	37	12	63	0	0	0	0	19
Possible	1	11	7	78	1	11	0	0	9
<b>Total</b>	<b>10</b>	<b>29</b>	<b>23</b>	<b>68</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>34</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Ruddy Duck records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Least Grebe/Tigua

## *Tachybaptus dominicus*

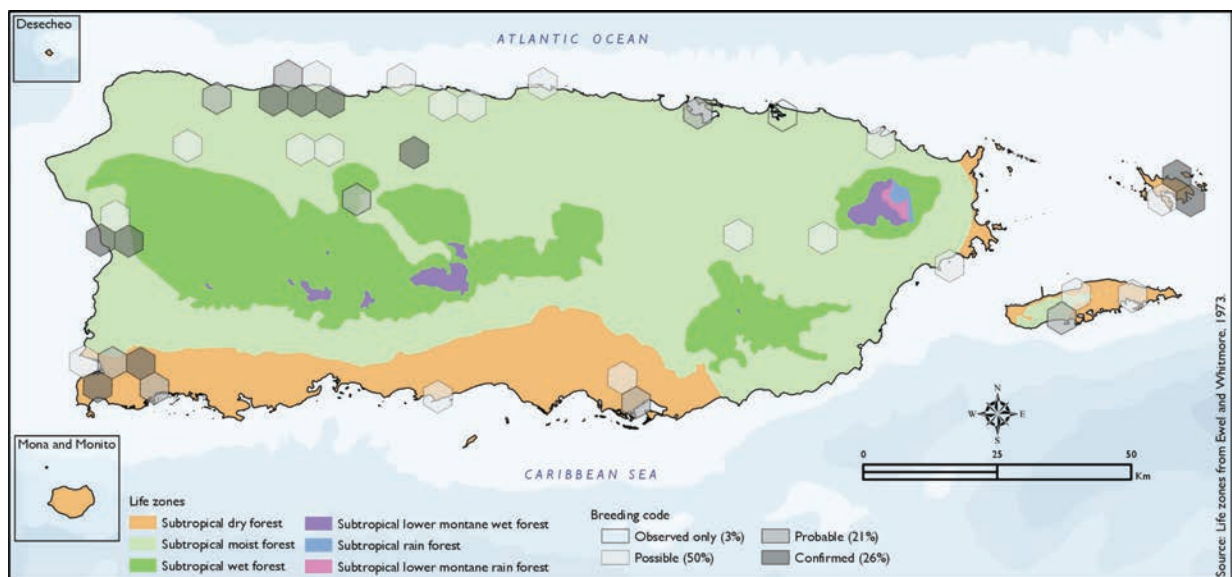


Photo by Alcides Morales

### Distribution and Habitat

The Least Grebe occurs from the south-central United States through South America including the West Indies, where it is uncommon on Puerto Rico (Raffaele and others 1998). It can usually be seen in the Caño Tiburones Natural Reserve (Oberle 2018). It also occurs on Culebra and Vieques Islands (Ventosa-Febles and others 2005), in the latter being an extremely rare visitor (Gemmill 2015). It is found locally in the lowlands, and it usually inhabits freshwater ponds, canals, temporary pools with thick

floating vegetation (Oberle 2018), and freshwater cattail swamps (Raffaele and others 1998). The atlas fieldwork yielded a total of 72 records within 38 hexagons or 8 percent of the 479 total hexagons (see map). Of the 38 hexagons where this species was found, breeding met the atlas definition of confirmed in 26 percent (10) of the hexagons, probable in 21 percent (8), and possible in 50 percent (19), while the species was observed in 3 percent (1) of the hexagons but without evidence of breeding (see map).



Least Grebe distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the Least Grebe breeds through most of the year, but the breeding activity peaks from April to May and again from September to November (Raffaele and others 1998). The nest is built over water among emergent vegetation (Biaggi 1997, Raffaele and others 1998). Atlas results show that this species breeds throughout the year with the most breeding

activity in May (see chart). Results (see table and map) show that this species breeds mostly in the lowlands within the subtropical moist forest life zone (62 percent of the hexagons) and less commonly within the subtropical dry forest life zone (35 percent of the hexagons).

**Population Status and Conservation**

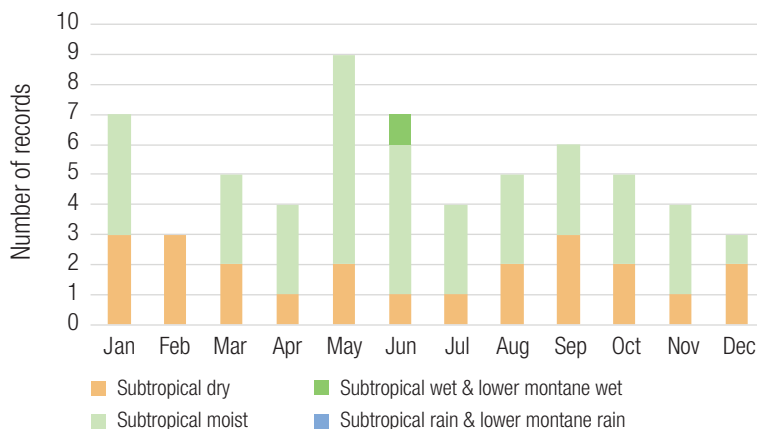
The current population trend of the Least Grebe is described as ‘stable’ (Wetlands International

2012). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Least Grebe has a protected habitat in land of 18 percent or 162 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (908 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Least Grebe breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	4	40	6	60	0	0	0	0	10
Probable	3	38	4	50	1	13	0	0	8
Possible	6	32	13	68	0	0	0	0	19
<b>Total</b>	<b>13</b>	<b>35</b>	<b>23</b>	<b>62</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>37</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Least Grebe records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Pied-billed Grebe/Zaramago

## *Podilymbus podiceps*



Photo by Joseph Wunderle

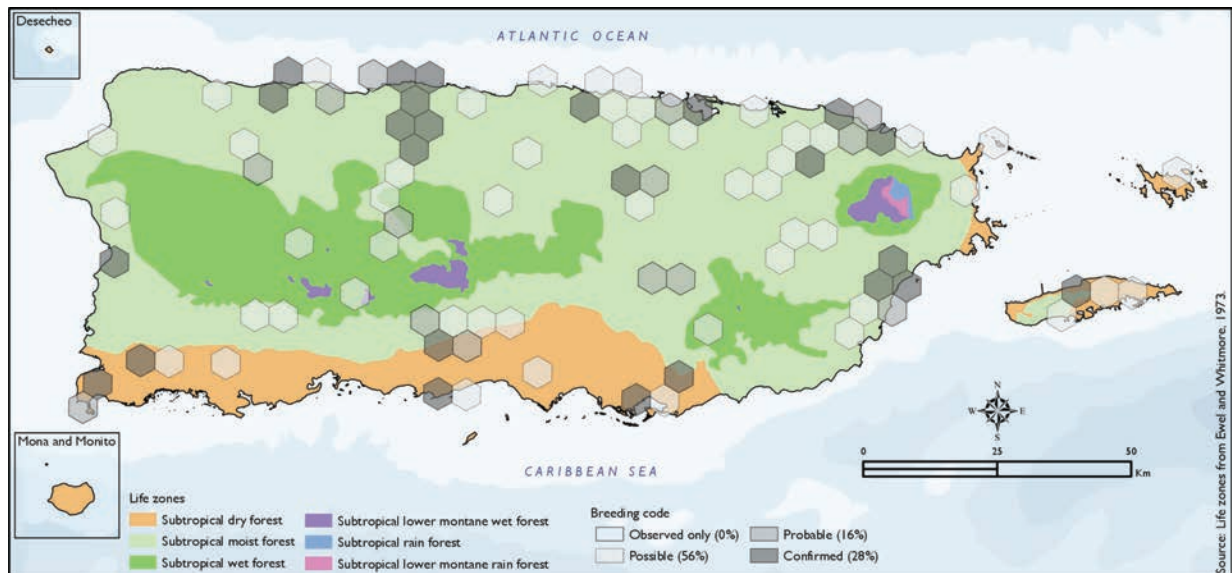
### Distribution and Habitat

The Pied-billed Grebe occurs throughout the Western Hemisphere including the West Indies (Raffaele and others 1998). In Puerto Rico, the species is a common resident in wetlands, ponds, and reservoirs in the coastal plain and lowlands (Oberle 2018). It also occurs on Culebra and Vieques (PRDNER 2015, Saliva 1994, Sorrié 1975, Ventosa-Febles and others 2005), in the latter being a rare resident (Gemmill 2015). The atlas fieldwork yielded a total of 157 records within 89 hexagons or 18 percent of the 479 total hexagons (see map). Of the 89 hexagons where this species occurs,

breeding met the atlas definition of confirmed in 28 percent (25) of the hexagons, probable in 16 percent (14), and possible in 56 percent (50) (see map).

### Breeding Ecology

The Pied-billed Grebe builds a floating nest among emergent vegetation (Raffaele and others 1998). Previously published reports indicate that it breeds throughout the year, but mostly from March to July (Raffaele and others 1998). Atlas results show that this species' breeding season extends throughout the year with most breeding activity from March to June (see chart).



Pied-billed Grebe distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



The breeding activity peaks during March and June, and it mostly takes place within the subtropical moist forest life zone (see chart). Results show that this species breeds mostly within the subtropical moist forest life zone (74 percent of the hexagons) throughout the island. However, results indicate that it also breeds in the subtropical dry forest life zone (20 percent of the hexagons), and subtropical

wet and lower montane wet forest life zones (6 percent of the hexagons) (see table and map).

**Population Status and Conservation**

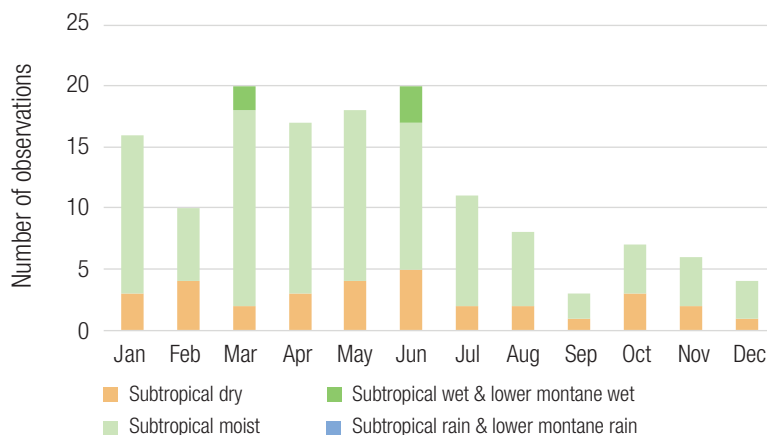
The current population trend of the Pied-billed Grebe is described as ‘stable,’ although some populations have unknown trends (Wetlands International 2012). This species is currently listed as a species of least

concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Pied-billed Grebe has a protected habitat in land of 12 percent or 253 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (2127 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Pied-billed Grebe breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	7	28	18	72	0	0	0	0	25
Probable	2	14	12	86	0	0	0	0	14
Possible	9	18	36	72	5	10	0	0	50
<b>Total</b>	<b>18</b>	<b>20</b>	<b>66</b>	<b>74</b>	<b>5</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>89</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Pied-billed Grebe records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Rock Pigeon/Paloma Doméstica

## *Columba livia*

### Distribution and Habitat

The Rock Pigeon is native to Europe and Asia, and has been introduced throughout the world (Oberle 2018), where it is now a common resident in the northern Bahamas, the Greater Antilles, the Virgin and Cayman Islands, and in large towns of the Lesser Antilles (Raffaele and others 1998). It regularly inhabits many town plazas throughout Puerto Rico (Oberle 2018), and it is also common in urban areas of Vieques (Gemmill 2015). Habitat includes mostly city streets and parks, buildings (Oberle 2018), and populated rural areas (Raffaele and others 1998). The atlas fieldwork yielded a total of 603 records within 347 hexagons

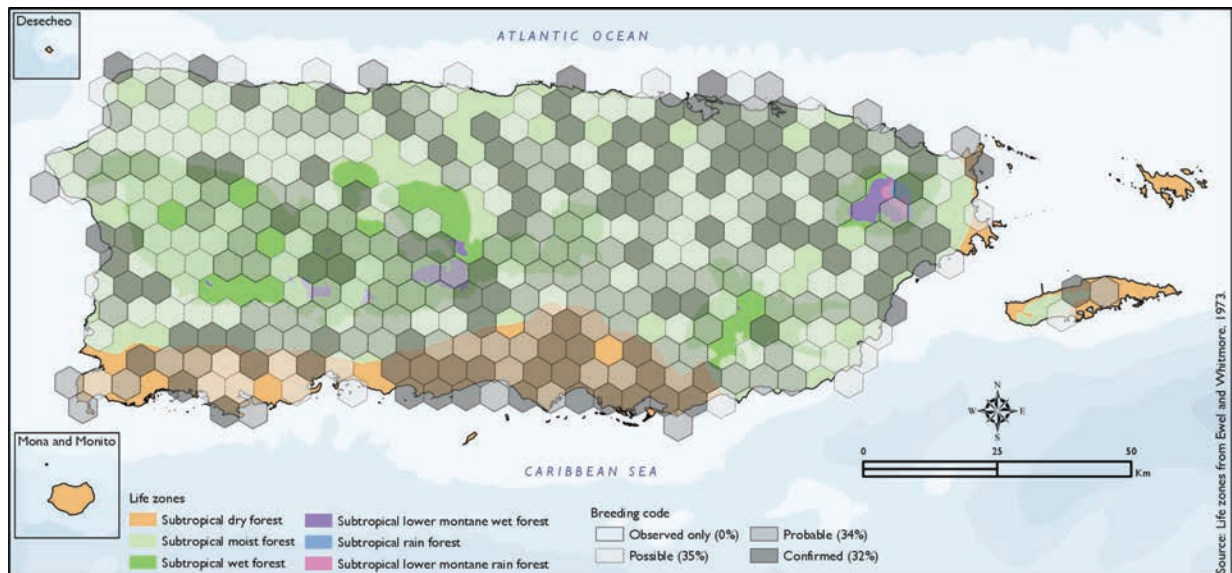
or 72 percent of the 479 total hexagons (see map). Of the 347 hexagons where this pigeon was found, breeding met the atlas definition of confirmed in 32 percent (110) of the hexagons, probable in 34 percent (117), and possible in 35 percent (120) (see map).

### Breeding Ecology

The Rock Pigeon builds a nest made of sticks and other plant material that is often placed on human-made structures such as buildings, bridges, store fronts (Oberle 2018), or any other available ledge (Raffaele and others 1998). Previously published reports indicate that breeding occurs throughout



Photo by José Salguero



Rock Pigeon distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

the year (Raffaele and others 1998). Atlas results show that this species breeds throughout the year with the most breeding activity from March to June (see chart). Overall, the breeding activity peaks in June, and it mostly takes place within the subtropical moist forest life zone (see chart). Atlas results show that this species breeds mostly within the subtropical moist forest life zone (63 percent of the hexagons) (see table) but also in the subtropical dry

forest life zone (17 percent of the hexagons) and within subtropical wet and subtropical rain forest life zones at higher elevations (20 and <1 percent of the hexagons, respectively) (see table and map).

**Population Status and Conservation**

The current population trend of the Rock Pigeon is described as ‘decreasing’ in Israel (del Hoyo and others 2013), but elsewhere the species is currently listed as

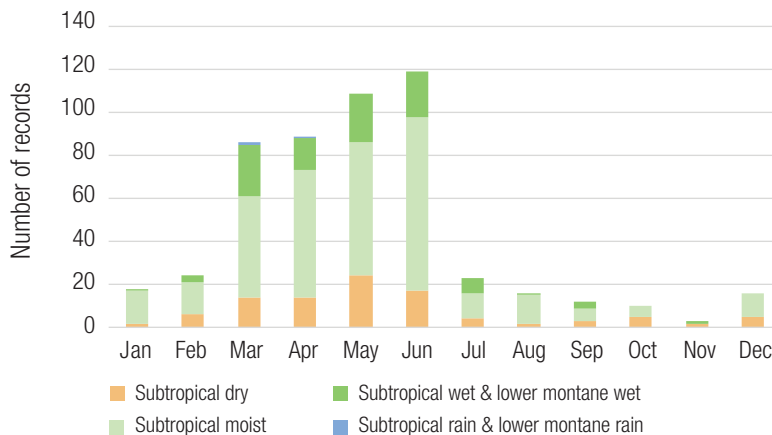
a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Rock Pigeon has a protected habitat in land of 11 percent or 904 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (8276 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Rock Pigeon breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	28	25	72	65	9	8	1	<1	110
Probable	21	18	62	53	34	29	0	0	117
Possible	10	8	84	71	25	21	0	0	119 <sup>b</sup>
<b>Total</b>	<b>59</b>	<b>17</b>	<b>218</b>	<b>63</b>	<b>68</b>	<b>20</b>	<b>1</b>	<b>&lt;1</b>	<b>346</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.

<sup>b</sup> A different number of total hexagons for each breeding code in this table may not reflect the actual number of hexagons where the species was found breeding, as some of the hexagons in the coastal zone or on the water may not have ecological life zone data.



Number of Rock Pigeon records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by José Salguero

## Scaly-naped Pigeon/Paloma Turca

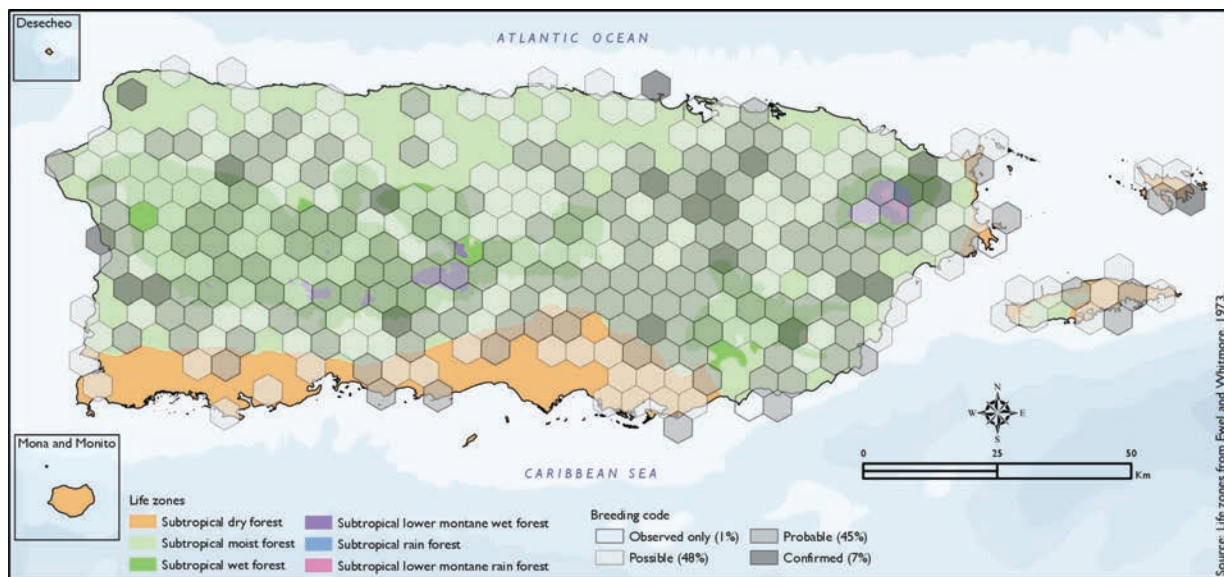
### *Patagioenas squamosa*

#### Distribution and Habitat

The Scaly-naped Pigeon is a common to fairly common year-round resident on Puerto Rico, the Virgin Islands, and other islands of the Lesser Antilles, as well as the mountain forests of the Dominican Republic and Haiti (Raffaele and others 1998).

Its range is limited to the West Indies and islands off the north coast of Venezuela (Raffaele and others 1998). In Puerto Rico, it can be observed throughout the main island (Raffaele 1989a) and larger offshore islands such as Desecheo (Meier and others 1989), Mona (Barnés 1946, Bowditch 1902, Gordon and others 1961, Terborgh and Faaborg 1973), Culebra (Wetmore 1917), and Vieques (Sorrié 1975, USFWS 1994, Wetmore 1916), in the latter being a fairly common resident (Gemmill 2015). It is an irregular visitor to Puerto Rico's offshore islands (Raffaele 1989a). This species usually occurs in humid forests (Bond 1961, Oberle 2018), coffee plantations (Biaggi 1997), and parks, sometimes moving

into urban areas to feed on fruits (J.A. Salguero-Farías, personal observation 2009). Systematic surveys of the pigeon indicate that the species is most abundant in moist and wet life zones and rarer in the subtropical life zone (Rivera-Milán 1992). The atlas fieldwork yielded a total of 653 records within 325 hexagons or 68 percent of the 479 total hexagons (see map). Of the 325 hexagons where this species was found, breeding met the atlas definition of confirmed in 7 percent (22) of the hexagons, probable in 45 percent (145), and possible in 48 percent (155), while the species was observed in 1 percent (3) of the hexagons but without evidence of breeding (see map).



Scaly-naped Pigeon distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

The Scaly-naped Pigeon usually builds a frail stick nest in a tree or bush, but the nest can also be constructed on a palm frond or a bromeliad (Raffaele and others 1998). Previously published reports indicate that the Scaly-naped Pigeon breeds throughout the year but primarily from March to June (Raffaele and others 1998). On Puerto Rico and its satellite islands, columbid nesting season extends from February to September, but nest density peaks during April–June, and year-round nesting is infrequent (Rivera-Milán 1996). Atlas results show that this species’ breeding season

extends throughout the year with the most breeding activity from March to June (see chart). Breeding activity peaks in June after the onset of the rainy season, and it mostly takes place in the subtropical moist forest life zone (see chart). Results show that this species breeds mostly within the subtropical moist forest life zone (59 percent of the hexagons) (see table). However, results indicate that it also breeds at higher elevations within the subtropical wet forest life zones (26 percent of the hexagons), as well as in the coastal plains of the subtropical dry forest life zone (15 percent of the hexagons) (see table and map).

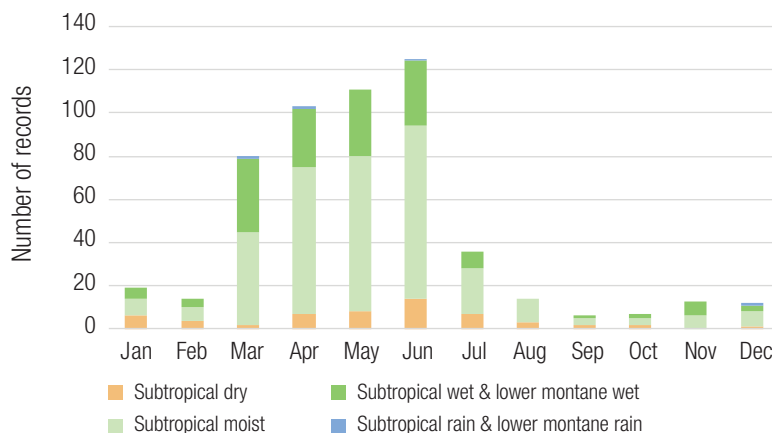
**Population Status and Conservation**

The current population trend of the Scaly-naped Pigeon is described as ‘decreasing’ (del Hoyo and others 2013). However, this species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Scaly-naped Pigeon has a protected habitat in land of 13 percent or 981 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (7699 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Scaly-naped Pigeon breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	1	5	17	77	3	14	1	5	22
Probable	16	11	88	61	41	28	0	0	145
Possible	30	19	86	55	39	25	0	0	155
<b>Total</b>	<b>47</b>	<b>15</b>	<b>191</b>	<b>59</b>	<b>83</b>	<b>26</b>	<b>1</b>	<b>&lt;1</b>	<b>322</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Scaly-naped Pigeon records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by Michael Morel

# White-crowned Pigeon/ Paloma Cabeciblanca

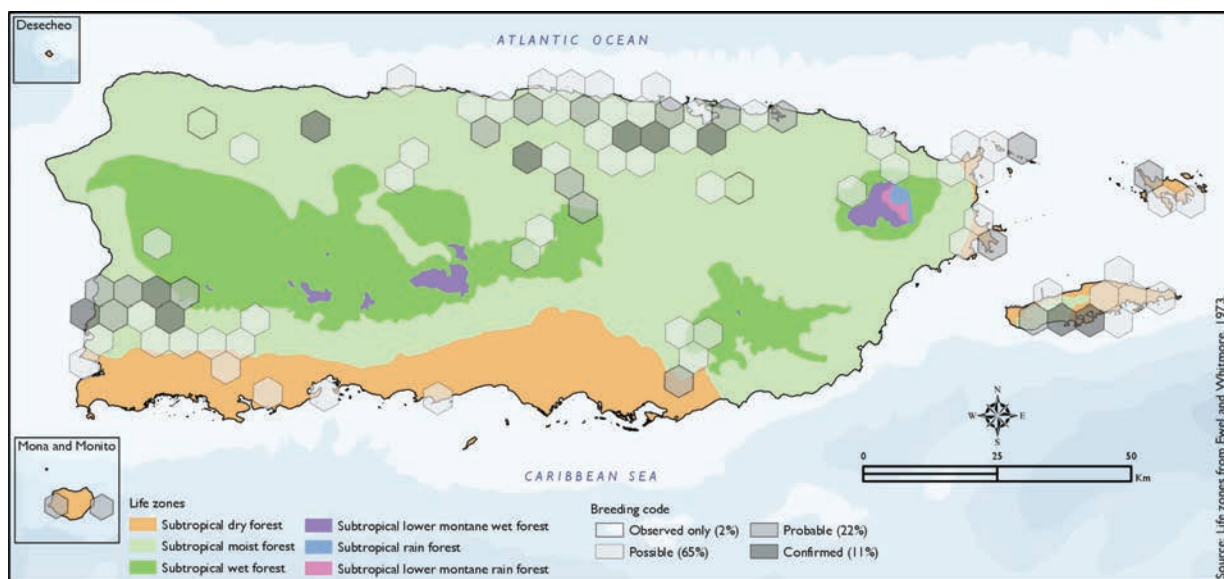
*Patagioenas leucocephala*

## Distribution and Habitat

The White-crowned Pigeon is a common to locally common breeding resident in The Bahamas, Cuba, Jamaica, Antigua, Hispaniola, Puerto Rico, the Virgin Islands, San Andrés, and Providencia (Raffaele and others 1998). It is a common to fairly common resident in Vieques (Biaggi 1997, Gemmill 2015) and is also fairly common on Culebra and Mona (Ventosa-Febles and others 2005). The resident population on Puerto Rico is believed to be augmented in spring and summer by visiting White-crowned Pigeons from other islands, which also

breed on the main and satellite islands (Raffaele 1989a). Wetmore (1916) found the White-crowned Pigeon in only a few localities on the north coast of Puerto Rico (e.g., Punta Picu, north of Mameyes) and suggested that the species was more abundant on the island in the 1870s as described by Gundlach (1878). The populations of White-crowned Pigeons were sufficiently abundant for detailed studies of nesting biology in Mona, Dorado, and Roosevelt Roads Naval Base during 1973–1975 by Wiley and Wiley (1979). Both Raffaele (1989b) and Oberle (2018) note that the pigeon is common in Dorado. During 1995–2008, the White-crowned Pigeon population increased from low numbers, possibly due to increased second-growth forests used for foraging and nesting (Rivera-Milán 1996,

2001). The species usually inhabits coastal woodlands and mangroves during the breeding season but can be found inland in the mountains when not breeding (Raffaele and others 1998). The atlas fieldwork yielded a total of 139 records within 88 hexagons or 18 percent of the 479 total hexagons (see map). In the 88 hexagons where this species was found, breeding met the atlas definition of confirmed in 11 percent (10) of the hexagons, probable in 22 percent (19), and possible in 65 percent (57), while the species was observed in 2 percent (2) of the hexagons but without evidence of breeding (see map). Atlas results suggest that the pigeon may still be expanding its breeding range on Puerto Rico where it remains fairly local and common in southwestern, north-central, and eastern portions of the island.



White-crowned Pigeon distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

The White-crowned Pigeon generally nests in colonies and builds a flimsy twig nest, usually in mangroves or dry scrub but also in trees around towns (Raffaele and others 1998). In Puerto Rico some birds breed in trees bordering a golf course (Wiley and Wiley 1979). Both sexes share the building of the nest and egg incubation; the male does most of the incubation during the day, while the female incubates mostly at night (Wiley and Wiley 1979). Previously published reports indicate that breeding occurs primarily from March to August but sometimes as late as September (Raffaele and others 1998, Wiley and Wiley 1979). However, breeding season may vary with location on the island, and breeding in the southwest is not

always synchronized with breeding in the northeast portion of the island. Atlas results suggest that this species' breeding season extends throughout the year with most breeding activity from April to June (see chart). The breeding activity peaks in May and mostly takes place within the subtropical moist forest life zone (see chart). Results show that this species breeds mostly in lowlands within the subtropical moist forest life zone (67 percent of the hexagons) (see table). It also breeds in the subtropical dry forest life zone (27 percent of the hexagons) (see table and map).

as 'decreasing' (Butcher and Niven 2007). This species is currently listed as a near threatened species by the IUCN (BirdLife International 2016). In Puerto Rico, the White-crowned Pigeon is classified as data deficient (PRDNER 2016). A decline in abundance in counts during 2008–2014 suggests that increased illegal hunting may have been a driver of the observed decline, although urban development and other threats could also have affected the island's population (Rivera-Milán and others 2016). In Puerto Rico, the White-crowned Pigeon has a protected habitat in land of 16.8 percent or 343 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (2031 km<sup>2</sup>).

**Population Status and Conservation**

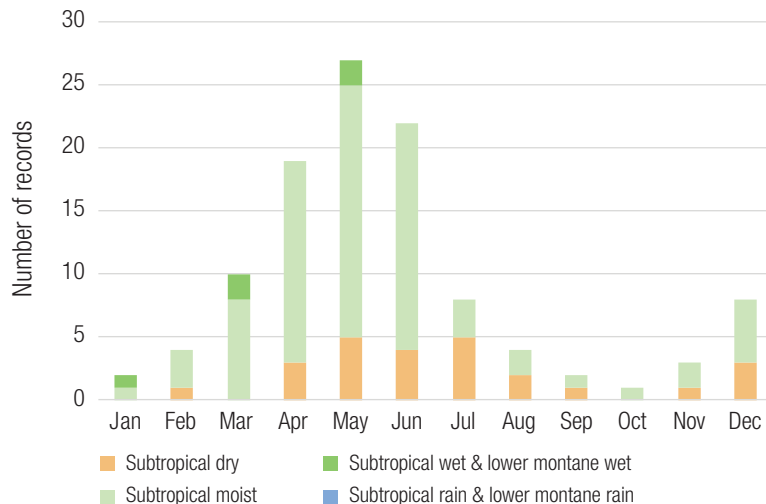
The current population trend of the White-crowned Pigeon is described

Number of hexagons by ecological life zone and percentage of the total number of hexagons where White-crowned Pigeon breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	1	10	9	90	0	0	0	0	10
Probable	6	32	12	63	1	5	0	0	19
Possible	16	29	36	64	4	7	0	0	56 <sup>b</sup>
<b>Total</b>	<b>23</b>	<b>27</b>	<b>57</b>	<b>67</b>	<b>5</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>85</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.

<sup>b</sup> A different number of total hexagons for each breeding code in this table may not reflect the actual number of hexagons where the species was found breeding, as some of the hexagons in the coastal zone or on the water may not have ecological life zone data.



Number of White-crowned Pigeon records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by Ramon Luis Rivera

## Plain Pigeon/ Paloma Sabanera

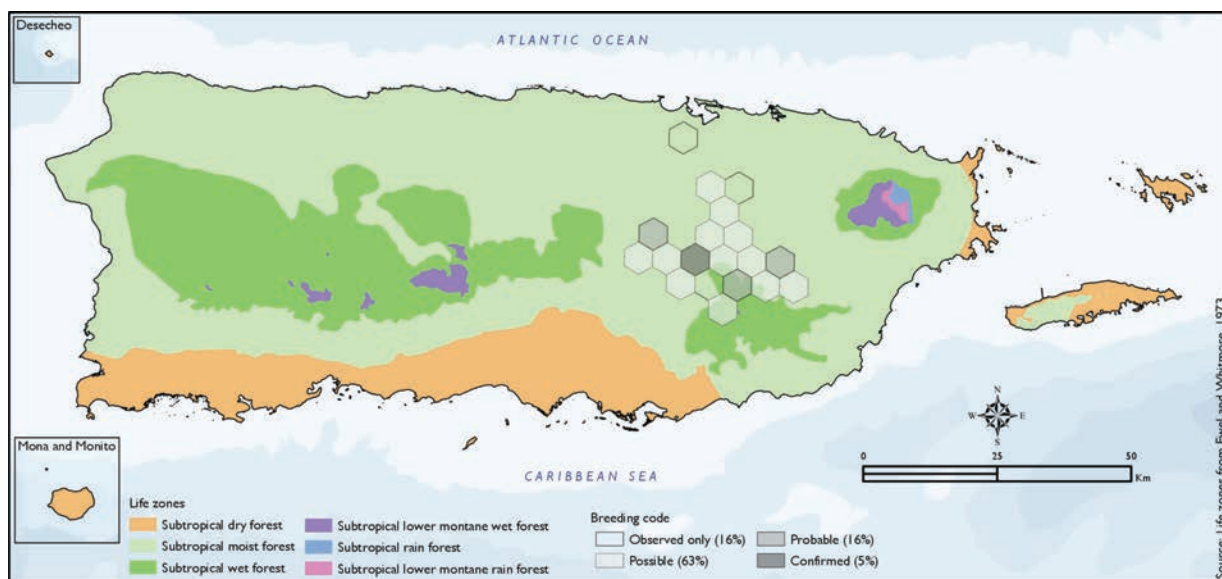
*Patagioenas inornata*

### Distribution and Habitat

The Plain Pigeon is a species endemic to the Greater Antilles where it is a common year-round resident on Hispaniola and rare on Cuba, Jamaica, and Puerto Rico (Raffaele and others 1998). In Puerto Rico, it occurs primarily

in the east-central region near Cidra and some neighboring municipalities such as Comerío, Caguas, Cayey, Aibonito, and San Lorenzo (Oberle 2018, Rivera-Milán and others 2003). It has not been reported from the satellite islands. This species usually inhabits open savannas and woodlands, lowland forest edges, mountain forests, primary- and second-growth forests, coastal areas, dry or wet limestone forests, and agricultural areas such as croplands and cattle pastures (Collar and others 1992, Collazo and Bonilla-Martinez 1988, Danforth 1936, PRDNER 1999, Raffaele and others 1998). In Puerto Rico, the species can be found mostly in wooded ravines,

second-growth areas, bamboo thickets, and patches of farmland and pasture within moist mountain forests (Collar and others 1992, Collazo and Bonilla-Martinez 1988, Oberle 2018, Rivera-Milán and others 2003). The atlas fieldwork yielded a total of 31 records within 19 hexagons or 4 percent of the 479 total hexagons (see map). Of the 19 hexagons where the Plain Pigeon was found, breeding met the definition of confirmed in 5 percent (1) of the hexagons, probable in 16 percent (3), and possible in 63 percent (12), while it was observed in 16 percent (3) of the hexagons but without evidence of breeding (see map).



Plain Pigeon distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

The Plain Pigeon builds a fragile nest made of sticks, twigs, leaves, and other plant material, which is usually placed in bamboo clumps, vine clusters, palm fronds, or hardwood trees (Biaggi 1997, Oberle 2018, Raffaele and others 1998). Previously published reports indicate that it breeds throughout the year but primarily from December to July (Oberle 2018). Atlas results suggest that this species' breeding season extends mostly from February to July, with the most breeding activity from March through June, and to a lesser extent from September to November (see chart). Overall, the breeding activity peaks in May, and it mostly occurs in the subtropical moist forest life zone. Results show that this species breeds mostly

in the east-central part of the island within the subtropical moist forest life zone (88 percent of the hexagons) (see table and map).

**Population Status and Conservation**

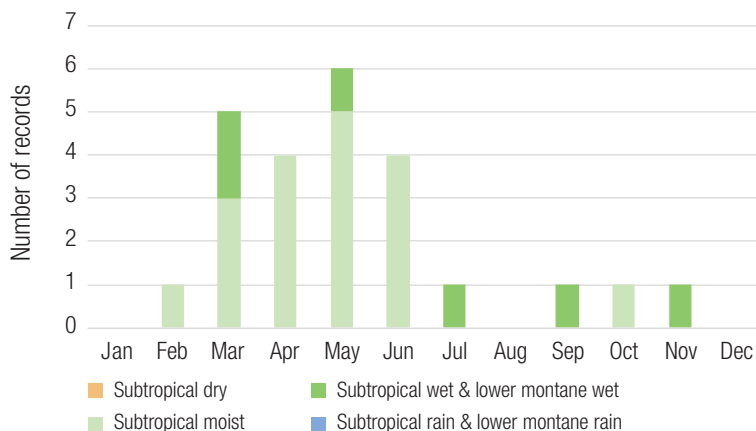
The Plain Pigeon is currently listed as a near threatened species by the IUCN (BirdLife International 2016). Nevertheless, the Puerto Rican subspecies (*P. i. wetmorei*) has declined dramatically throughout its distribution range and has been considered endangered due to habitat loss, illegal hunting, and predation by introduced mammals and hurricanes (Raffaele and others 1998; Rivera-Milán and others 2003, 2016). The subspecies is believed to have declined to <100 individuals in the 1970s, but it has recovered to several thousand individuals

(Raffaele and others 1998, Rivera-Milán and others 2003). Although the Plain Pigeon population has been found to decline following hurricanes (Rivera-Milán and others 2003, 2016), the population has recovered quickly after past hurricanes. However, the population decreased substantially following Hurricanes Irma and María in September 2017 (Rivera-Milán and others 2019a). The Puerto Rican subspecies is classified as endangered by local and Federal laws (PRDNER 2016 and USFWS 1973, respectively). In Puerto Rico, the Plain Pigeon subspecies has a protected habitat in land of 5.2 percent or 20.1 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (382 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Plain Pigeon breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	0	0	1	100	0	0	0	0	1
Probable	0	0	2	67	1	33	0	0	3
Possible	0	0	11	92	1	8	0	0	12
<b>Total</b>	<b>0</b>	<b>0</b>	<b>14</b>	<b>88</b>	<b>2</b>	<b>13</b>	<b>0</b>	<b>0</b>	<b>16</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Plain Pigeon records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Eurasian Collared-Dove/*Tórtola Collarina*

## *Streptopelia decaocto*



Photo by Carina Roig

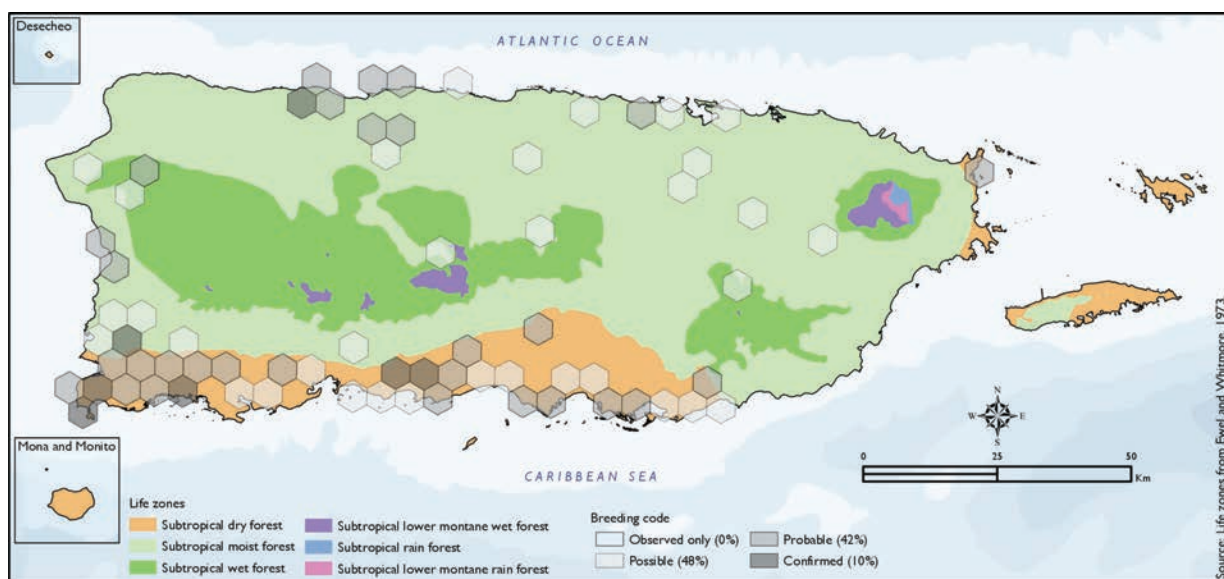
### Distribution and Habitat

The Eurasian Collared-Dove is native to Asia and Europe, and in the West Indies it has been introduced to The Bahamas, Guadeloupe (Raffaele and others 1998), and Puerto Rico (Biaggi 1997). It also occurs in Cuba, the Cayman Islands, Martinique, St. Christopher, Nevis, Montserrat, and Dominica (Raffaele and others 1998). It is a domesticated form of the African Collared-Dove (*S. roseogrisea*). It is expected that the entire West Indies will be colonized by birds from nearby populations (Raffaele and others 1998). This species' habitat consists of urban areas (Raffaele and others 1998). The atlas fieldwork yielded a

total of 113 records within 69 hexagons or 14 percent of the 479 total hexagons (see map). Of the 69 hexagons where this dove was found, breeding met the atlas definition of confirmed in 10 percent (7) of the hexagons, probable in 42 percent (29), and possible in 48 percent (33) (see map).

### Breeding Ecology

The Eurasian Collared-Dove builds a platform nest made of twigs, usually placed in a tree, bush, or palm, or on a building ledge (Raffaele and others 1998). Previously published reports indicate that it breeds primarily from March to August (Raffaele and others 1998). It has been



Eurasian Collared-Dove distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico.

found to hybridize with the African Collared-Dove in Europe (Fisher 1953). Atlas results show that this species' breeding season extends throughout the year, with the most breeding activity during May and June (see chart). Overall, the breeding activity peaks in May and mostly takes place within the subtropical dry forest life zone. Results show that this species breeds mostly in the southern coast of the island within the subtropical dry

forest life zone (54 percent of the hexagons) (see table). It also breeds in the subtropical moist forest life zone (42 percent of the hexagons) and within subtropical wet forest life zones at higher elevations (4 percent of the hexagons) (see table and map).

**Population Status and Conservation**

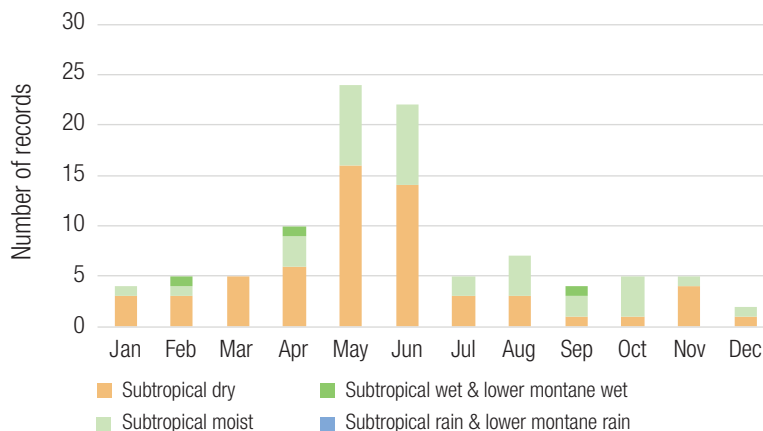
The Eurasian Collared-Dove is currently listed as a species of least concern by the IUCN

(BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Eurasian Collared-Dove has a protected habitat in land of 8 percent or 137 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1653 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Eurasian Collared-Dove breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	5	71	2	29	0	0	0	0	7
Probable	19	66	9	31	1	3	0	0	29
Possible	13	39	18	55	2	6	0	0	33
<b>Total</b>	<b>37</b>	<b>54</b>	<b>29</b>	<b>42</b>	<b>3</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>69</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Eurasian Collared-Dove records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# African Collared-Dove/ Paloma Collarina Africana

*Streptopelia roseogrisea*

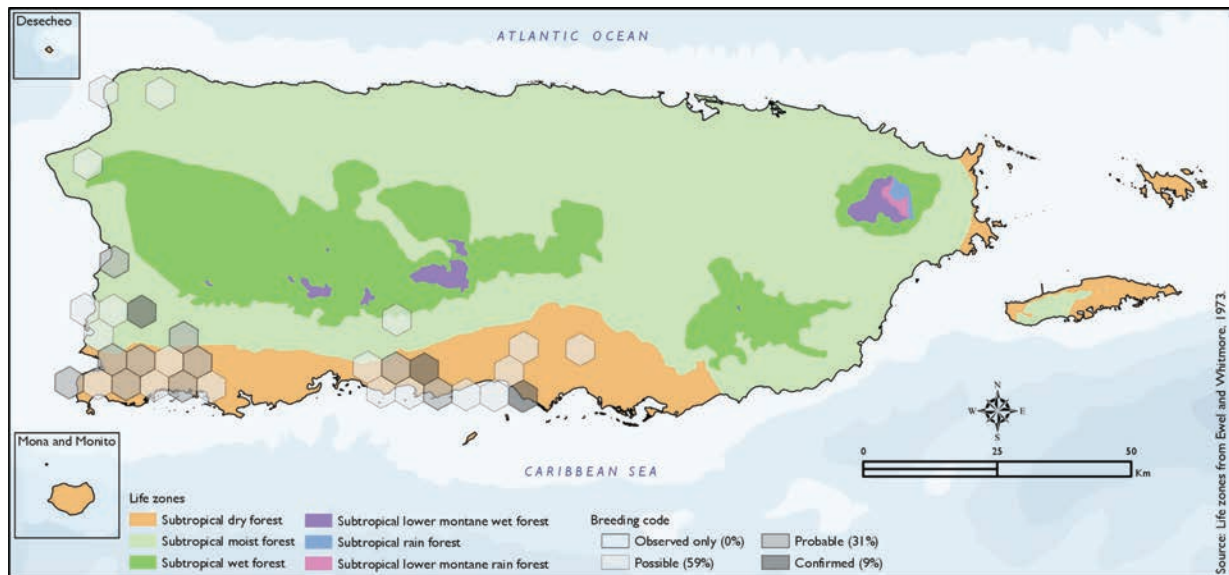
## Distribution and Habitat

The African Collared-Dove is a nonnative naturalized species in Puerto Rico, originally from sub-Saharan Africa and the Arabian Peninsula (Oberle 2018), whose presence has been confirmed in multiple records from the municipality of Cabo Rojo (Garrido and others 2007). In the past, this species was confused with the Eurasian Collared-Dove (*S. decaocto*), another nonnative species that looks very similar to the African Collared-Dove, but the former is larger and darker. In Oberle (2000), African Collared-Dove is included as

*S. risoria*; however, taxonomists do not consider *S. risoria* as a separate species but rather the domesticated form (Oberle 2018). This species is mostly associated with cities and urban areas near houses (Oberle 2018). The atlas fieldwork yielded a total of 48 records within 32 hexagons or 7 percent of the 479 total hexagons (see map). Of the 32 hexagons where this species was found, breeding met the atlas definition of confirmed in 9 percent (3) of the hexagons, probable in 31 percent (10), and possible in 59 percent (19) (see map).



Photo by Jordi Salguero Roig



African Collared-Dove distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

### Breeding Ecology

Published information about breeding seasonality is lacking for the African Collared-Dove in Puerto Rico. Atlas results show that the African Collared-Dove breeding season extends from January to July, with a peak in May (see chart). Results show that the African Collared-Dove is confined to the south and southwestern coastal lowlands within the subtropical dry (69

percent of the hexagons) and subtropical moist forest life zones (31 percent of the hexagons) of Puerto Rico (see table and map).

### Population Status and Conservation

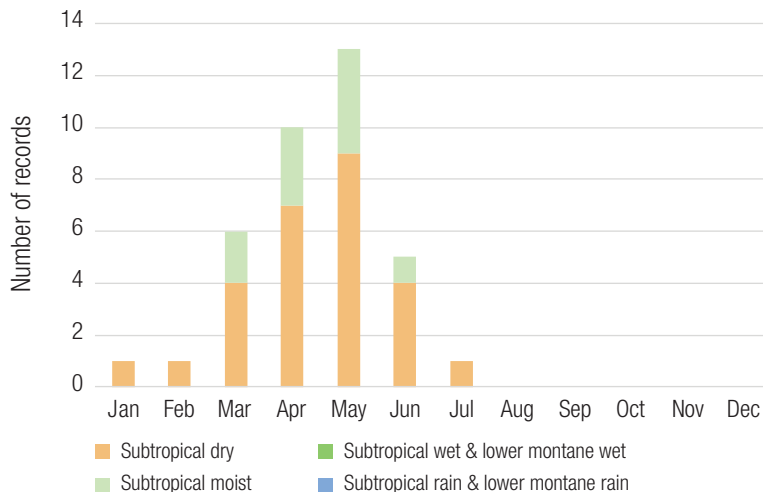
The African Collared-Dove global population size has not been quantified or assessed, but the species is described as common to locally abundant, and it is listed as a species of least concern by the IUCN (BirdLife

International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, this species has a protected habitat in land of 5 percent or 39 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found (767 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where African Collared-Dove breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	2	67	1	33	0	0	0	0	3
Probable	8	80	2	20	0	0	0	0	10
Possible	12	63	7	37	0	0	0	0	19
<b>Total</b>	<b>22</b>	<b>69</b>	<b>10</b>	<b>31</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>32</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of African Collared-Dove records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Common Ground-Dove/Rolita

## *Columbina passerina*

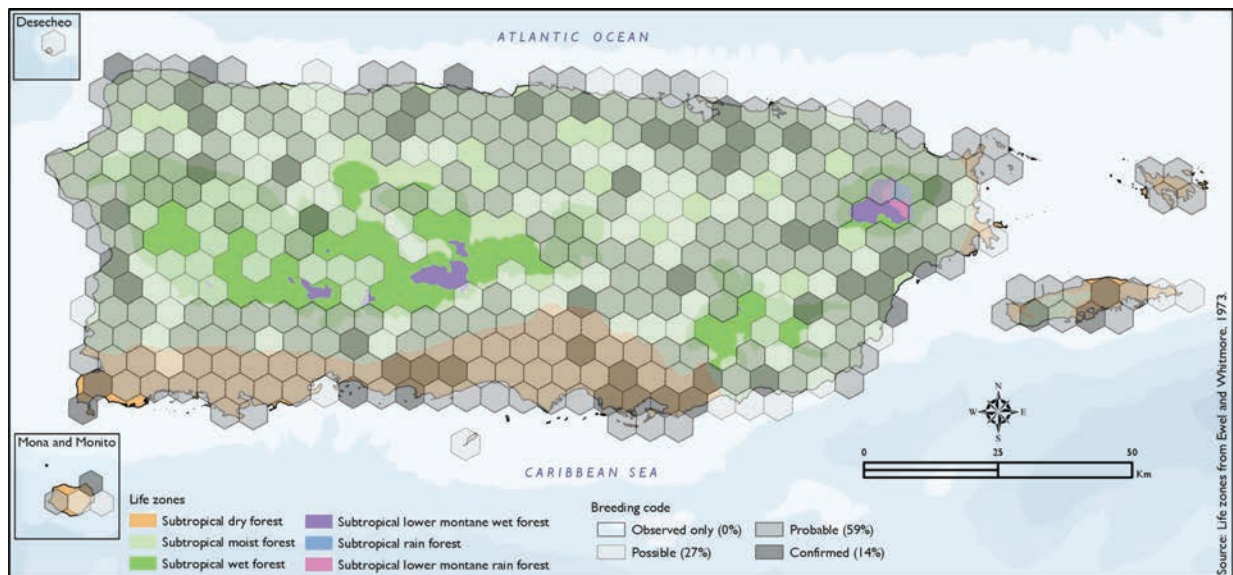


Photo by José Salguero

### Distribution and Habitat

The Common Ground-Dove occurs through the Southern United States, Mexico, Central America, and northern South America including the West Indies (Raffaele and others 1998). It is a year-round and very common resident in Puerto Rico (Raffaele and others 1998), Culebra, Mona (Ventosa-Febles and others 2005), and Vieques islands (Gemmill 2015). Puerto Rico and its satellite islands harbor an endemic subspecies (*C. p. portoricensis*), with the exception of Mona, which has another subspecies

(*C. p. exigua*). The Common Ground-Dove uses a wide range of lowland habitats (Raffaele and others 1998) including forest edges, farms, open country, gardens, and towns (Oberle 2018). The atlas fieldwork yielded a total of 861 records within 378 hexagons or 80 percent of the 479 total hexagons (see map). Of the 378 hexagons where this species was found, breeding met the atlas definition of confirmed in 14 percent (53) of the hexagons, probable in 59 percent (223), and possible in 27 percent (102) (see map).



Common Ground-Dove distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

### Breeding Ecology

The Common Ground-Dove builds a nest made of rootlets, grasses, or twigs in a shrub or tree, or on the ground. Previously published reports indicate that it breeds year-round, but breeding peaks during May and June (Raffaele and others 1998). Atlas results show that this species breeds throughout the year, with the

most breeding activity from March to June and with a peak in May (see chart). Results indicate that the Common Ground-Dove breeds within all ecological life zones (see table and map).

### Population Status and Conservation

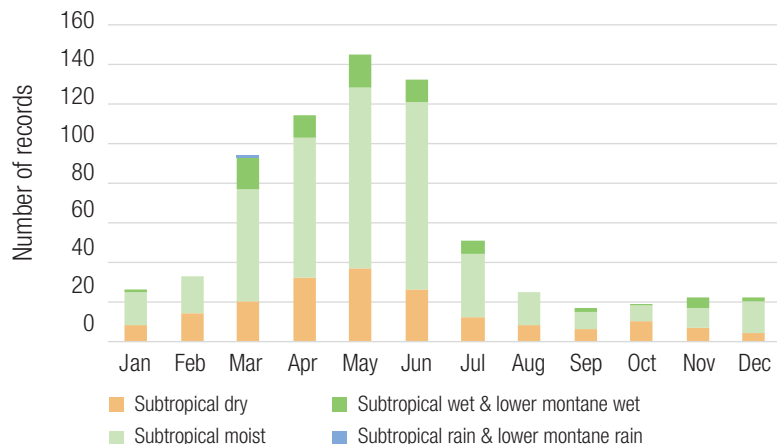
The Common Ground-Dove current population trend is suspected to be decreasing, but it is listed as a species of least

concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Common Ground-Dove has a protected habitat in land of 12 percent or 1105 km<sup>2</sup> of the total area covered by the hexagons where this species is known to breed (9040 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Common Ground-Dove breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	17	32	32	60	4	8	0	0	53
Probable	60	27	142	64	20	9	1	<1	223
Possible	11	11	65	64	26	25	0	0	102
<b>Total</b>	<b>88</b>	<b>23</b>	<b>239</b>	<b>63</b>	<b>50</b>	<b>13</b>	<b>1</b>	<b>&lt;1</b>	<b>378</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Common Ground-Dove records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Ruddy Quail-Dove/Paloma Perdiz Rojiza

## *Geotrygon montana*

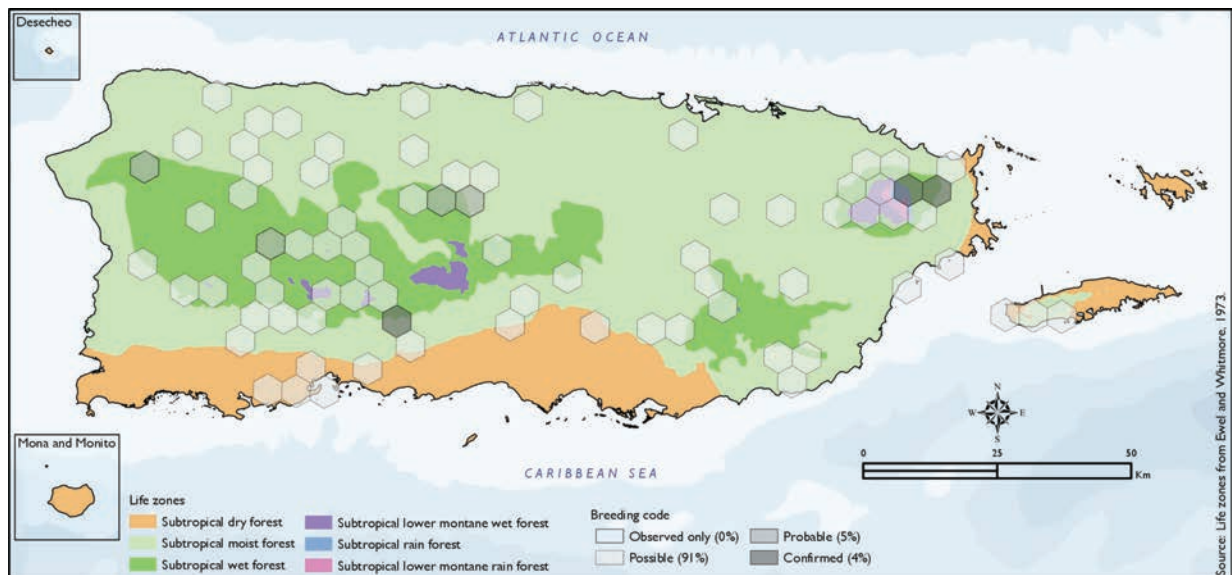


Photo by Pedro W. Santana

### Distribution and Habitat

The Ruddy Quail-Dove breeds from Mexico to Brazil and throughout the West Indies (Raffaele and others 1998). In Puerto Rico, it has been reported from Maricao and Carite State Forests (Bowdish 1902, Oberle 2018), all forested areas at lower elevations of the Sierra de Luquillo (Recher and Recher 1966), and Mona (Terborgh and Faaborg 1973). It is described as extremely rare on Vieques (Gemmill 2015). This species usually inhabits humid and heavily forested areas among the hills and mountains, and it

is common in coffee, citrus, and cacao plantations (Bond 1961, Oberle 2000, Raffaele 1989a). It is associated with dense forests with a well-developed understory (Oberle 2018), as it dwells mostly on the forest floor (Raffaele 1989a). The atlas fieldwork yielded a total of 97 records within 77 hexagons or 16 percent of the 479 total hexagons (see map). Of the 77 hexagons where this species was found, breeding met the atlas definition of confirmed in 4 percent (3) of the hexagons, probable in 5 percent (4), and possible in 91 percent (70) (see map).



Ruddy Quail-Dove distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

The Ruddy Quail-Dove builds nests made of twigs and leaves, usually low on fallen trees or small shrubs (Biaggi 1997, Raffaele 1989a). The nests are commonly constructed near or on the ground, and previously published reports indicate that breeding occurs from February to August (Raffaele 1989a). Nevertheless, atlas results show that this species' breeding season extends throughout the year, with the most breeding activity in April, May, and June (see chart). Results show that this

species breeds mostly within the subtropical moist forest life zone (53 percent of the hexagons), as well as in subtropical wet and lower montane wet forest life zones (36 percent of the hexagons) to a lesser extent (see table and map). Most of the confirmed breeding records are from the Sierra de Luquillo.

**Population Status and Conservation**

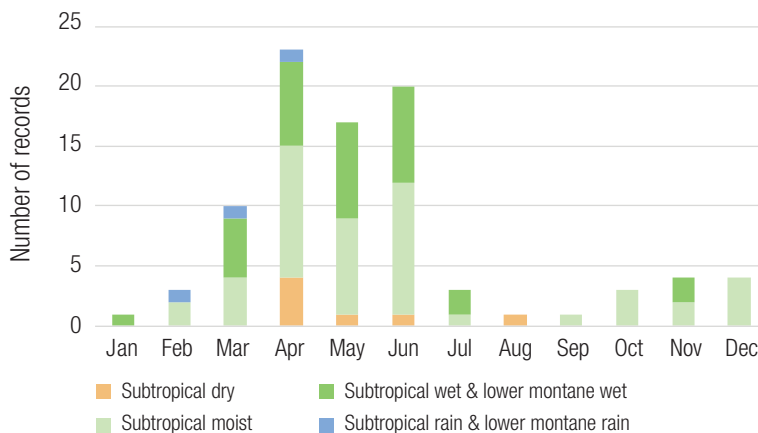
This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). However, it is predicted to lose 16.5–18.7 percent of

suitable habitat within its distribution range over three generations, or around 14 years, based on Amazonian deforestation model projections (Bird and others 2012, Soares-Filho and others 2006). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Ruddy Quail-Dove has a protected habitat in land of 25 percent or 455 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1842 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Ruddy Quail-Dove breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	1	33	1	33	1	33	3
Probable	0	0	1	25	3	75	0	0	4
Possible	7	10	39	56	24	34	0	0	70
<b>Total</b>	<b>7</b>	<b>9</b>	<b>41</b>	<b>53</b>	<b>28</b>	<b>36</b>	<b>1</b>	<b>1</b>	<b>77</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Ruddy Quail-Dove records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Key West Quail-Dove/Paloma Perdiz Áurea

## *Geotrygon chrysia*

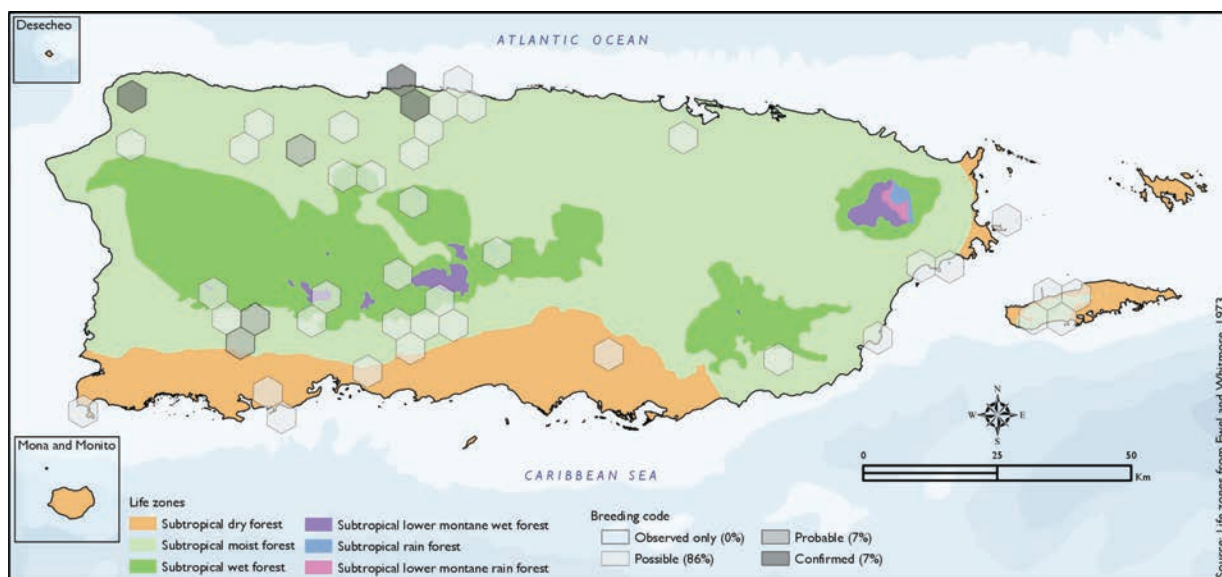


Photo by Jan Zegarra

### Distribution and Habitat

The Key West Quail-Dove is a species native to the Greater Antilles and The Bahamas (Raffaele and others 1998). In Puerto Rico, this species has been reported for the mainland, Mona, and Vieques (Biaggi 1997, Bowdish 1902, Raffaele 1989a), in the latter being a rare to extremely rare resident (Gemmill 2015). In Puerto Rico, it is known from western Ponce in the southern region and from Arecibo to Isabela among the haystack hills of the northern coast. Nonetheless, a population was reported from the southern area of the Tortuguero Lagoon (Raffaele 1989a). It usually inhabits coastal forested areas and wooded, scrubby thickets in arid areas (Saliva 1994). It is

difficult to observe as it is more frequently found on the ground than in trees (Biaggi 1997). The species mostly inhabits the understory of dense forests with ample leaf litter, primarily in arid and semi-arid areas. However, it has also been documented in moist and wet mountain forests with undisturbed understory (Raffaele and others 1998). The atlas fieldwork yielded a total of 63 records within 44 hexagons or 9 percent of the 479 total hexagons (see map). Of the 44 hexagons where this species was found, breeding met the atlas definition of confirmed in 7 percent (3) of the hexagons, probable in 7 percent (3), and possible in 86 percent (38) (see map).



Key West Quail-Dove distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

### Breeding Ecology

The Key West Quail-Dove builds its nest of branches and plants (Biaggi 1997). The nests are usually built above the ground in bushes or small trees and are commonly located either on the ground or in low undergrowth among bromeliads (Raffaele 1998). Atlas results show that this species' breeding season extends mostly from January to August, with the most breeding activity from March through June, and to a lesser extent from October to December (see chart). Results show that this species breeds

within the subtropical moist forest life zone (66 percent of the hexagons) at the northern karst region of the island, although it is considered possible for it to breed in the subtropical dry forest life zone (16 percent of the hexagons) as well as in the subtropical wet and lower montane wet forest life zones (18 percent of the hexagons) (see table and map).

### Population Status and Conservation

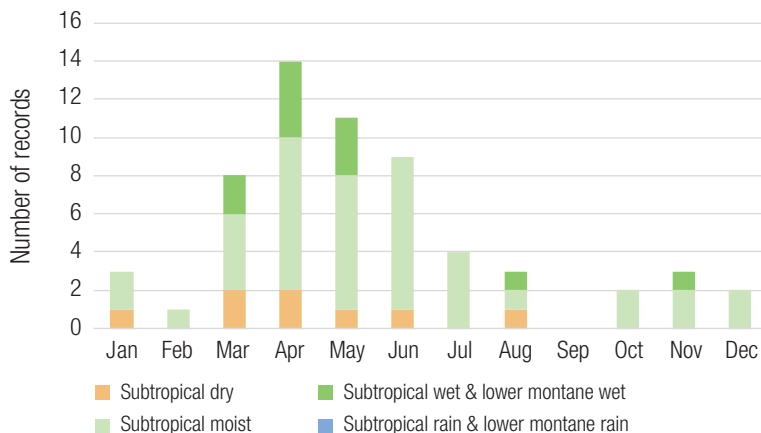
The global population trend of the Key West Quail-Dove has not been quantified or assessed, but

it is described as 'fairly common' (Stotz and others 1996). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Key West Quail-Dove has a protected habitat in land of 24 percent or 255 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1052 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Key West Quail-Dove breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	3	100	0	0	0	0	3
Probable	0	0	3	100	0	0	0	0	3
Possible	7	18	23	61	8	21	0	0	38
<b>Total</b>	<b>7</b>	<b>16</b>	<b>29</b>	<b>66</b>	<b>8</b>	<b>18</b>	<b>0</b>	<b>0</b>	<b>44</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Key West Quail-Dove records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Bridled Quail-Dove/ Paloma Perdiz de Martinica

*Geotrygon mystacea*



Photo by Daphe Gemmill

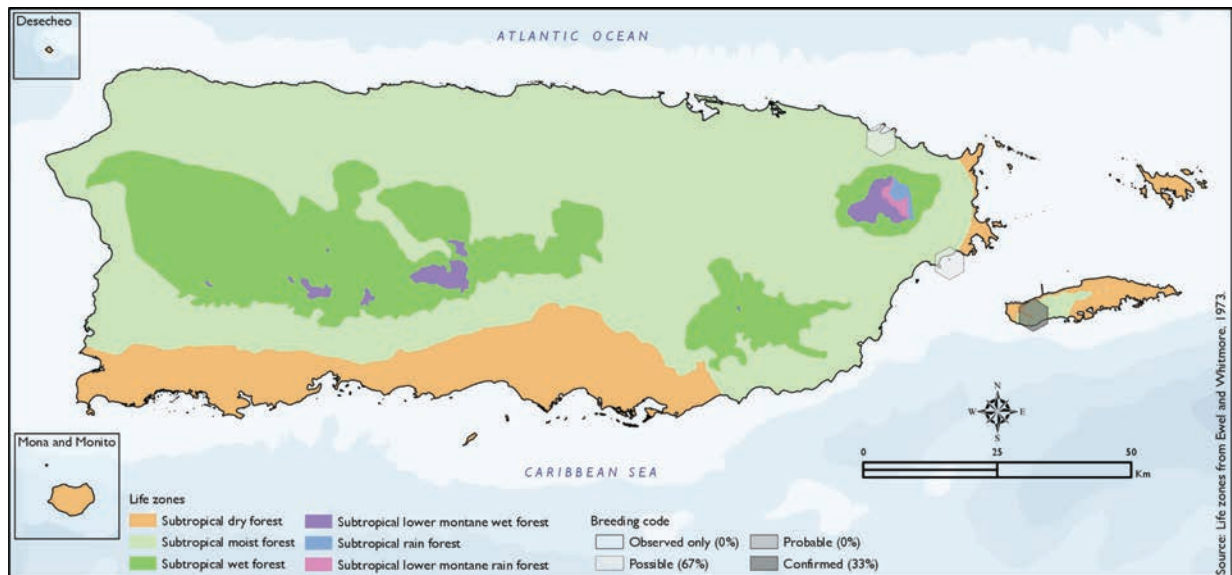
## Distribution and Habitat

The Bridled Quail-Dove is an extremely rare resident species in Puerto Rico (Raffaele and others 1998). On Vieques, it is described as a rare resident, restricted to the higher elevations of Mt. Pirata and Cerro El Buey (Gemmill 2015), and there are also records from Culebra (Biaggi 1997). This species is a secretive forest dweller that prefers dense mountain or lowland woodlands (Boal 2011, Raffaele and others 1998). The atlas fieldwork yielded a total of 10 records within three hexagons or 0.6 percent of the 479 total hexagons

(see map). Of the three hexagons where this species was found, breeding met the atlas definition of confirmed in 33 percent (one) of the hexagons and possible in 67 percent (two) (see map).

## Breeding Ecology

Bridled Quail-Dove nests are small platforms of twigs that are placed in vines, shrubs, and trees at a low height. Previously published reports indicate that breeding takes place primarily from May to July but also from October to December (Boal 2011, Raffaele and others 1998). Atlas results do not show a clear



Bridled Quail-Dove distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

pattern as evidence of breeding is very low for this species (see chart). Results show that all breeding activity was associated with the subtropical moist forest life zone (100 percent of the hexagons) (see table and map).

**Population Status and Conservation**

The Bridled Quail-Dove population is suspected to be declining owing to habitat

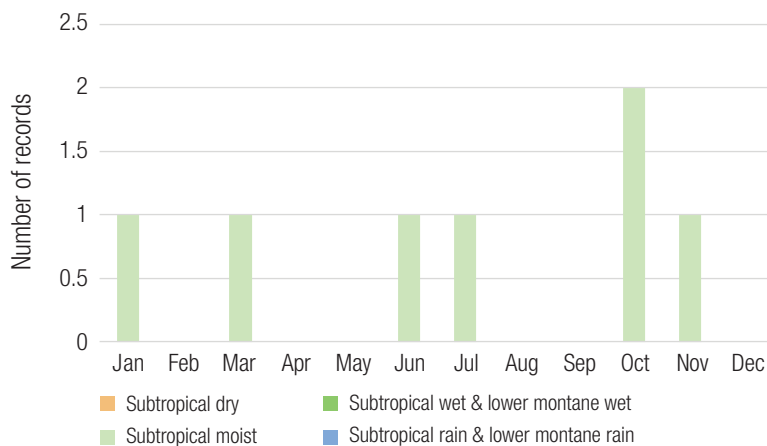
alteration and loss throughout its distribution (mostly the eastern Caribbean and Virgin Islands); introduction of mongooses (*Herpestes auropunctatus*), cats (*Felis catus*), and rats (*Rattus* spp.) to islands; and hunting (Boal 2011). However, the Bridled Quail-Dove is listed as a species of least concern by the IUCN (BirdLife International 2016), whereas in Puerto Rico

it is a conservation priority due to lack of data (PRDNER 2015, 2016). In Puerto Rico, the Bridled Quail-Dove has a protected habitat in land of 23 percent or 16 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (71 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Bridled Quail-Dove breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	0	0	1	100	0	0	0	0	1
Probable	0	0	0	0	0	0	0	0	0
Possible	0	0	2	100	0	0	0	0	2
<b>Total</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Bridled Quail-Dove records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# White-winged Dove/*Tórtola Aliblanca*

## *Zenaida asiatica*

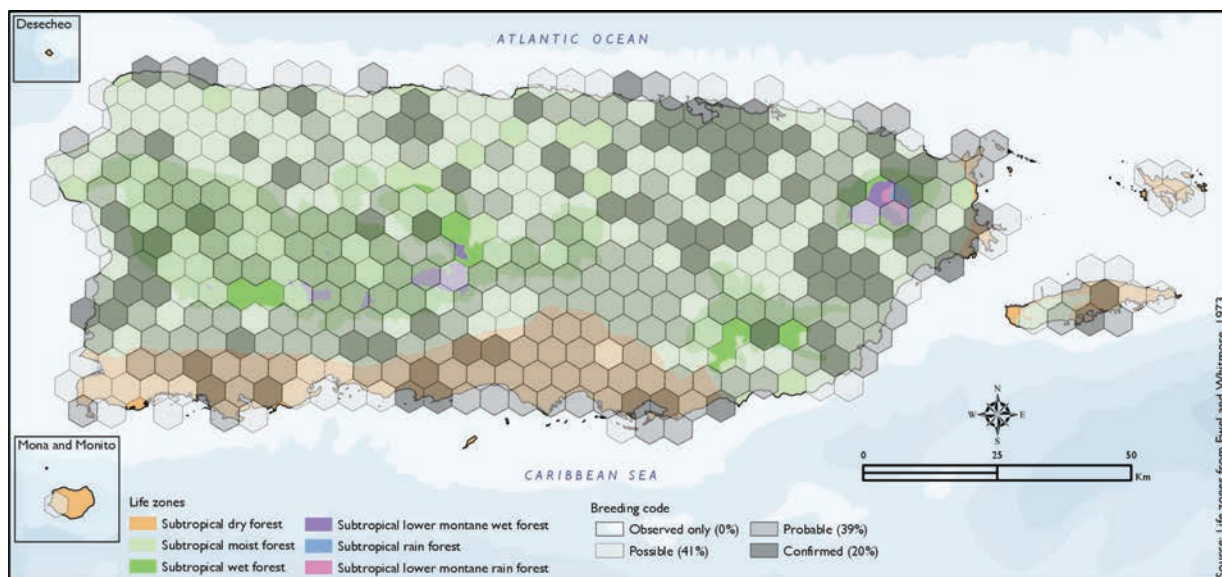


Photo by Michael More

### Distribution and Habitat

The White-winged Dove occurs through southern North America, Central America, and western South America (Bond 1961, Raffaele and others 1998). In the West Indies, it can be found in The Bahamas, Cuba, Jamaica, Hispaniola, the Cayman Islands, San Andrés, Providencia, Puerto Rico, St. Croix, St. John (Raffaele and others 1998), and St. Thomas. The species was first recorded on Puerto Rico in 1943 (Raffaele 1989a) and has since expanded its range throughout the island. It first occurred on Vieques in 1971 (Sorrié 1975) where it is now an abundant

breeding resident (Gemmill 2015). This species occurs mostly in gardens, agricultural areas, mangroves, dry scrub forest (Oberle 2018), and open woodlands (Raffaele and others 1998, Saliva 1994). The atlas fieldwork yielded a total of 966 records within 412 hexagons or 86 percent of the 479 total hexagons (see map). Of the 412 hexagons where this species was found, breeding met the atlas definition of confirmed in 20 percent (82) of the hexagons, probable in 39 percent (162), and possible in 41 percent (168) (see map).



White-winged Dove distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

### Breeding Ecology

Previously published reports indicate that the White-winged Dove breeds throughout the year in urban areas and from April to June in arid zones (Raffaele and others 1998). It mostly breeds colonially and builds a frail nest made of twigs and grasses, usually placed at a low to moderate height (Raffaele and others 1998). Atlas results show that this species' breeding season extends throughout the year with the most breeding activity from March to June (see chart). The breeding activity peaks in May at the onset of the rainy season,

and it mostly takes place in the subtropical moist forest life zone (see chart). Results show that this species breeds mostly within the subtropical moist forest life zone (60 percent of the hexagons) (see table). It also breeds in the subtropical dry forest life zone (21 percent of the hexagons) and at higher elevations within the subtropical wet and lower montane wet forest life zones (19 percent of the hexagons) (see table and map).

### Population Status and Conservation

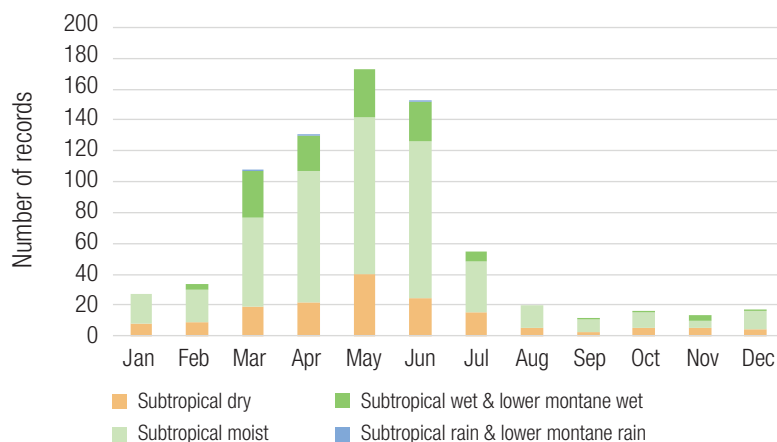
The current population trend of the White-winged Dove is

described as 'increasing' in North America (Butcher and Niven 2007). This species is currently listed as a species of Least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the White-winged Dove has a protected habitat in land of 12 percent or 1230 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (9853 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where White-winged Dove breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	14	17	61	74	6	7	1	1	82
Probable	42	26	78	48	42	26	0	0	162
Possible	29	17	109	65	30	18	0	0	168
<b>Total</b>	<b>85</b>	<b>21</b>	<b>248</b>	<b>60</b>	<b>78</b>	<b>19</b>	<b>1</b>	<b>&lt;1</b>	<b>412</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of White-winged Dove records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by José Salguero

# Zenaida Dove/ Tórtola Cardosantera

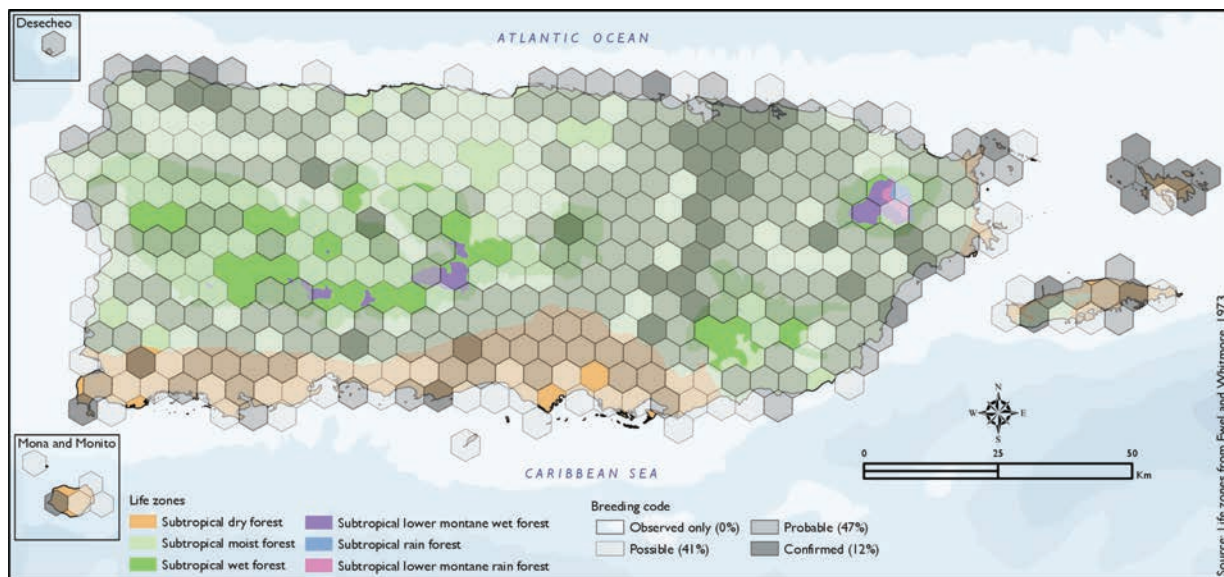
## *Zenaida aurita*

### Distribution and Habitat

The Zenaida Dove occurs on the south coast of Florida, the coast of the Yucatán Peninsula, and throughout the West Indies, where it is a common year-round resident (Raffaele and others 1998). It is fairly abundant throughout Puerto Rico and can

be seen from cultivated fields in the lowlands all the way up to the mountains (Biaggi 1997, Rivera-Milán 1996). It also occurs in Mona (Barnés 1946, Gordon and others 1961, Oberle 2018, Terborgh and Faaborg 1973), Desecheo (Meier and others 1989), Culebra (Oberle 2018, Wetmore 1917), and Vieques (Sorrié 1975, USFWS 1994), in the latter being a common resident throughout the year (Gemmill 2015). It is found throughout the archipelago including mangrove cays and other small cays with scarce vegetation. This species primarily inhabits open coastal areas, hotel grounds, and gardens but also scrub thickets, open woodlands,

pine woods (Raffaele and others 1998), farms, towns (Oberle 2018), coffee plantations (Biaggi 1997), and mangroves (Biaggi 1997, Oberle 2018, Sorrié 1975). The atlas fieldwork yielded a total of 938 records within 406 hexagons or 85 percent of the 479 total hexagons (see map). Of the 406 hexagons where this species was found, breeding met the atlas definition of confirmed in 12 percent (48) of the hexagons, probable in 47 percent (192), and possible in 41 percent (165), while this species was also observed in an additional hexagon (<1 percent) but without evidence of breeding (see map).



Zenaida Dove distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

The Zenaida Dove generally builds a thin platform nest made of twigs, usually in a tree or bush, but sometimes on the ground (Raffaele and others 1998, Wiley 1991) or in a cactus, palm (Oberle 2018), and even mangroves (Sorrié 1975). Previously published reports indicate that breeding is variable as it occurs throughout the year in urban areas, from February to June in moist and wet habitats, and from April to June in dry or arid zones (Raffaele and others 1998). Atlas results show that this species' breeding season extends throughout the year with the

most breeding activity from March to June (see chart). The breeding activity peaks during May and June, and mostly takes place within the subtropical moist forest life zone (see chart). Results show that this species breeds throughout the island but mostly within the subtropical moist forest life zone (61 percent of the hexagons) (see table), but it also breeds in the subtropical dry forest life zone (23 percent of the hexagons) and within subtropical wet forest life zones at higher elevations (15 percent of the hexagons) (see table and map).

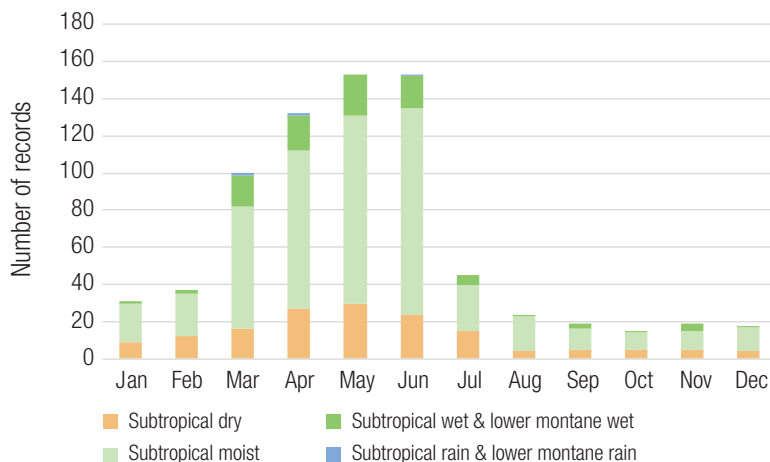
**Population Status and Conservation**

The current population trend of the Zenaida Dove is suspected to be increasing in some parts of the West Indies (del Hoyo and others 2013). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Zenaida Dove has a protected habitat in land of 12 percent or 1192 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (9685 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Zenaida Dove breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	14	29	32	67	2	4	0	0	48
Probable	34	18	132	69	26	14	0	0	192
Possible	46	28	84	51	34	21	1	1	165
<b>Total</b>	<b>94</b>	<b>23</b>	<b>248</b>	<b>61</b>	<b>62</b>	<b>15</b>	<b>1</b>	<b>&lt;1</b>	<b>405</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Zenaida Dove records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Mourning Dove/Tórtola Rabilarga

## *Zenaida macroura*

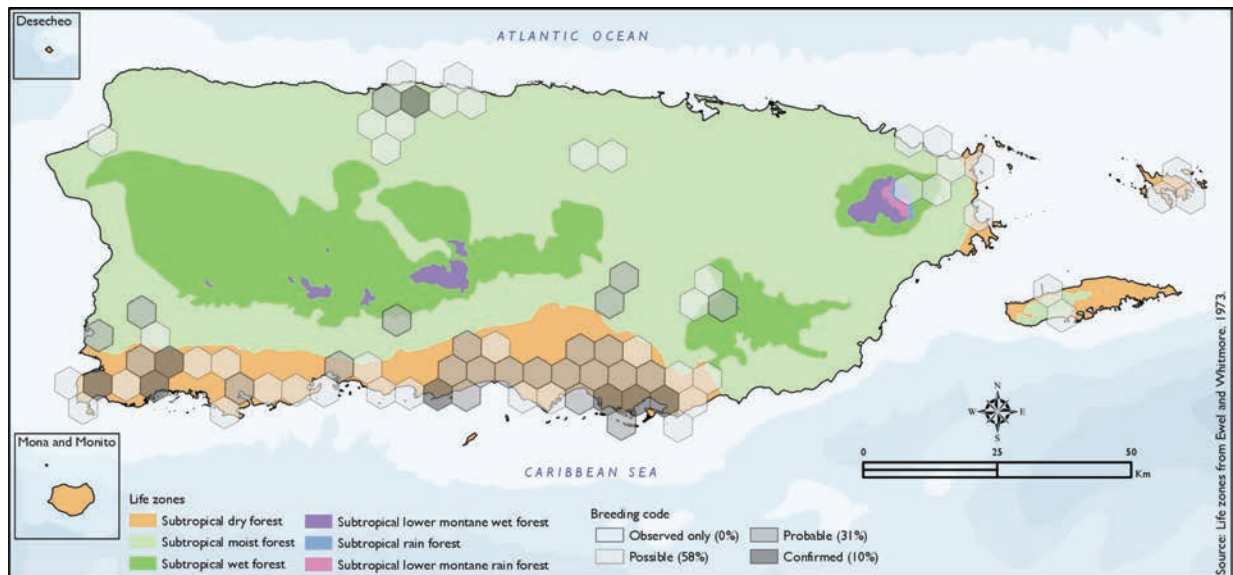


Photo by José Salguero

### Distribution and Habitat

The Mourning Dove occurs through North and Central America including the Caribbean (Raffaele and others 1998). This species was first reported in Puerto Rico in 1935 (Bond 1987) and in Vieques in 1967 (Bond 1967). In Puerto Rico, it occurs primarily in the southwestern region (Biaggi 1997) but also in the northern coastal plains, and it is known to inhabit satellite islands such as Mona (Gordon and others 1961) and Vieques. It is a rare resident throughout the year in Vieques (Gemmill 2015) and a rare visitor to Mona.

This species is associated mostly with subtropical dry and moist forest life zones, plantations (Rivera-Milán 1992), grassy fields (Saliva 1994), and open country of the lowlands (Raffaele and others 1998). The atlas fieldwork yielded a total of 129 records within 77 hexagons or 16 percent of the 479 total hexagons (see map). Of the 77 hexagons where this species was found, breeding met the atlas definition of confirmed in 10 percent (8) of the hexagons, probable in 31 percent (24), and possible in 58 percent (45) (see map).



Mourning Dove distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

The Mourning Dove builds a nest made of twigs and grasses, which is usually placed in a bush or tree at a low to medium height (Raffaele and others 1998). Previously published reports indicate that it breeds from March to August (Raffaele and others 1998). Atlas results suggest that this species' breeding season extends throughout the year, with the most breeding activity from March to June (see chart). Overall, the breeding activity peaks in April. Results show that

this species breeds mostly on the southern coast of the island within the subtropical dry forest life zone (64 percent of the hexagons) (see table). However, results indicate that it also breeds in the lowlands within subtropical moist forest life zone (32 percent of the hexagons) (see table and map).

**Population Status and Conservation**

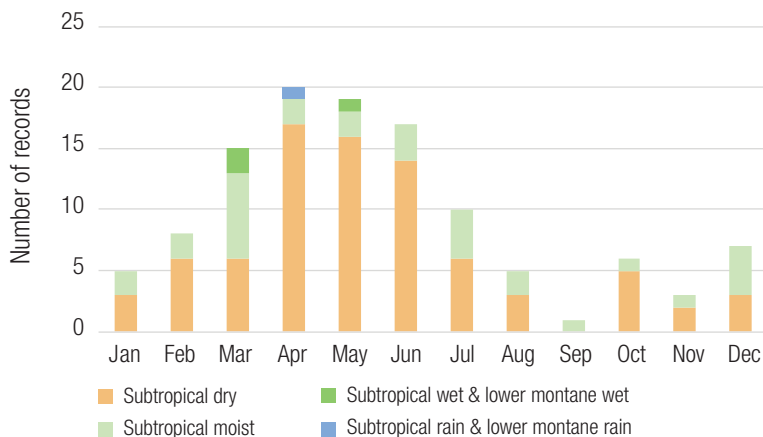
The current population trend of the Mourning Dove is described as 'increasing' in North America

(Butcher and Niven 2007). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Mourning Dove has a protected habitat in land of 13 percent or 236 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found this species (1842 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Mourning Dove breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	7	88	1	13	0	0	0	0	8
Probable	17	71	6	25	1	4	0	0	24
Possible	25	56	18	40	1	2	1	2	45
<b>Total</b>	<b>49</b>	<b>64</b>	<b>25</b>	<b>32</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>77</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Mourning Dove records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Smooth-billed Ani/Garrapatero o Judío

## *Crotophaga ani*

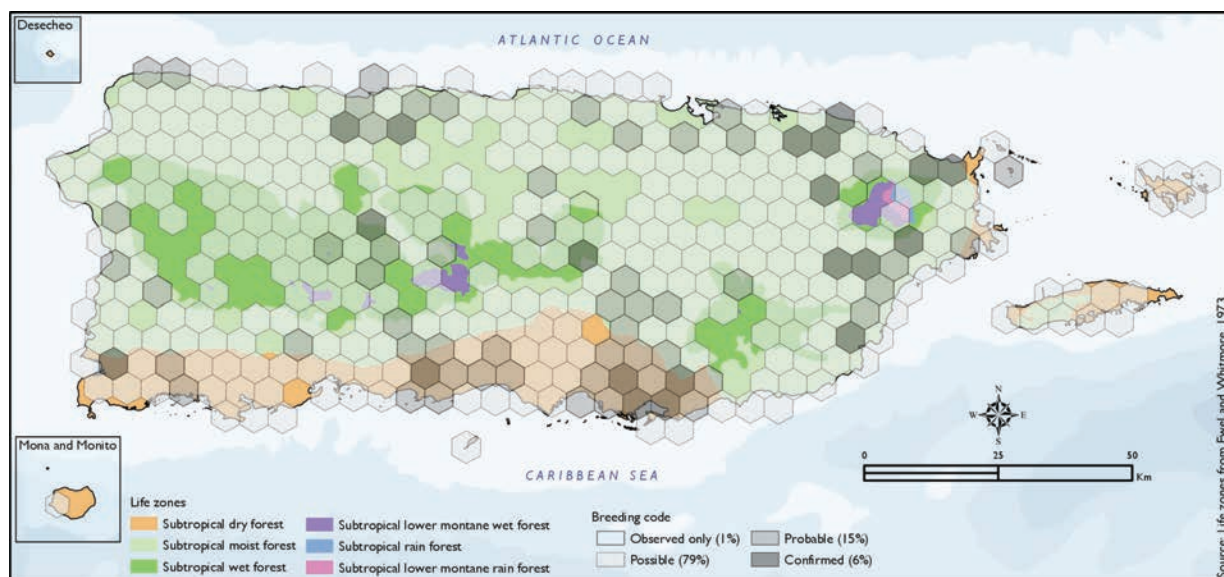
### Distribution and Habitat

The Smooth-billed Ani occurs from the southern tip of the United States through the West Indies, and from Costa Rica through most of South America (Biaggi 1997, Raffaele and others 1998). It is a common widespread breeding resident in Puerto Rico (Oberle 2018, Raffaele 1989a) and satellite islands such as Desecheo (Meier and others 1989), Mona (Barnés 1946, Gordon and others 1961, Terborgh and Faaborg 1973), Culebra (Wetmore 1917), and Vieques (Saliva 1994, Sorrié 1975, Wetmore 1916), in the latter being a fairly common resident (Gemmill 2015). Anis are most

common, usually in flocks, in open and semi-open habitats including pastures with scattered trees and shrubby fields (Oberle 2018, Raffaele 1989a). The atlas fieldwork yielded a total of 631 records within 359 hexagons or 75 percent of the 479 total hexagons (see map). Of the 359 hexagons where this species was found, breeding met the atlas definition of confirmed in 6 percent (20) of the hexagons, probable in 15 percent (54), and possible in 79 percent (282), while the species was observed in 1 percent (3) of the hexagons but without evidence of breeding (see map).



Photo by José Salguero



Smooth-billed Ani distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

## Breeding Ecology

The Smooth-billed Ani builds a large bulky nest made mostly of twigs, leaves, and dried plant material, usually placed in a tree at several meters above the ground (Biaggi 1997). The nest is used communally by different females to lay their eggs (Raffaele and others 1998). Previously published reports indicate that this species appears to breed year-round (Raffaele and others 1998). Atlas results show that this species' breeding season extends throughout the year, with the most breeding

activity from March to June (see chart). Overall, the breeding activity peaks in June, and it mostly takes place within the subtropical moist forest life zone (63 percent of the hexagons) (see table). However, results indicate that it also breeds in the southern region within the subtropical dry forest life zone (22 percent of the hexagons) and in subtropical wet and lower montane wet forest life zones at higher elevations (15 percent of the hexagons) (see table and map).

## Population Status and Conservation

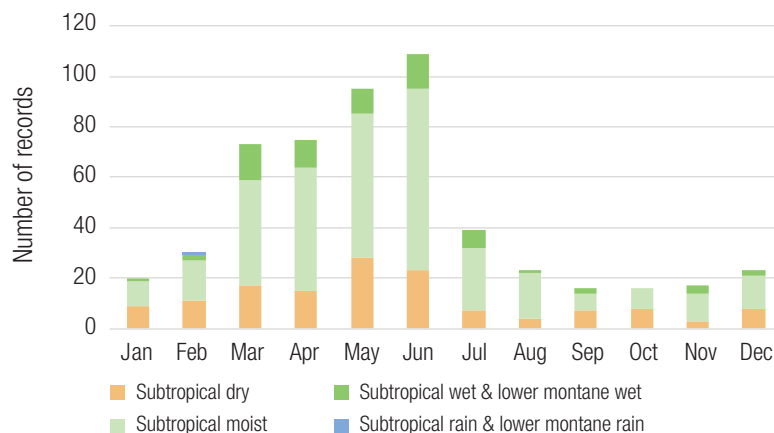
The current population trend of the Smooth-billed Ani is described as decreasing in North America (Butcher and Niven 2007). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Smooth-billed Ani has a protected habitat in land of 12 percent or 1020 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (8490 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Smooth-billed Ani breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	6	30	12	60	2	10	0	0	20
Probable	18	33	32	59	4	7	0	0	54
Possible	53	19	179	64	48	17	1	<1	281 <sup>b</sup>
<b>Total</b>	<b>77</b>	<b>22</b>	<b>223</b>	<b>63</b>	<b>54</b>	<b>15</b>	<b>1</b>	<b>&lt;1</b>	<b>355</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.

<sup>b</sup> A different number of total hexagons for each breeding code in this table may not reflect the actual number of hexagons where the species was found breeding, as some of the hexagons in the coastal zone or on the water may not have ecological life zone data.



Number of Smooth-billed Ani records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by José Salguero

# Yellow-billed Cuckoo/ Pájaro Bobo Piquiamarillo

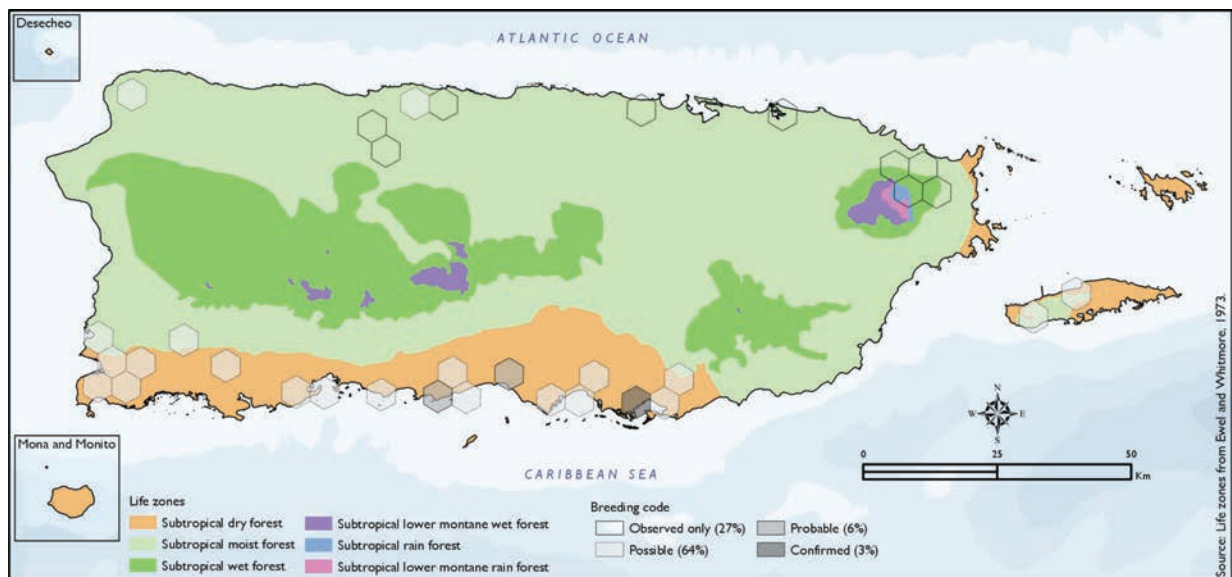
## *Coccyzus americanus*

### Distribution and Habitat

The Yellow-billed Cuckoo occurs from the United States through South America including the West Indies, where one population consists of uncommon to rare breeding residents from May to August on Cuba, Hispaniola, Puerto Rico, Jamaica, and the Virgin Islands

(Raffaele and others 1998). Another population migrates south from North America during September and October and returns to the north during March and April (Raffaele and others 1998). As a migrant, it is common in the southern part of The Bahamas, Cuba, Hispaniola, and Puerto Rico, while it is uncommon in the northern part of The Bahamas, the Cayman Islands, and Jamaica, and rare in the Virgin Islands (Raffaele and others 1998). It is described as a rare passage migrant in spring, and extremely rare in summer and fall on Vieques (Gemmill 2015). However, during migration and winter it can be

found anywhere in the islands. This species usually inhabits dry forests and lowland scrub (Raffaele and others 1998), and it mostly occurs in dry coastal regions in Puerto Rico (Biaggi 1997). The atlas fieldwork yielded a total of 44 records within 33 hexagons or 7 percent of the 479 total hexagons (see map). Of the 33 hexagons where this species was found, breeding met the atlas definition of confirmed in 3 percent (1) of the hexagons, probable in 6 percent (2), and possible in 64 percent (21), while the species was observed in 27 percent (9) of the hexagons but without evidence of breeding (see map).



Yellow-billed Cuckoo distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

The Yellow-billed Cuckoo builds a cup-shaped nest made of twigs and dried grass, which is usually placed low in a bush (Raffaele and others 1998). Previously published reports indicate that it breeds from April to July (Raffaele and others 1998). Atlas results show that this species breeds mostly from April to August, with one record each in February and November, and a peak in May (see chart). Results

show that this species breeds mostly within the subtropical dry forest life zone (79 percent of the hexagons) (see table), but it may also breed in subtropical moist forests (21 percent of the hexagons) (see table and map).

**Population Status and Conservation**

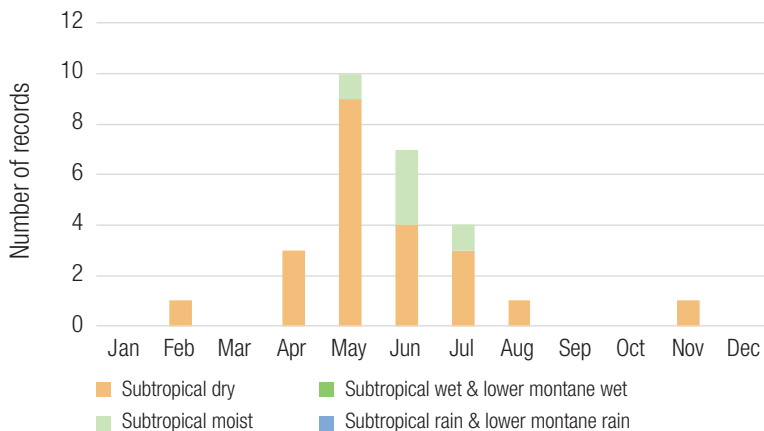
The current population trend of the Yellow-billed Cuckoo is described as ‘decreasing’ in North America (BirdLife International 2016, Butcher and Niven 2007).

This species is currently listed as a species of Least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Yellow-billed Cuckoo has a protected habitat in land of 10 percent or 58 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (575 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Yellow-billed Cuckoo breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	1	100	0	0	0	0	0	0	1
Probable	2	100	0	0	0	0	0	0	2
Possible	16	76	5	24	0	0	0	0	21
<b>Total</b>	<b>19</b>	<b>79</b>	<b>5</b>	<b>21</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>24</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Yellow-billed Cuckoo records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Mangrove Cuckoo/Pájaro Bobo Menor

## *Coccyzus minor*

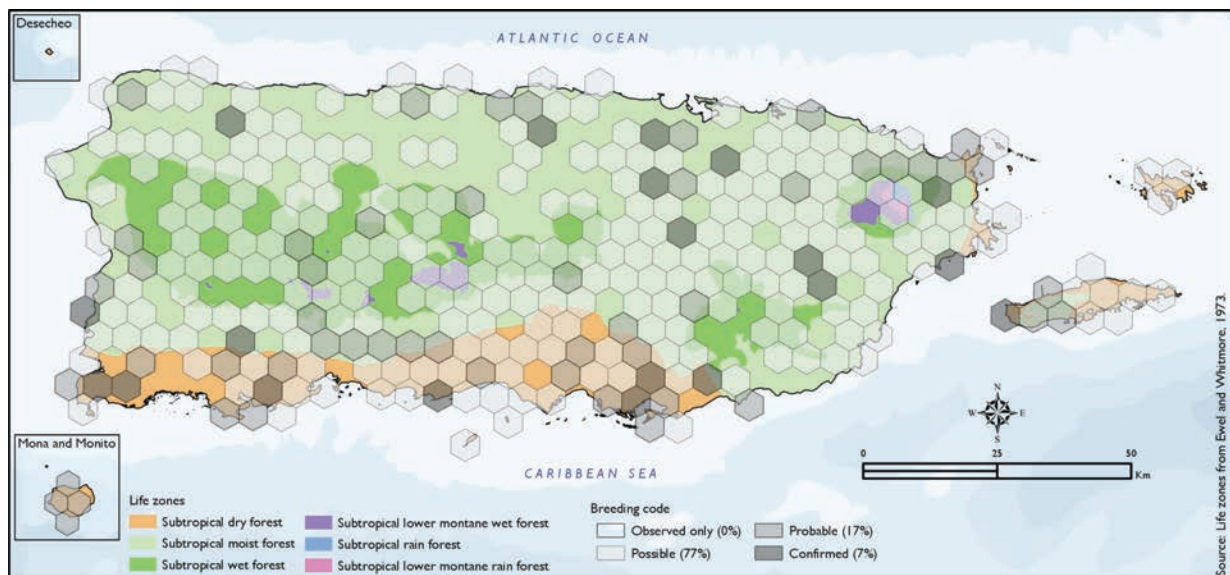


Photo by José Salguero

### Distribution and Habitat

The Mangrove Cuckoo occurs from south Florida in the United States through Central America and northern South America including the West Indies, where it is generally a common resident throughout most of the islands (Raffaele and others 1998). It is common and fairly abundant throughout Puerto Rico's mainland at all elevations (Biaggi 1997). It is also known to inhabit satellite islands such as Desecheo (Meier and others 1989), Culebra (Wetmore 1917), Mona (Barnés 1946, Bowdish 1902, Gordon and others 1961, Terborgh and Faaborg 1973), and Vieques (Sorrié 1975, Wetmore 1916),

in the latter being a common resident throughout the year (Gemmill 2015). This species generally inhabits mangroves and mangrove swamps, coffee plantations, thickets (Raffaele 1989a), limestone hills, coastal scrub, and mountain forests (Oberle 2018). The atlas fieldwork yielded a total of 513 records within 306 hexagons or 64 percent of the 479 total hexagons (see map). Of the 306 hexagons where this species was found, breeding met the atlas definition of confirmed in 7 percent (20) of the hexagons, probable in 17 percent (51), and possible in 77 percent (235) (see map).



Mangrove Cuckoo distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



### Breeding Ecology

The Mangrove Cuckoo builds a flimsy nest made of dry twigs and sticks, usually placed on a horizontal limb in a tree or bush (Biaggi 1997, Oberle 2018, Raffaele and others 1998). Previously published reports indicate that it breeds from February to June (Raffaele and others 1998). Atlas results show that this species' breeding season extends throughout the year with the most breeding activity from March to June (see chart). Overall, the breeding activity peaks in May at the onset of the

rainy season, and it mostly takes place in the subtropical moist forest life zone (57 percent of the hexagons) (see table and chart). It also breeds within the subtropical dry forest life zone (25 percent of the hexagons) and in the subtropical wet and lower montane wet forest life zones at higher elevations (19 percent of the hexagons) (see table and map).

### Population Status and Conservation

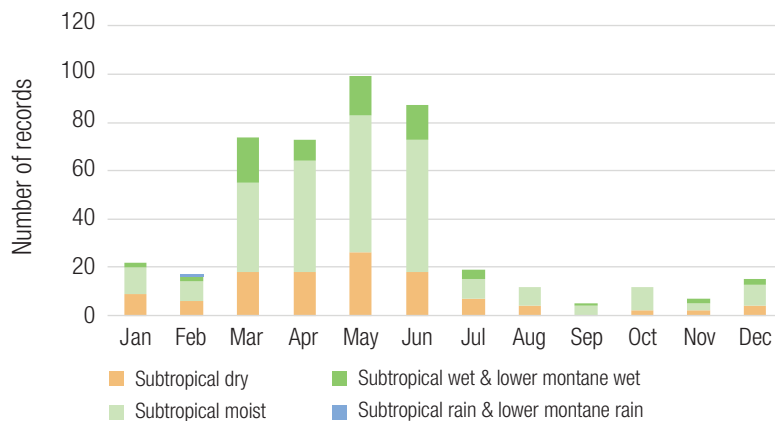
The current population trend of the Mangrove Cuckoo is suspected to be 'stable' due to

the lack of evidence for any declines or threats, and it is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Mangrove Cuckoo has a protected habitat in land of 12 percent or 911 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (7318 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Mangrove Cuckoo breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	8	40	11	55	1	5	0	0	20
Probable	20	39	27	53	4	8	0	0	51
Possible	47	20	135	57	52	22	1	<1	235
<b>Total</b>	<b>75</b>	<b>25</b>	<b>173</b>	<b>57</b>	<b>57</b>	<b>19</b>	<b>1</b>	<b>&lt;1</b>	<b>306</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Mangrove Cuckoo records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Puerto Rican Lizard-Cuckoo/Pájaro Bobo Mayor

## *Coccyzus vieilloti*

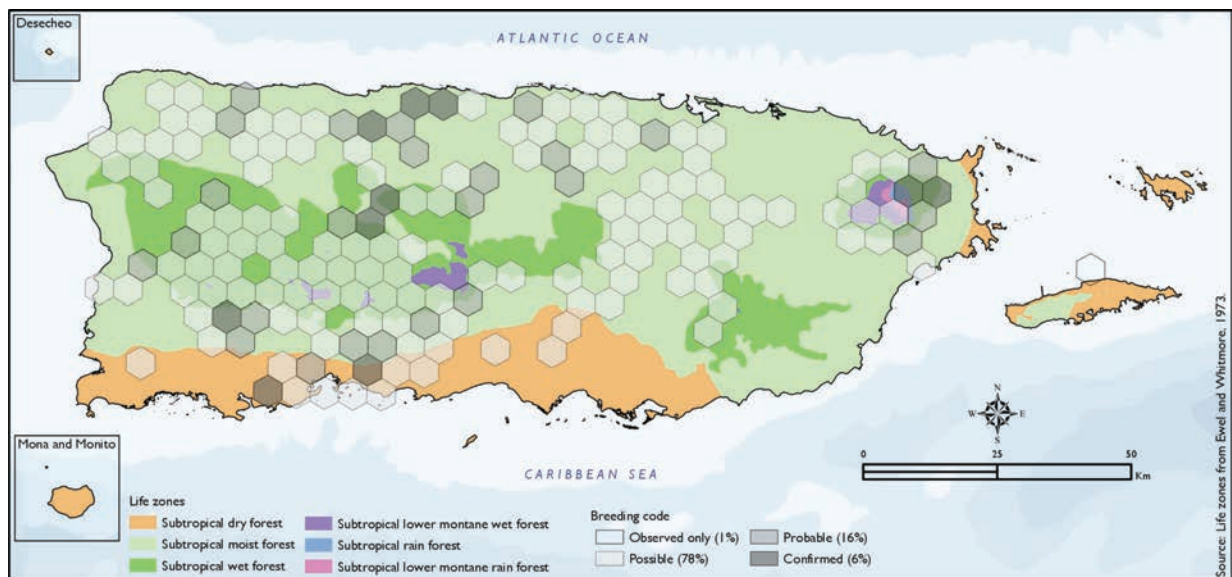


Photo by José Salguero

### Distribution and Habitat

The Puerto Rican Lizard-Cuckoo is endemic to Puerto Rico, where it is fairly common at all elevations (Raffaele and others 1998). It is considered a rare visitor on Vieques (Gemmill 2015). This is a common species in the haystack hills or mogotes of the north coast, shade coffee plantations, suburban neighborhoods with dense vegetation, and all mountainous areas with thick forests, and occurs in xeric forests in the vicinity of Guánica (Oberle 2018, Raffaele 1989a). Typical locations to find this species are at the Granados Trail in Guánica State Forest, on the trails at Guajataca and Vega State Forests, or around

the parking lot and entrance road to El Portal visitor center in El Yunque National Forest (Oberle 2018). It is also common below 900 m in Los Tres Picachos State Forest (Miranda-Castro and others 2000). The atlas fieldwork yielded a total of 269 records within 161 hexagons or 34 percent of the 479 total hexagons (see map). Of the 161 hexagons where this species was found, breeding met the atlas definition of confirmed in 6 percent (10) of the hexagons, probable in 16 percent (25), and possible in 78 percent (125), while the species was observed but without evidence of breeding in 1 percent (1) of the hexagons (see map).



Puerto Rican Lizard-Cuckoo distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

### Breeding Ecology

Based on the limited data available, the Puerto Rican Lizard-Cuckoo appears to breed throughout the year (Raffaele and others 1998). Pairs start courtship early in the year when males bring nesting materials to the females (J.A. Salguero-Faría, personal observation 2009). The nest is a loose structure made of leaves and sticks (Raffaele and others 1998). Atlas results show that this species breeds throughout the year with the

most breeding activity from March to June (see chart). Breeding activity peaks during April, and it mostly takes place within the subtropical moist forest life zone (58 percent of the hexagons) (see table). It also breeds within the subtropical wet and subtropical rain forest life zones (32 and 1 percent of the hexagons, respectively), as well as in the southern coastal plain within the subtropical dry forest life zone (9 percent of the hexagons) (see table and map).

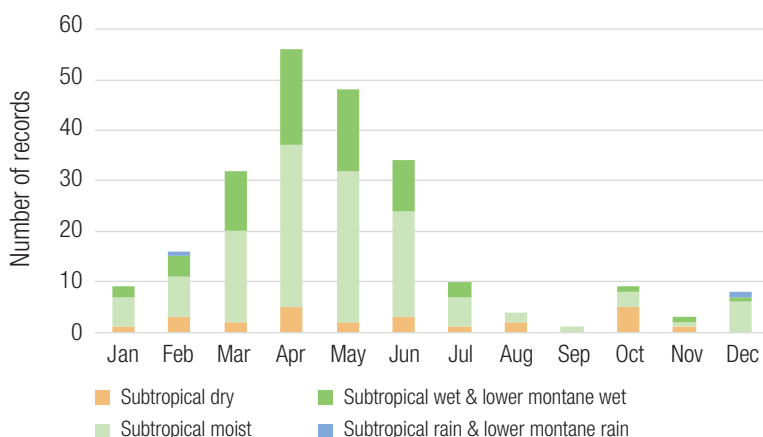
### Population Status and Conservation

This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Puerto Rican Lizard-Cuckoo has a protected habitat in land of 17 percent or 651 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (3828 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Puerto Rican Lizard-Cuckoo breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	2	20	4	40	3	30	1	10	10
Probable	1	4	19	76	5	20	0	0	25
Possible	12	10	70	56	43	34	0	0	125
<b>Total</b>	<b>15</b>	<b>9</b>	<b>93</b>	<b>58</b>	<b>51</b>	<b>32</b>	<b>1</b>	<b>1</b>	<b>160</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Puerto Rican Lizard-Cuckoo records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Antillean Nighthawk/Querequequé

*Chordeiles gundlachii*



Photo by Noelia Nieves

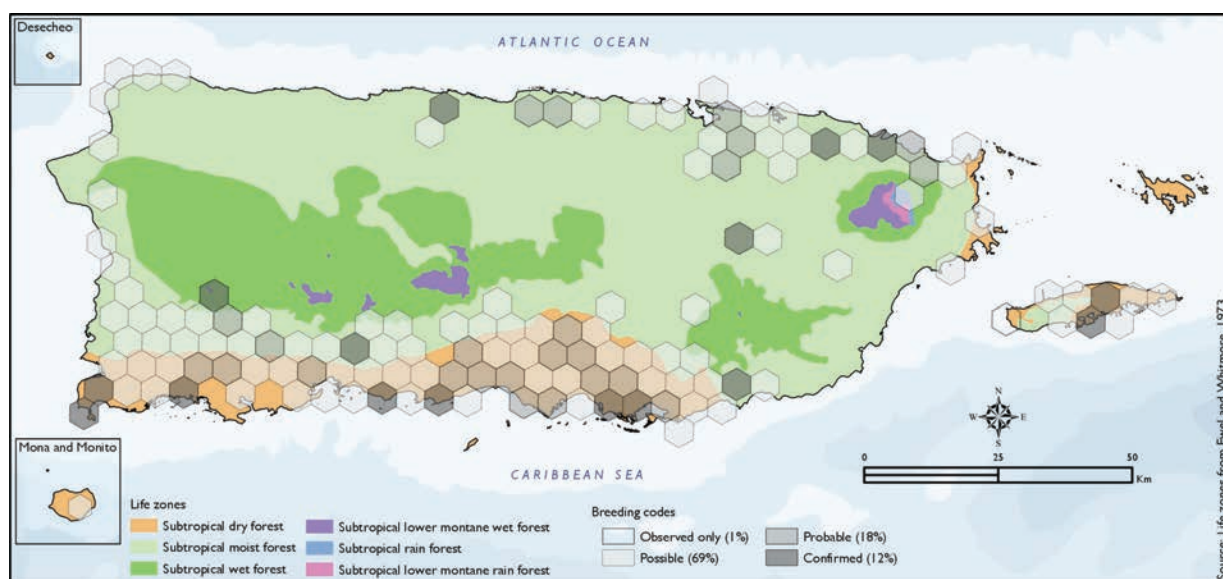
## Distribution and Habitat

The Antillean Nighthawk is a locally common breeding bird on Puerto Rico from May to August (Raffaele and others 1998). On Vieques, it is a rare breeding summer visitor (Gemmill 2015). This species has nocturnal and crepuscular habits, and inhabits open flat areas, pastures, savannas, gravel beaches, rocky outcrops, and coastal fringes (Biaggi 1997, Brigham and others 2011, Raffaele and others 1998). The atlas fieldwork yielded a total of 254 records within 134 hexagons or 28 percent of the 479 total hexagons (see map). Of the 134 hexagons where this species was found, breeding met

the atlas definition of confirmed in 12 percent (16) of the hexagons, probable in 18 percent (24), and possible in 69 percent (93), while the species was observed in 1 percent (1) of the hexagons but without evidence of breeding (see map).

## Breeding Ecology

The Antillean Nighthawk nests on the ground among leaves, sand, or gravel from May to July, according to previously published reports (Raffaele and others 1998). Also, it is well known for its propensity to nest on flat gravel roofs, especially in cities (Brigham and others



Antillean Nighthawk distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

2011). Atlas results indicate that the Antillean Nighthawk's breeding occurs mostly between March and August, with a peak in May within the subtropical dry forest life zone and in June within the subtropical moist forest life zone (see chart). We are skeptical of breeding observations in other months of the year, given that most nighthawks migrate out of Puerto Rico at this time. The "possible" category is probably not a good indication for breeding in this species. Results show that the Antillean Nighthawk mostly breeds within the subtropical

moist and subtropical dry forest life zones (51 and 47 percent of the hexagons, respectively), but some breeding activity has also been reported for the subtropical wet and subtropical rain forest life zones (see table and map). Most breeding is on the coastal plain with a paucity of records on the east coast.

**Population Status and Conservation**

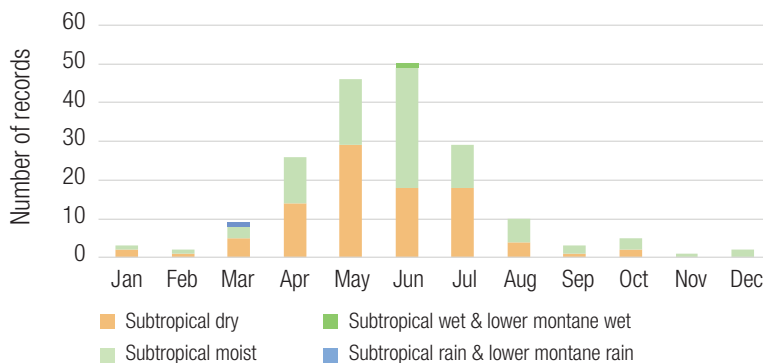
The Antillean Nighthawk population is suspected to be declining probably owing to increased predation, use of pesticides that reduce insect

numbers, and habitat loss (Brigham and others 2011). Despite the fact that the population trend appears to be decreasing, it is listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Antillean Nighthawk has a protected habitat in land of 10 percent or 321 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (3183 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Antillean Nighthawk breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	9	56	6	38	1	6	0	0	16
Probable	15	63	9	38	0	0	0	0	24
Possible	39	42	53	57	0	0	1	1	93
<b>Total</b>	<b>63</b>	<b>47</b>	<b>68</b>	<b>51</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>133</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Antillean Nighthawk records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by Gloria Archilla

# Puerto Rican Nightjar/Guabairo

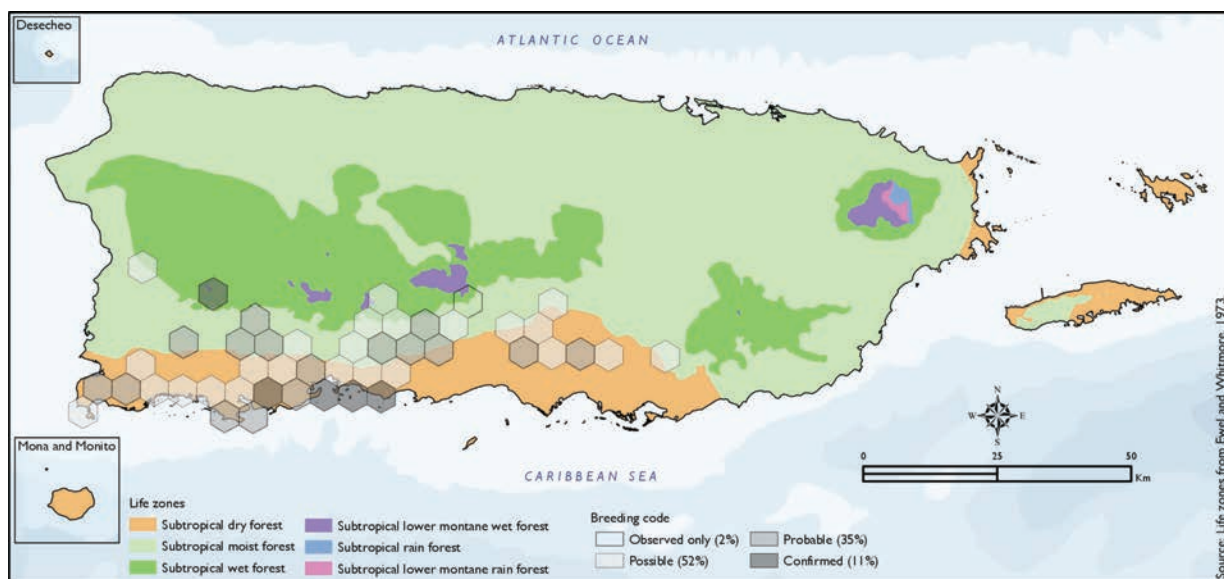
## *Antrostomus noctitherus*

it was originally described, but currently it is mostly restricted to southern Puerto Rico from Cabo Rojo to Guayama (Reynard 1962, Vilella and Zwank 1993). Its distribution includes privately owned lands between the Guayanilla-Peñuelas area (USFWS 2017, Vilella and Zwank 1987), as well as the Susúa (Oberle 2018, Vilella and Zwank 1993) and Maricao (Delannoy 2005, Vilella and Zwank 1993) State Forests, and other localities including La Parguera and Sierra Bermeja in Lajas (Oberle 2018, Vilella and Zwank 1993), and Guaniquilla, El Combate (Raffaele and others 1998), and Peñones de Melones in Cabo Rojo (Díaz-Méndez and Vicenty 2005). Typical habitat for this species includes xeric limestone

forests along the southwestern coast of the island, dry deciduous and semideciduous forests with dense leaf litter, evergreen forests, and sometimes riparian areas and plantations (Oberle 2018; Raffaele and others 1998; Vilella 1989; Vilella and Zwank 1987, 1993). The atlas fieldwork yielded a total of 146 records within 46 hexagons or 10 percent of the 479 total hexagons (see map). Of the 46 hexagons where this species was found, breeding met the atlas definition of confirmed in 11 percent (5) of the hexagons, probable in 35 percent (16), and possible in 52 percent (24), while the species was observed in 2 percent (1) of the hexagons but without evidence of breeding (see map).

### Distribution and Habitat

The Puerto Rican Nightjar is endemic to Puerto Rico where it is rare to locally common in and around the Guánica State Forest (Raffaele and others 1998, Vilella and Zwank 1993). Historically, its distribution may have included the northern karst from where



Puerto Rican Nightjar distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

### Breeding Ecology

Previously published reports indicate that the Puerto Rican Nightjar breeds from late February to early July (Raffaele and others 1998). The nesting occurs directly on a dense leaf litter layer of the forest floor, often under a low bush (Biaggi 1997, Oberle 2018, Raffaele and others 1998). Atlas results show that this species breeds from December through August with the most breeding activity from February to May (see chart). Breeding activity peaks during May, and it mostly takes place

within the subtropical dry forest life zone (60 percent of the hexagons) (see table). It also breeds within the subtropical moist and subtropical wet forest life zones at higher elevations (36 and 4 percent of hexagons, respectively) (see table and map).

### Population Status and Conservation

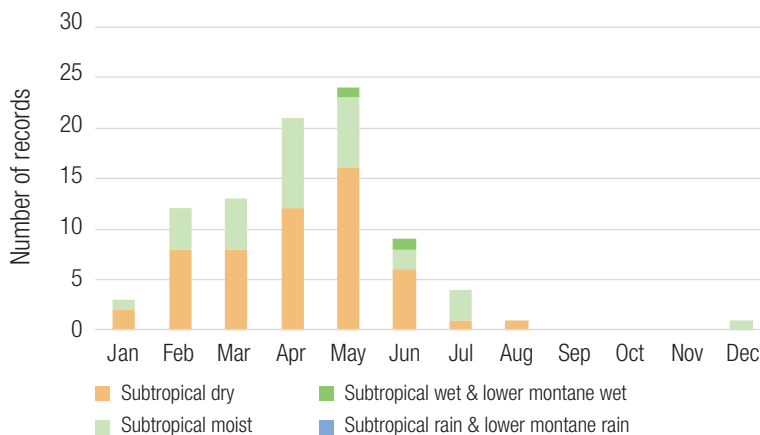
The Puerto Rican Nightjar is currently listed as Endangered by the IUCN (BirdLife International 2016). Threats to the population include habitat destruction, as well as the presence of nest and

chick predators such as feral cats (*Felis catus*), mongooses (*Herpestes auro-punctatus*), and fire ants (*Solenopsis* spp.) (Oberle 2018, Raffaele and others 1998). Locally, this species is classified as endangered by local and Federal laws (PRDNER 2016 and USFWS 1973, respectively). In Puerto Rico, the Puerto Rican Nightjar has a protected habitat in land of 14 percent or 155 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1079 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Puerto Rican Nightjar breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	4	80	0	0	1	20	0	0	5
Probable	9	56	7	44	0	0	0	0	16
Possible	14	58	9	38	1	4	0	0	24
<b>Total</b>	<b>27</b>	<b>60</b>	<b>16</b>	<b>36</b>	<b>2</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>45</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Puerto Rican Nightjar records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Black Swift/Vencejo Negro

## *Cypseloides niger*



Photo by Jesus M. Rios Cruz

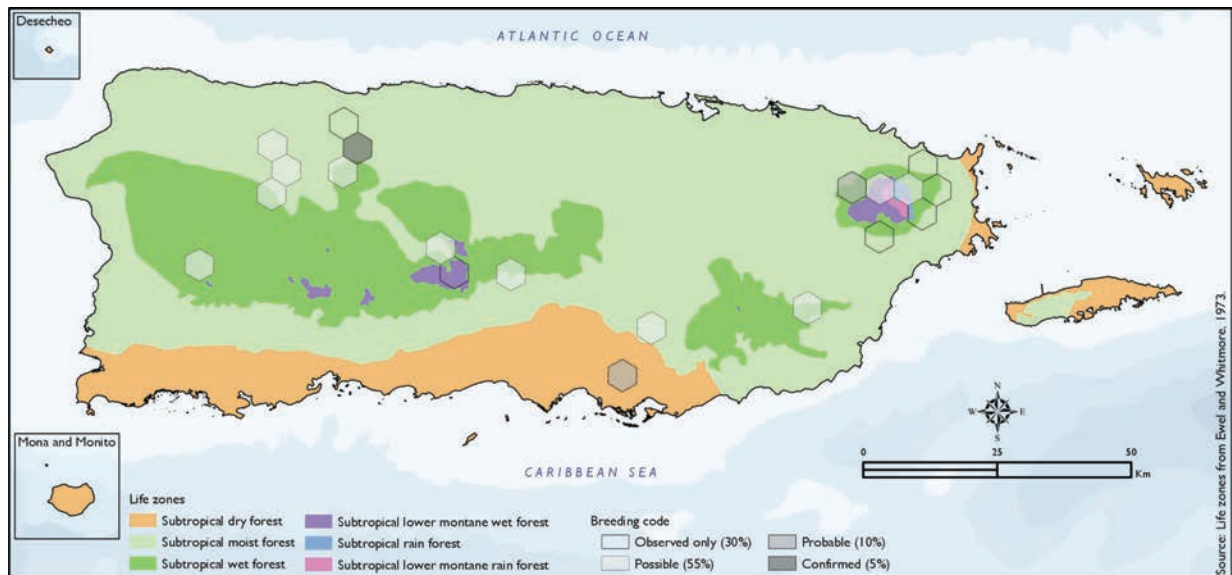
### Distribution and Habitat

The Black Swift occurs in Western North America, Central America, Guyana, Columbia, and throughout the West Indies (Raffaele and others 1998). It is a summer resident migrant species in Puerto Rico and is very rare in winter (Kepler 1971, Raffaele 1989a). The Black Swift is more common in mountainous areas (e.g., El Yunque National Forest and Maricao) than in the lowlands and coastal areas (Raffaele and others 1998), but it has been seen over the coast in the Guánica dry forest (Kepler 1971). The atlas fieldwork yielded a total of 26 records within 20 hexagons or 4 percent

of the 479 total hexagons (see map). Of the 20 hexagons where this species was found, breeding met the atlas definition of confirmed in 5 percent (1) of the hexagons, probable in 10 percent (2), and possible in 55 percent (11), while the species was observed in 30 percent (6) of the hexagons but without evidence of breeding (see map).

### Breeding Ecology

The Black Swift nesting sites are associated with crevices in cliffs, often near or under a waterfall. Previously published reports indicate that breeding takes place from March to September (Raffaele and others 1998). Atlas



Black Swift distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



results indicate that the breeding season for this species extends mostly during the first period of the year (March–July) and peaks in June (see chart). In general, this species breeds in the subtropical wet forest, but during the peak of the breeding season it uses other life zones, a pattern observed in many other species. Results show that this species breeds mostly within the subtropical wet and subtropical moist forest life zones (50 and

36 percent of the hexagons, respectively). Breeding for this species was also reported for one hexagon (7 percent of the hexagons) in both the subtropical dry forest life zone and subtropical rain forest life zone (see table and map).

**Population Status and Conservation**

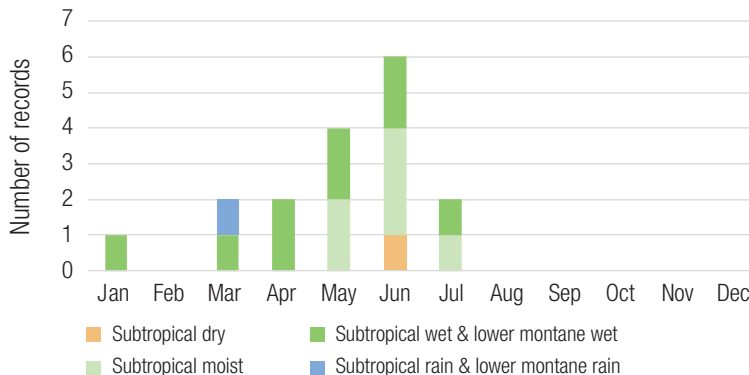
Although the Black Swift population is slowly decreasing due to habitat degradation,

among other causes, it is listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is listed as vulnerable (PRDNER 2016). In Puerto Rico, the Black Swift has a protected habitat in land of 40 percent or 134 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (335 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Black Swift breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	1	100	0	0	0	0	1
Probable	1	50	0	0	1	50	0	0	2
Possible	0	0	4	36	6	55	1	9	11
<b>Total</b>	<b>1</b>	<b>7</b>	<b>5</b>	<b>36</b>	<b>7</b>	<b>50</b>	<b>1</b>	<b>7</b>	<b>14</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Black Swift records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Antillean Mango/Zumbador Dorado

## *Anthracothorax dominicus*



Photo by José Salguero

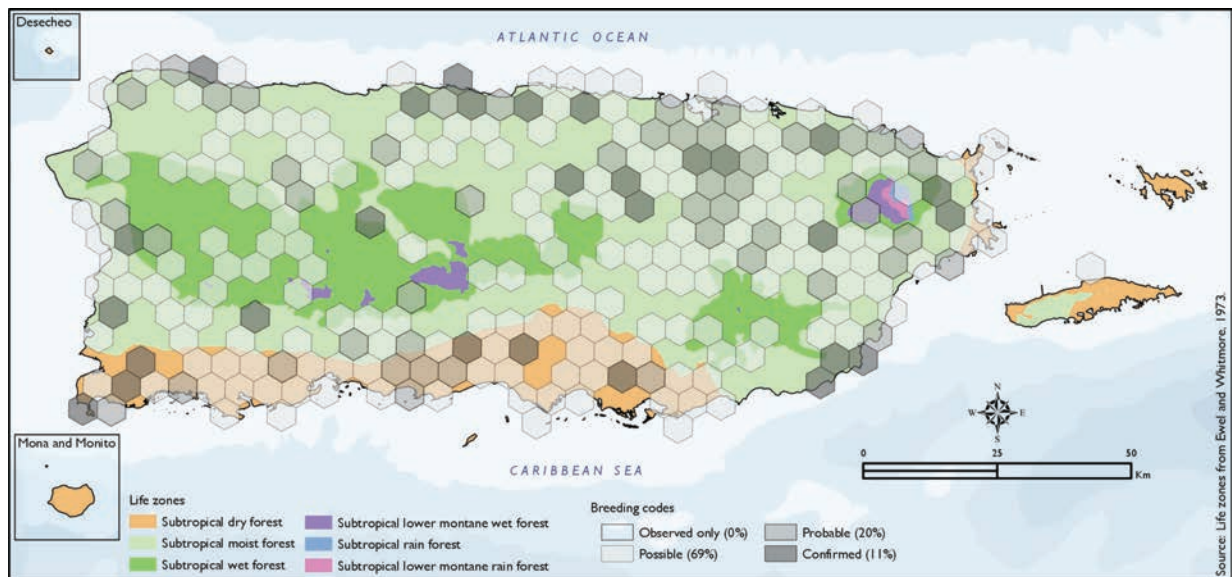
### Distribution and Habitat

The Antillean Mango is a Caribbean endemic and common resident species in Puerto Rico (Raffaele and others 1998), especially in the lowlands (Oberle 2018), and it is an extremely rare former breeder on Vieques (Gemmill 2015). This species is the most abundant hummingbird in forested habitats, scrub, clearings in dry and moist forests in the south coasts, and the hills of northern Puerto Rico (Biaggi 1997, Oberle 2018), and it is also present in gardens and coffee plantations (Raffaele and others 1998). The atlas fieldwork yielded a total of 401 records within 253 hexagons

or 53 percent of the 479 total hexagons (see map). Of the 253 hexagons where this species was found, breeding met the atlas definition of confirmed in 11 percent (28) of the hexagons, probable in 20 percent (51), and possible in 69 percent (174) (see map).

### Breeding Ecology

The Antillean Mango constructs a cup-shaped nest on a branch, from March to August, according to previously published reports (Raffaele and others 1998). Atlas results indicate that this species' breeding season extends throughout the year, but it is most active from March to July



Antillean Mango distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

(see chart). Results show that this species uses all ecological life zones to breed, but breeding occurs most commonly in the subtropical moist forest life zone (65 percent of the hexagons), followed by the subtropical dry and subtropical wet forest life zones (23 and 12 percent of the hexagons, respectively) (see table and map). Breeding was also reported for one hexagon in the subtropical rain forest life zone.

**Population Status and Conservation**

The population trend for the Antillean Mango across its

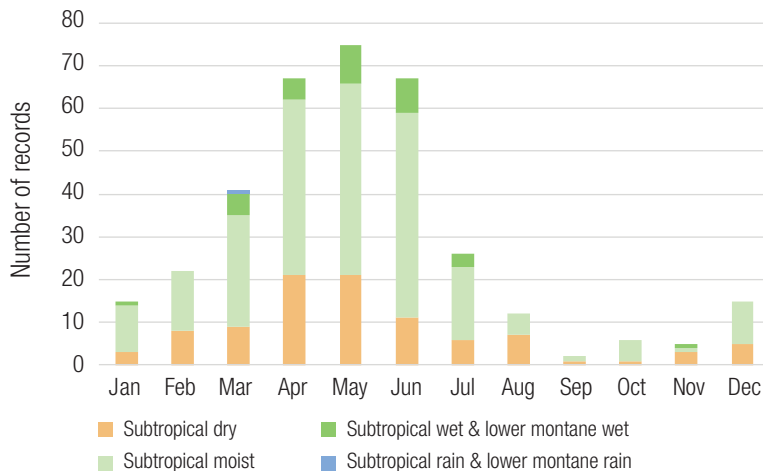
distribution range is unknown, and since it is relatively common, it is listed as a species of least concern by the IUCN (BirdLife International 2016), while locally this species is not listed in any of the threatened categories used by PRDNER and USFWS. The Antillean Mango, once formerly common on Vieques (Wetmore 1916), declined with the spread of the Green-throated Carib on this island (Gemmill 2015). Whether the mango population decline on Vieques is attributable to competition with the Green-throated Carib and/or due to habitat change on this island is

unknown. However, given this history of the mango's decline on Vieques and the relatively recent arrival of the Green-throated Carib on Puerto Rico, it would be prudent to carefully monitor the mango population on Puerto Rico. In Puerto Rico, the Antillean Mango has a protected habitat in land of 12 percent or 720 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (6050 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Antillean Mango breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	6	21	20	71	2	7	0	0	28
Probable	8	16	39	76	4	8	0	0	51
Possible	44	25	105	60	24	14	1	1	174
<b>Total</b>	<b>58</b>	<b>23</b>	<b>164</b>	<b>65</b>	<b>30</b>	<b>12</b>	<b>1</b>	<b>&lt;1</b>	<b>253</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Antillean Mango records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Green Mango/Zumbador Verde

## *Anthracothorax viridis*



Photo by José Salguero

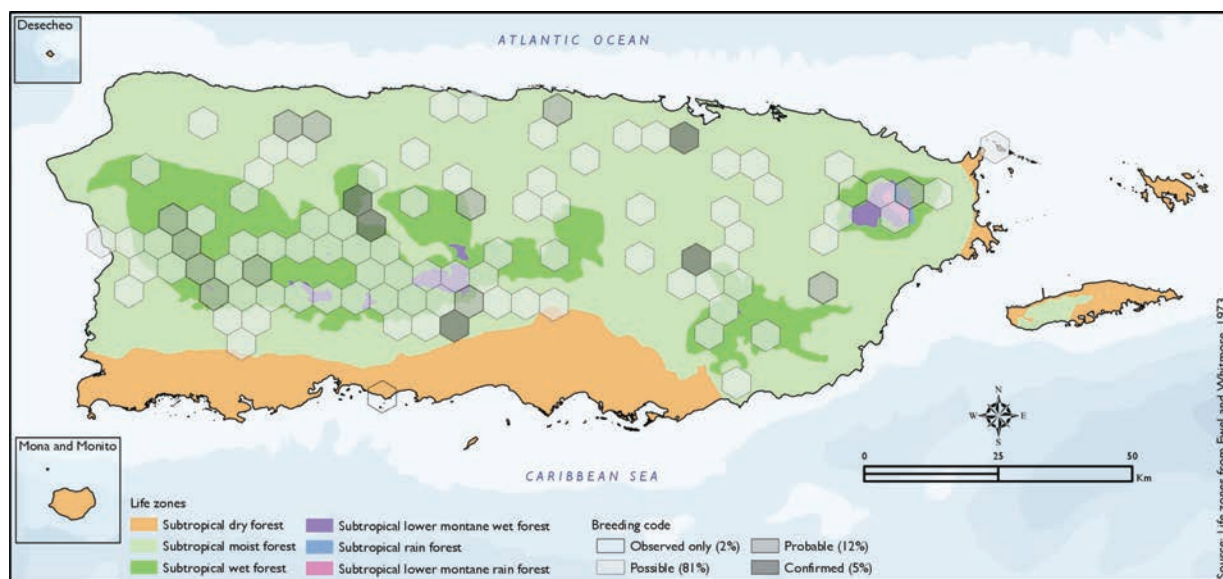
### Distribution and Habitat

The Green Mango is endemic to Puerto Rico and particularly common in the central and western mountains (Raffaele and others 1998). This species inhabits mountain forests, coffee plantations (Raffaele and others 1998), and forest edges in mountains and foothills (Oberle 2018). The atlas fieldwork yielded a total of 141 records within 99 hexagons or 21 percent of the 479 total hexagons (see map). Of the 99 hexagons where this species was found, breeding met the atlas definition of confirmed in 5 percent (5) of

the hexagons, probable in 12 percent (12), and possible in 81 percent (80), while the species was observed in 2 percent (2) of the hexagons but without evidence of breeding (see map).

### Breeding Ecology

The Green Mango builds a cup-shaped nest coated with lichens, and breeding has been recorded in October, December, February, April, and May in previously published reports (Raffaele and others 1998). Atlas results indicate that the Green Mango breeding season extends throughout the year, but it is



Green Mango distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

most active from March to June (see chart). Atlas results show that one of the hexagons where breeding was confirmed for the Green Mango occurs in the metropolitan area of San Juan, suggesting that some urban forests may provide suitable habitat for this forest-dwelling bird. Results show that the Green Mango mostly breeds within the subtropical moist

and subtropical wet forest life zones (49 and 48 percent of the hexagons, respectively) (see table and map).

**Population Status and Conservation**

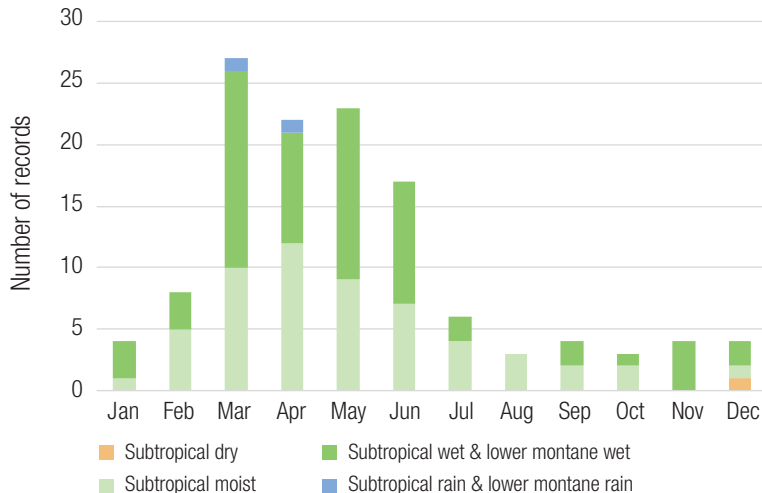
The population trend of the Green Mango is unknown; however, it is listed as a species of least concern by the IUCN (BirdLife International 2016), and

locally this species is not listed in any threatened category of PRDNER or USFWS. In Puerto Rico, the Green Mango has a protected habitat in land of 18 percent or 422 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (2320 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Green Mango breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	3	60	2	40	0	0	5
Probable	0	0	5	42	6	50	1	8	12
Possible	1	1	40	50	39	49	0	0	80
<b>Total</b>	<b>1</b>	<b>1</b>	<b>48</b>	<b>49</b>	<b>47</b>	<b>48</b>	<b>1</b>	<b>1</b>	<b>97</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Green Mango records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by José Salguero

# Green-throated Carib/ Zumbador Pechiazul

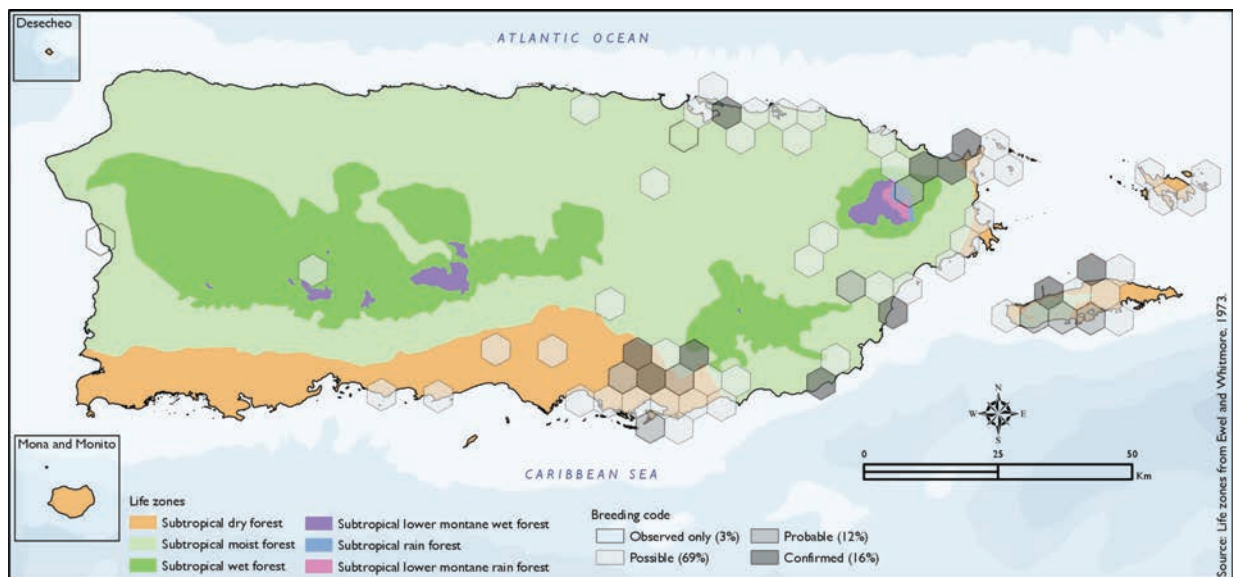
*Eulampis holosericeus*

## Distribution and Habitat

The Green-throated Carib occurs throughout the Lesser Antilles, the Virgin Islands, Vieques (Gemmill 2015), and Puerto Rico (Raffaele and others 1998), where it is a common but local resident (Oberle 2018). This hummingbird is believed to have

colonized from the Virgin Islands and the Lesser Antilles, where it is widespread and common (Raffaele 1989a, Raffaele and others 1998). Although Wetmore found this species to be common on Culebra, Culebrita, and Vieques during his surveys in 1911–1912, he never observed it on Puerto Rico and was aware of only two prior records from the main island (Wetmore 1916). However, by the 1980s the Green-throated Carib was found in eastern Puerto Rico and believed to be expanding its range westward on the island (Raffaele 1989a). It is currently common on the coastal plain of the eastern third of Puerto

Rico and on offshore cays (J.A. Salguero-Farías, personal observation 2009). The Green-throated Carib inhabits forests, mangroves, and gardens (Oberle 2018). The atlas fieldwork yielded a total of 99 records within 68 hexagons or 14 percent of the 479 total hexagons (see map). Of the 68 hexagons where this species was found, breeding met the atlas definition of confirmed in 16 percent (11) of the hexagons, probable in 12 percent (8), and possible in 69 percent (47), while the species was observed in 3 percent (2) of the hexagons but without evidence of breeding (see map).



Green-throated Carib distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the Green-throated Carib breeds from March to mid-July, and nests are built in the fork of a twig above the ground (Raffaele and others 1998). Atlas results show that breeding occurs in almost every month and probably extends throughout the year, but it is higher in May and June (see chart). Results show that this species mostly

breeds within the subtropical dry and subtropical moist forest life zones (50 and 47 percent of the hexagons, respectively), in the coastal lowlands (see table and map).

**Population Status and Conservation**

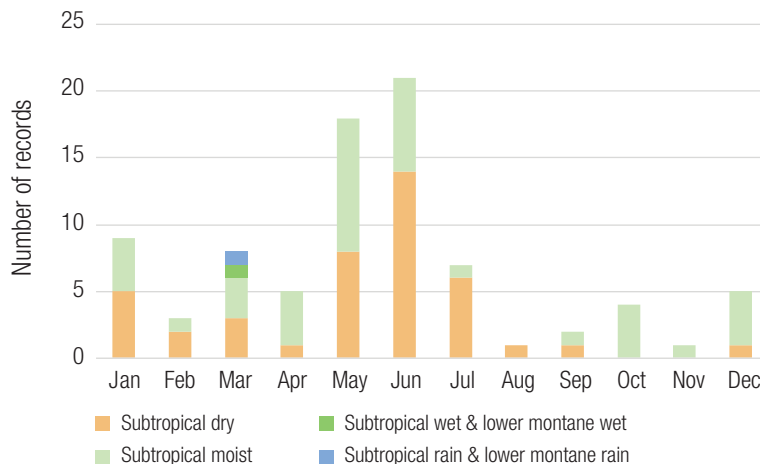
The Green-throated Carib population is described as common within its distribution range, and it is listed as a species of least concern by the

IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Green-throated Carib has a protected habitat in land of 10 percent or 158 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1622 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Green-throated Carib breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	4	36	7	64	0	0	0	0	11
Probable	4	50	3	38	0	0	1	13	8
Possible	25	53	21	45	1	2	0	0	47
<b>Total</b>	<b>33</b>	<b>50</b>	<b>31</b>	<b>47</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>66</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Green-throated Carib records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Puerto Rican Emerald/ Zumbadorcito de Puerto Rico

*Riccordia maugaeus*



Photo by Noelia Nieves

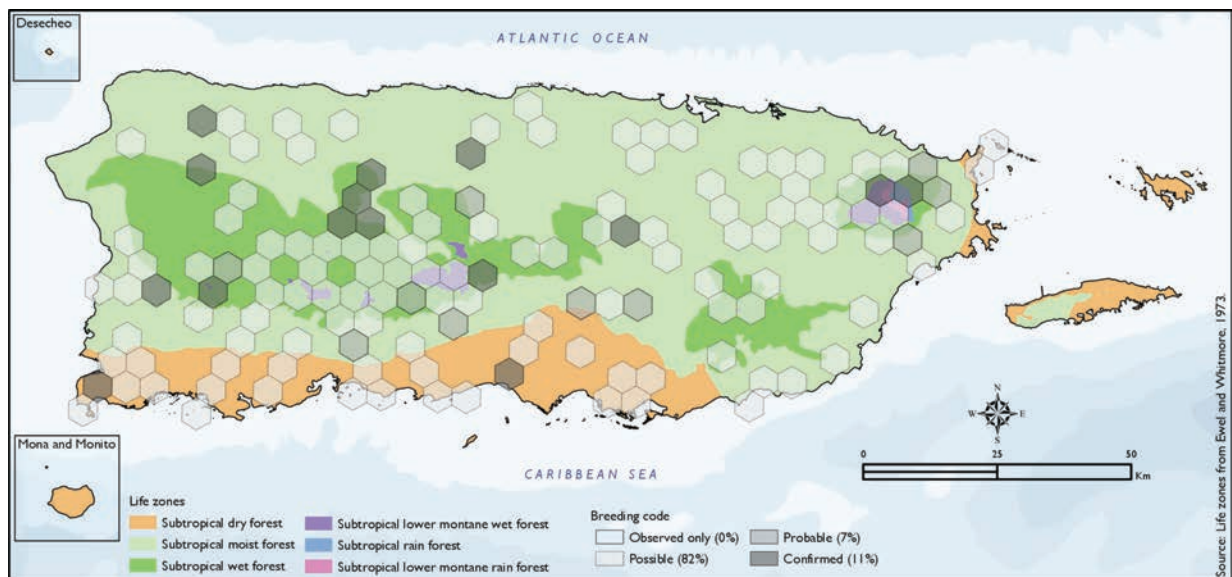
## Distribution and Habitat

The Puerto Rican Emerald is a hummingbird endemic to Puerto Rico and relatively common in most of the main island, except on the east coast, Culebra, and Vieques (Oberle 2018). It is absent from satellite islands except Vieques where it was first documented in 2003 and is considered a rare visitor (Gemmill 2015). This hummingbird occurs in mountain forests, shade coffee plantations, lowland wooded areas including dry coastal habitats, mangroves, and gardens (Gemmill 2015, Oberle 2018, Raffaele and others 1998). The atlas fieldwork

yielded a total of 200 records within 137 hexagons or 29 percent of the 479 total hexagons (see map). Of the 137 hexagons where the Puerto Rican Emerald was found, breeding met the atlas definition of confirmed in 11 percent (15) of the hexagons, probable in 7 percent (10), and possible in 82 percent (112) (see map).

## Breeding Ecology

The Puerto Rican Emerald builds a cup-shaped nest made of soft fibers (including spider webs) coated with lichens (Raffaele 1989a). Previously published reports indicate that it breeds



Puerto Rican Emerald distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



primarily from February to May but also irregularly throughout the year (Raffaele and others 1998). Atlas results suggest that this species' breeding season extends throughout the year, with the most breeding activity from March through June (see chart). Overall, the breeding activity peaks in April, and it mostly occurs in the subtropical moist forest life zone. Results show that this species breeds throughout most of the island, mainly within the subtropical

moist forest life zone (47 percent of the hexagons) (see table). It also breeds within subtropical wet and lower montane wet forest life zones at higher elevations (33 percent of the hexagons), as well as in the subtropical dry forest life zone (20 percent of the hexagons) (see table and map).

**Population Status and Conservation**

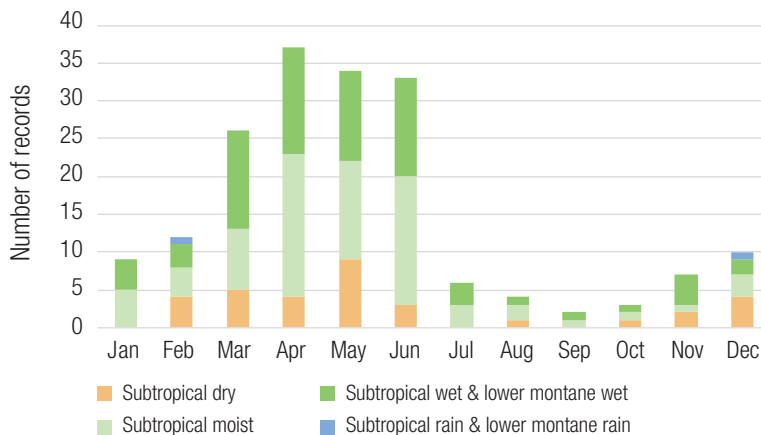
The overall population size of the Puerto Rican Emerald has not been quantified, but this

species is described as 'common' and is listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, it is not listed in any of the threatened categories used by PRDNER and USFWS. In Puerto Rico, the Puerto Rican Emerald has a protected habitat in land of 15 percent or 502 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (3278 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Puerto Rican Emerald breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	2	13	4	27	8	53	1	7	15
Probable	0	0	7	70	3	30	0	0	10
Possible	25	22	53	47	34	30	0	0	112
<b>Total</b>	<b>27</b>	<b>20</b>	<b>64</b>	<b>47</b>	<b>45</b>	<b>33</b>	<b>1</b>	<b>1</b>	<b>137</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Puerto Rican Emerald records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by Guillermo Plaza

# Antillean Crested Hummingbird/ Zumbadorcito Crestado

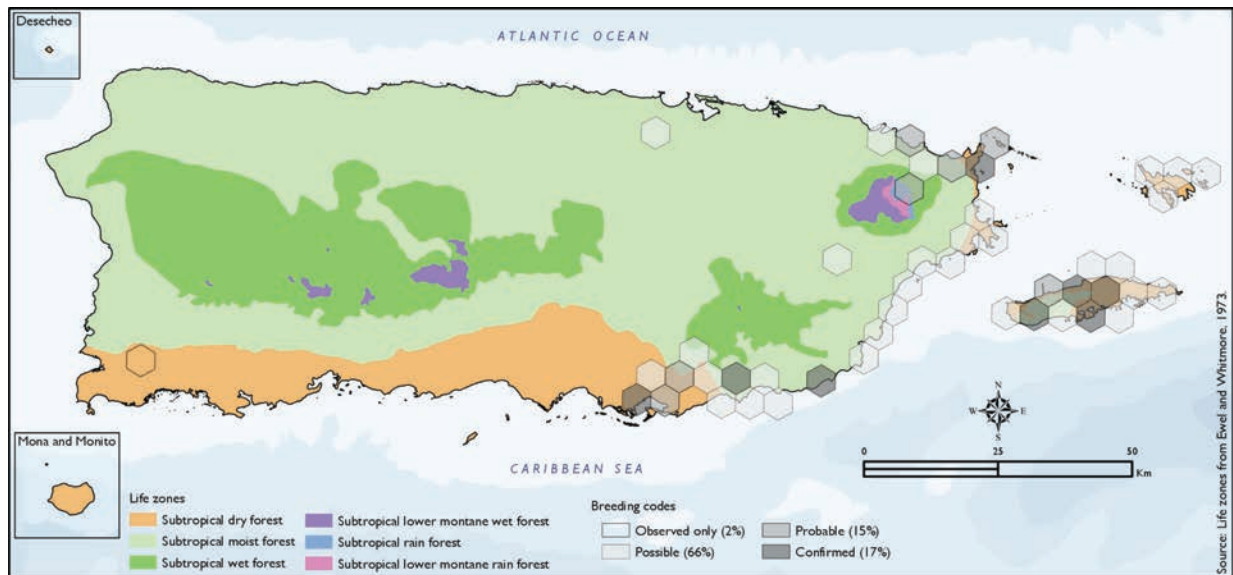
*Orthorhyncus cristatus*

## Distribution and Habitat

The Antillean Crested Hummingbird is a common resident throughout the Lesser Antilles, the Virgin Islands, and Puerto Rico (Raffaele and others 1998), principally on the eastern coast of the island including Culebra (Ventosa-Febles and

others 2005) and Vieques (Gemmill 2015). The species is believed to be a relatively recent arrival from the Virgin Islands and the Lesser Antilles. First documented with a specimen from Vieques in 1912 (Wetmore 1916), it was not found on mainland Puerto Rico in 1875–1876 by Gundlach (1878) nor in 1911–1912 by Wetmore (1916, 1917), who was skeptical of reports of the species' occurrence on the main island. Even as late as 1950, the species was described as being of doubtful occurrence on Puerto Rico but by 1960 it was recognized as occurring in eastern Puerto Rico (Bond 1961, 1967), where it was believed to be expanding its range to the south (Raffaele

1989a). This species mostly occurs in lowland openings, developed areas, gardens, forest edges, and especially arid and dry forests, but also mountain forests, at least on other islands (Biaggi 1997, Raffaele and others 1998, Schuchmann and Boesman 2020). The atlas fieldwork yielded a total of 86 records within 47 hexagons or 10 percent of the 479 total hexagons (see map). Of the 47 hexagons where this species was found, breeding met the atlas definition of confirmed in 17 percent (8) of the hexagons, probable in 15 percent (7), and possible in 66 percent (31), while the species was observed in 2 percent (1) of the hexagons but without evidence of breeding (see map).



Antillean Crested Hummingbird distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

### Breeding Ecology

The Antillean Crested Hummingbird nests in a tiny cup of cotton or fine fibers covered with lichens in a tree, bush, or vine above the ground, year-round, but primarily from January to August, according to previously published reports (Raffaele and others 1998). Atlas results indicate that this species' breeding season extends throughout the year (except for the atlas data gap in August), with the most breeding activity from January through July (see chart). This seasonal breeding pattern appears to coincide in

each of the life zones with only a slight indication that breeding in the driest months (February, March, April) is reduced relative to the subtropical moist forest life zone. Results show that this species mostly breeds on the coastal plain within the subtropical dry forest life zone (50 percent of the hexagons), the subtropical moist forest life zone (48 percent of the hexagons), and for only one hexagon (2 percent of the hexagons) in the subtropical rain and lower montane rain forest life zones (see table and map).

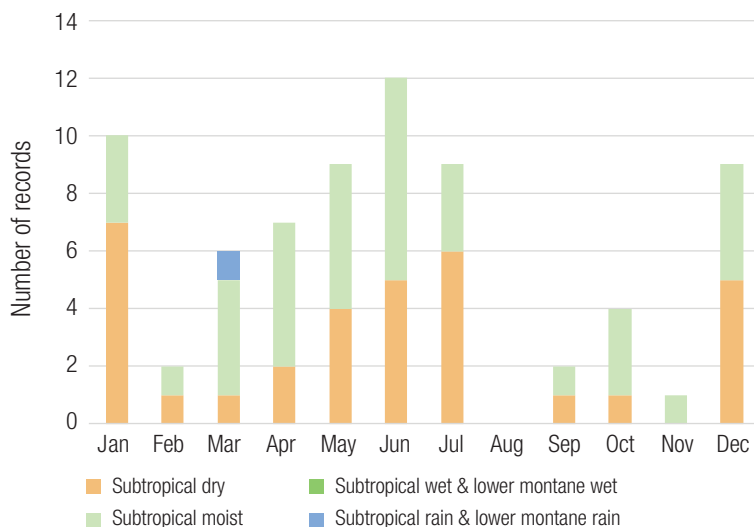
### Population Status and Conservation

This species is listed as a species of least concern by the IUCN (BirdLife International 2016), and locally it is not listed in any of the threatened categories used by PRDNER and USFWS. In Puerto Rico, the Antillean Crested Hummingbird has a protected habitat in land of about 14 percent or 152 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (~1096 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Antillean Crested Hummingbird breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	5	63	3	38	0	0	0	0	8
Probable	3	43	3	43	0	0	1	14	7
Possible	15	48	16	52	0	0	0	0	31
<b>Total</b>	<b>23</b>	<b>50</b>	<b>22</b>	<b>48</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>46</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Antillean Crested Hummingbird records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Clapper Rail/Pollo de Mangle

## *Rallus longirostris*



Photo by José A. Colon

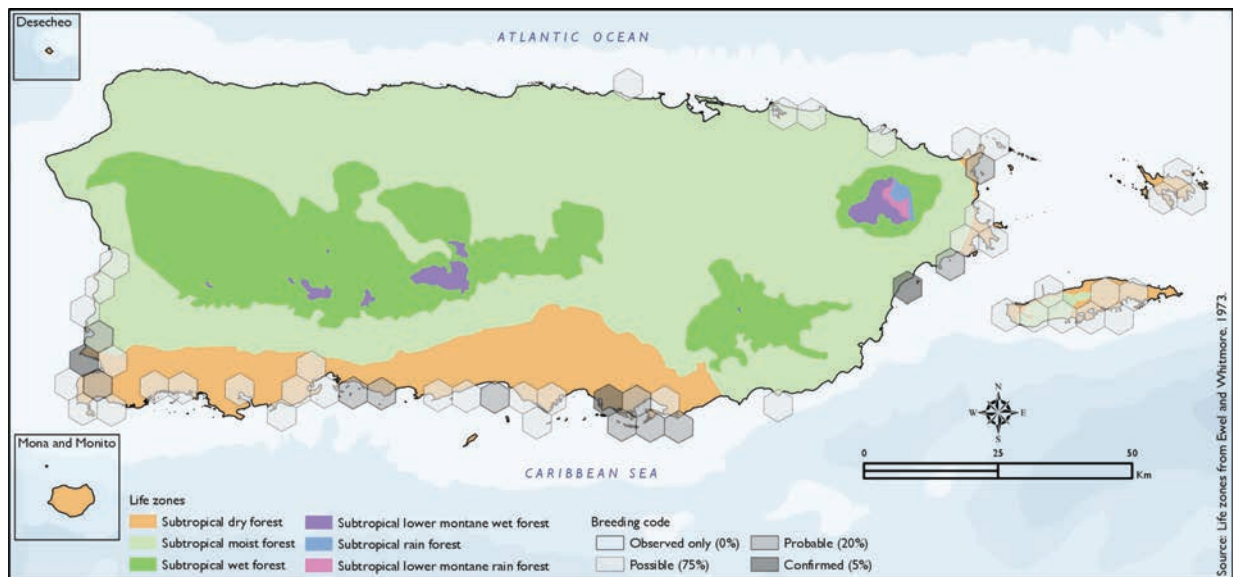
### Distribution and Habitat

The Clapper Rail occurs from the coastal United States south through South America including the West Indies (Raffaele and others 1998). It is a locally common resident in Puerto Rico (Raffaele 1983), especially on mangroves and salt flats along the coast (Oberle 2018, Raffale 1989a), and fairly common in Vieques (Gemmil 2015). The Clapper Rail's habitat includes mostly salt marshes, mangroves (Raffaele and others 1998), and mudflats (Oberle 2018). It also occurs in pairs or small groups on offshore mangrove cays

(J.A. Salguero-Farías, personal observation 2009). The atlas fieldwork yielded a total of 86 records within 55 hexagons or 11 percent of the 479 total hexagons (see map). Of the 55 hexagons where this species was found, breeding met the atlas definition of confirmed in 5 percent (3) of the hexagons, probable in 20 percent (11), and possible in 75 percent (41) (see map).

### Breeding Ecology

The Clapper Rail builds a platform nest of sticks among mangrove roots, and breeding season extends from April to



Clapper Rail distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

May, according to previously published reports (Raffaele and others 1998). Atlas results indicate that the breeding season for this species extends throughout the year and peaks in May (see chart). Results show that this species is confined to the coast and breeds within the subtropical dry and subtropical moist forest life zones (73 and 27 percent of the hexagons, respectively), and it is closely

associated with mangroves (e.g., note abundance of south and southwest coastal records in contrast to the north coast where mangroves are patchy, with the exception of Piñones, east of San Juan) (see table and map).

**Population Status and Conservation**

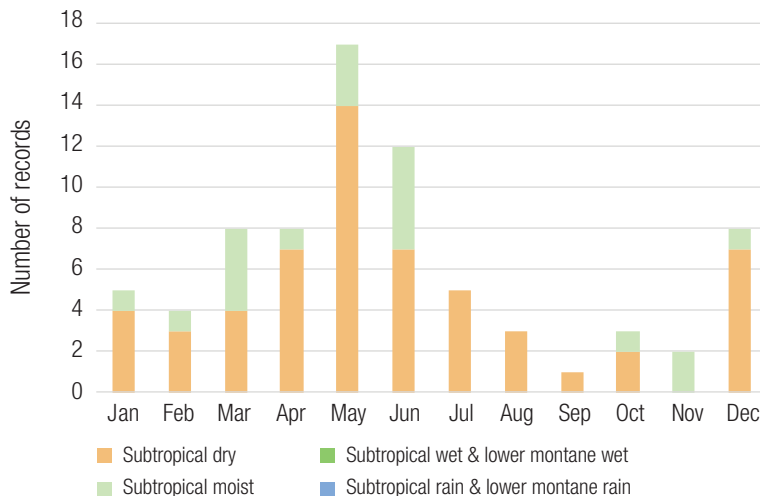
Overall, Clapper Rail population trends are decreasing worldwide due to habitat loss, but it is listed

as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed under any of the threatened categories. In Puerto Rico, the Clapper Rail has a protected habitat in land of 13 percent or 169 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1315 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Clapper Rail breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	2	67	1	33	0	0	0	0	3
Probable	9	82	2	18	0	0	0	0	11
Possible	29	71	12	29	0	0	0	0	41
<b>Total</b>	<b>40</b>	<b>73</b>	<b>15</b>	<b>27</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>55</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Clapper Rail records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Yellow-breasted Crake/Gallito Amarillo

## *Hapalocrex flaviventer*

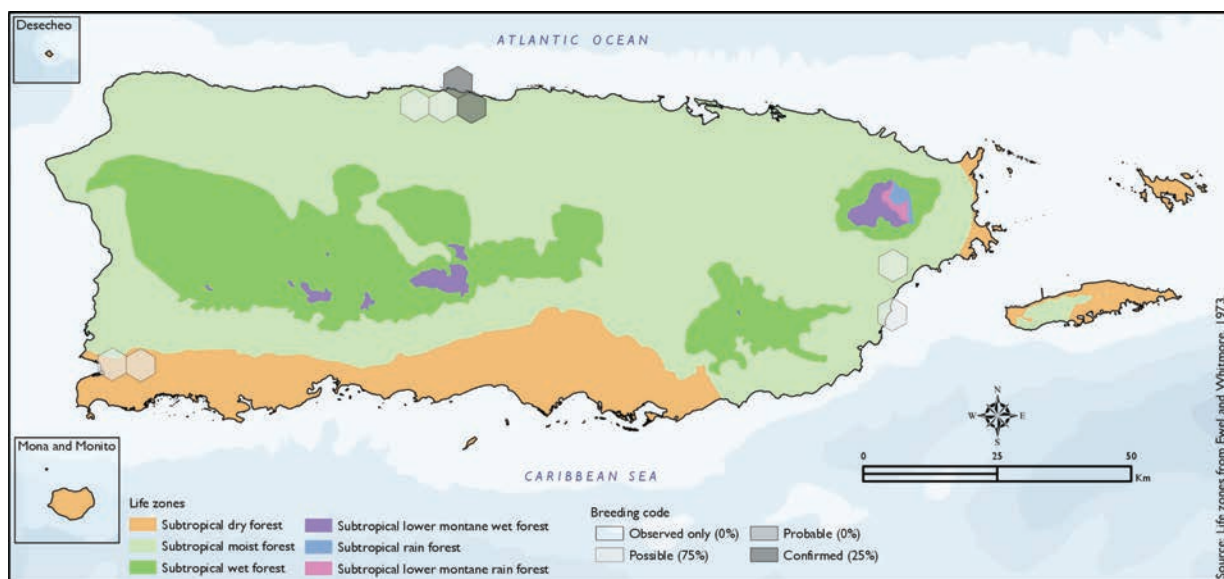


Photo by Guillermo Plaza

### Distribution and Habitat

The Yellow-breasted Crake is a species that occurs from Mexico through South America including the Greater Antilles in the Caribbean, where it is an uncommon resident on Cuba, Jamaica, and Puerto Rico, and rare on Hispaniola (Raffaele and others 1998). In Puerto Rico, it has been reported mostly from the Humacao (Vilella and others 2011), Boquerón, Caño Tiburones, and Laguna Cartagena wildlife refuges (Oberle 2018). Habitat includes mostly freshwater wetlands and canals with edges of short grass or other aquatic plants (Raffaele

and others 1998), as well as marshes, pond edges, flooded fields, and ditches with dense vegetation (Oberle 2018). The atlas fieldwork yielded a total of 11 records within eight hexagons or 1.6 percent of the 479 total hexagons (see map). Of the eight hexagons where this species was found, breeding met the atlas definition of confirmed in 25 percent (two) of the hexagons and possible in 75 percent (six) of the hexagons (see map). Low numbers of reports are not surprising as many rails and crakes are skulkers have crepuscular habits.



Yellow-breasted Crake distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the Yellow-breasted Crane breeds primarily from March to June (Raffaele and others 1998, Vilella and others 2011). The nest is woven on floating vegetation or reeds (Oberle 2018, Raffaele and others 1998, Vilella and others 2011). Of the 15 nests found in the Humacao refuge, two were located in May and November of 2001, and the remaining 13 nests were located from January to July 2001 (Vilella and others 2011). Atlas results suggest that this species breeds mostly from March to May, although there

might be scattered breeding activity during other months such as January, September, and December (see chart). The breeding activity peaks in March, and it mostly takes place within the subtropical moist forest life zone (75 percent of the hexagons) (see chart and table). However, results indicate that it may also breed in the subtropical dry forest life zone (25 percent of the hexagons) (see table and map).

**Population Status and Conservation**

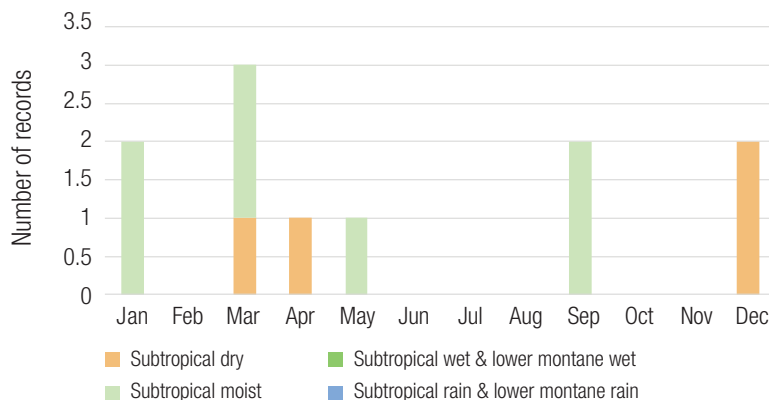
The global population trend of the Yellow-breasted Crane is increasing (Wetlands

International 2012), although some populations are stable (Butcher and Niven 2007). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Yellow-breasted Crane has a protected habitat in land of 17 percent or 33 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (191 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Yellow-breasted Crane breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	2	100	0	0	0	0	2
Probable	0	0	0	0	0	0	0	0	0
Possible	2	33	4	67	0	0	0	0	6
<b>Total</b>	<b>2</b>	<b>25</b>	<b>6</b>	<b>75</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Yellow-breasted Crane records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Purple Gallinule/Gallareta Azul

## *Porphyrio martinicus*

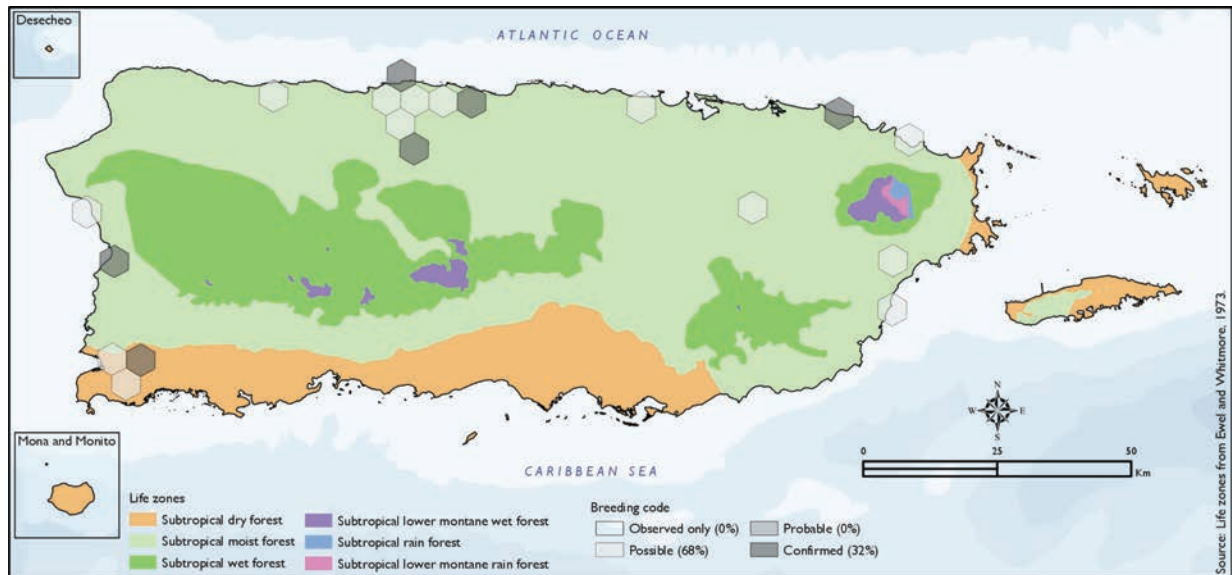


Photo by Michael Morel

### Distribution and Habitat

The Purple Gallinule occurs from the United States through Central and South America including the West Indies (Raffaele and others 1998). In addition, it also occurs in The Bahamas but to a lesser extent (Raffaele and others 1998). In Puerto Rico, it is an uncommon to rare resident in coastal wetlands (Oberle 2018, Raffaele 1989a) and can be seen regularly in the Humacao Natural Reserve, and Caño Tiburones Natural Reserve (Oberle 2018), but it can also be found at Las Cucharillas marsh in Cataño and the Boquerón Wildlife Refuge

(PRDNER 2015). The species presence is unconfirmed on Vieques (Gemmil 2015). Habitat includes rice fields along with freshwater marshes, swamps, and ponds with emergent dense vegetation (Oberle 2018, Raffaele and others 1998). The atlas fieldwork yielded a total of 40 records within 19 hexagons or 4 percent of the 479 total hexagons (see map). Of the 19 hexagons where this species was found, breeding met the atlas definition of confirmed in 32 percent (6) of the hexagons and possible in 68 percent (13) (see map).



Purple Gallinule distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

Previously published reports indicate that the Purple Gallinule breeds primarily from July to September (Raffaele and others 1998). The nest is usually built among cattails or rice grass (Raffaele and others 1998). Atlas results suggest that this species breeds throughout the year with the most breeding activity during March (see chart). Overall, the breeding activity mostly takes place in the lowlands within the subtropical moist forest life zone

(84 percent of the hexagons) (see table and map). However, results indicate that it also breeds within the subtropical dry forest life zone (16 percent of the hexagons) (see table and map).

**Population Status and Conservation**

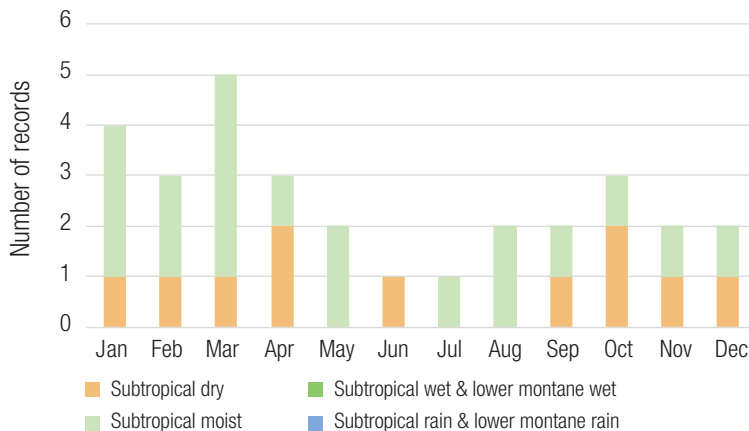
The current population trend of the Purple Gallinule is described as ‘decreasing.’ In North America, the population trend is decreasing (Butcher and Niven 2007), although populations are stable elsewhere

(Wetlands International 2012). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Purple Gallinule has a protected habitat in land of 16 percent or 71 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (454 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Purple Gallinule breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	1	17	5	83	0	0	0	0	6
Probable	0	0	0	0	0	0	0	0	0
Possible	2	15	11	85	0	0	0	0	13
<b>Total</b>	<b>3</b>	<b>16</b>	<b>16</b>	<b>84</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>19</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Purple Gallinule records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Common Gallinule/Gallareta Común

## *Gallinula galeata*



Photo by Guillermo Plaza

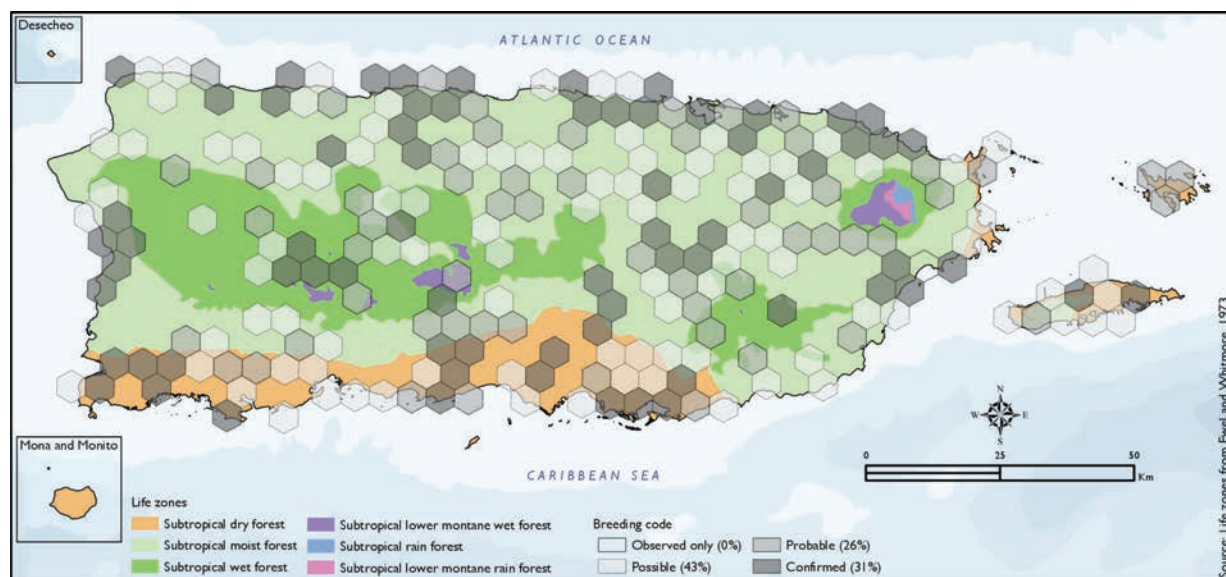
### Distribution and Habitat

The Common Gallinule is a common resident species in Puerto Rico known to occur in wetlands and various water bodies throughout the main island, Culebra, and Vieques (Raffaele 1989a), in the latter being a fairly common breeding resident (Gemmill 2015). This species is most common in freshwater habitats among rivers, brackish waters, canals, ditches, mangroves, stream banks, reservoirs, creeks, and ponds with dense vegetation (Oberle 2018). The atlas fieldwork yielded a total of 449 records within 222 hexagons

or 46 percent of the 479 total hexagons (see map). Of the 222 hexagons where this species was found, breeding met the atlas definition of confirmed in 31 percent (69) of the hexagons, probable in 26 percent (57), and possible in 43 percent (95), while the species was observed in an additional hexagon (<1 percent) but without evidence of breeding (see map).

### Breeding Ecology

The Common Gallinule builds its nest on floating vegetation, in a shrub, or on the ground (Oberle 2018). Previously published reports indicate that its breeding



Common Gallinule distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

activity extends year-round, peaking in May to September (Raffaele and others 1998). Atlas results confirm that the breeding season extends throughout the year, but the highest breeding activity peaks in March to June (see chart). Results show that the Common Gallinule is a habitat generalist that breeds within all ecological life zones except the subtropical rain forest life zone, a pattern that coincides with the abundance of these life zones

in the island. Most breeding activity was reported within the subtropical moist forest life zone (65 percent of the hexagons), followed by the subtropical dry and subtropical wet forest life zones (24 and 10 percent of the hexagons, respectively) (see table and map).

**Population Status and Conservation**

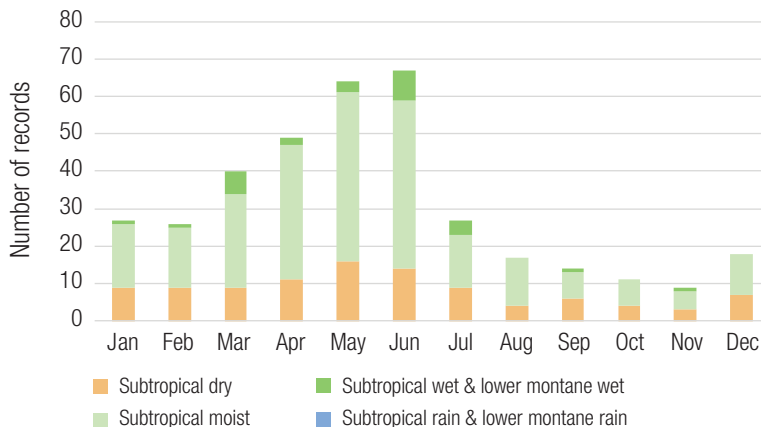
The Common Gallinule’s overall population trend is suspected to be stable, and it is listed as

a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Common Gallinule has a protected habitat in land of 11 percent or 586 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (5283 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Common Gallinule breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	19	28	44	64	6	9	0	0	69
Probable	10	18	37	65	10	18	0	0	57
Possible	25	26	63	66	7	7	0	0	95
<b>Total</b>	<b>54</b>	<b>24</b>	<b>144</b>	<b>65</b>	<b>23</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>221</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Common Gallinule records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# American Coot/Gallinazo Americano

## *Fulica americana*

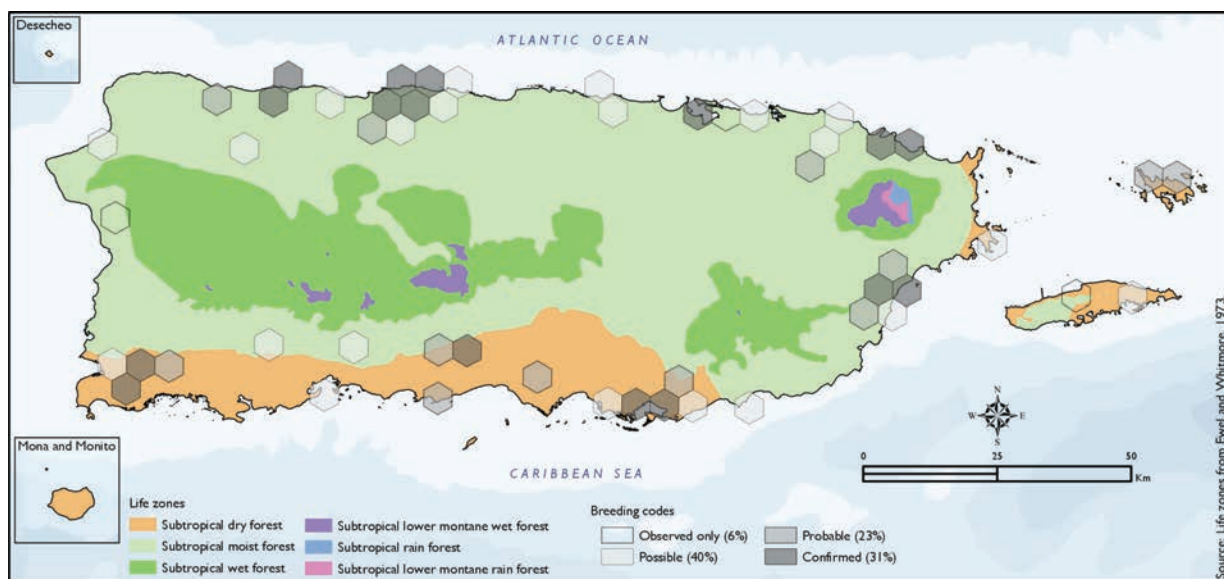


Photo by Guillermo Plaza

### Distribution and Habitat

The American Coot is widespread in the Western Hemisphere including the West Indies (Raffaele and others 1998). American Coot was combined with Caribbean Coot as the two species are now considered to be one species; the major difference between the two “species” is the color on the frontal shield above the bill (Chesser and others 2018). It is an uncommon breeder and a common winter visitor from North America in Puerto Rico (Oberle 2018), and on Vieques it is considered an extremely rare fall and winter visitor (Gemmill 2015). The American Coot can

be found in open freshwater areas with submergent vegetation (Raffaele and others 1998), such as lakes, ponds, and marshes (Oberle 2018). The atlas fieldwork yielded a total of 136 records within 52 hexagons or 11 percent of the 479 total hexagons (see map). Of the 52 hexagons where this species was found, breeding met the atlas definition of confirmed in 31 percent (16) of the hexagons, probable in 23 percent (12), and possible in 40 percent (21), while the species was observed in 6 percent (3) of the hexagons but without evidence of breeding (see map). Atlas findings indicated probable breeding on Culebra.



American Coot distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the American Coot breeds from March to June, and the nest is placed on the ground among vegetation, or even on floating vegetation (Raffaele and others 1998). Atlas results indicate that breeding occurs in almost every month and probably extends throughout the year, but small sample sizes make it difficult to generalize about breeding seasonality. However, breeding activity is relatively higher during the first period of the year particularly in

February (see chart). In addition, atlas results also show that breeding habitat for this species is restricted to subtropical moist and subtropical dry forest life zones in the coastal lowlands. Results show that this species breeds in the lowlands within the subtropical moist (63 percent of the hexagons) and subtropical dry forest life zones (37 percent of the hexagons), whereas no evidence of breeding was found in subtropical wet and subtropical rain forest life zones (see table and map).

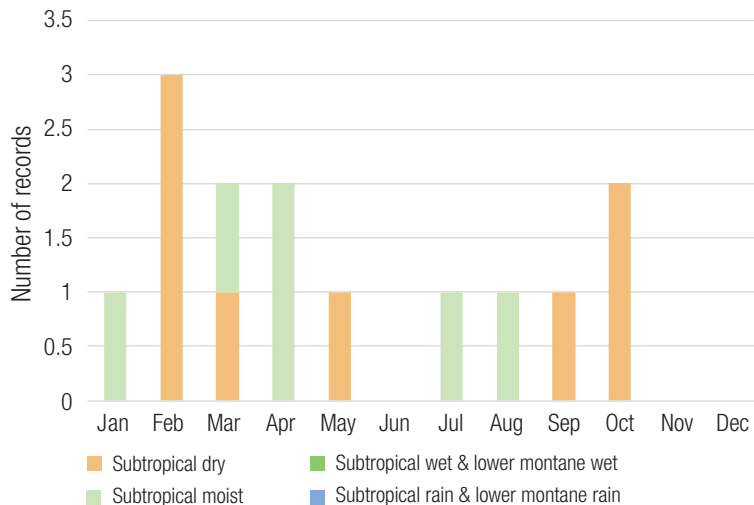
**Population Status and Conservation**

The American Coot is listed as a species of least concern by the IUCN (BirdLife International 2016). However, locally, this species (known as Caribbean Coot) is listed as vulnerable (PRDNER 2015). In Puerto Rico, the American Coot has a protected habitat in land of 11 percent or 127 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1171 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where American Coot breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	5	31	11	69	0	0	0	0	16
Probable	7	58	5	42	0	0	0	0	12
Possible	6	29	15	71	0	0	0	0	21
<b>Total</b>	<b>18</b>	<b>37</b>	<b>31</b>	<b>63</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>49</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of American Coot records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Black-necked Stilt/Viuda

## *Himantopus mexicanus*

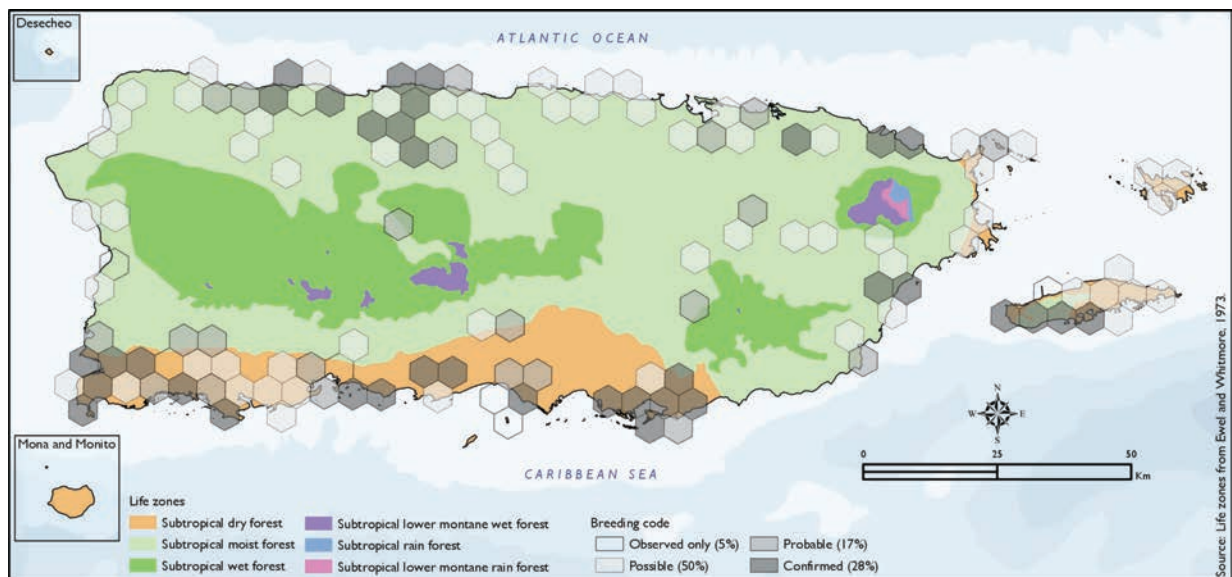


Photo by Joseph Wunderle

### Distribution and Habitat

The Black-necked Stilt occurs throughout the Western Hemisphere including the West Indies, where it is a common and locally abundant resident shorebird in Puerto Rico (Oberle 2018, Raffaele and others 1998), Culebra, Mona (Ventosa-Febles and others 2005), and Vieques (Gemmill 2015). On Puerto Rico, it is very common in the Cabo Rojo salt flats (Collazo and others 1995) as well as Jobos Bay (Wunderle, Jr. and others 1989) and elsewhere. The Black-necked Stilt is associated with shallow saltwater or freshwater with a soft muddy bottom, grassy marshes, wet savanna,

mudflats, shallow ponds, flooded fields, borders of salt ponds, and mangrove swamps, and is primarily found on the coastal plains (Oberle 2018, Raffaele and others 1998). The atlas fieldwork yielded a total of 290 records within 129 hexagons or 27 percent of the 479 total hexagons (see map). Of the 129 hexagons where this species was found, breeding met the atlas definition of confirmed in 28 percent (36) of the hexagons, probable in 17 percent (22), and possible in 50 percent (64), while the species was observed in 5 percent (7) of the hexagons but without evidence of breeding (see map).



Black-necked Stilt distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

### Breeding Ecology

The Black-necked Stilt builds a nest made of grass and twigs on the ground near water, from late April to August, and from September to October, according to previously published reports (Raffaele and others 1998). Atlas results show that this species breeds throughout the year, but it is more active from April to July (see chart). Results show that this species breeds within the subtropical moist (57 percent

of the hexagons) and subtropical dry forest life zones (43 percent of the hexagons) (see table and map).

### Population Status and Conservation

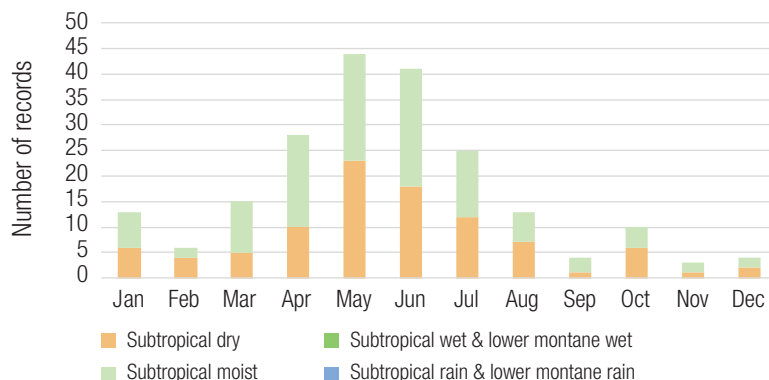
The Black-necked Stilt population is suspected to be increasing, and it is listed as a species of least concern by the IUCN (Robinson and others 2020). Locally, this species is not listed in any of the threatened categories used by PRDNER

and USFWS. In Puerto Rico, the Black-necked Stilt has a protected habitat in land of 14 percent or 411 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (2917 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Black-necked Stilt breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	20	56	16	44	0	0	0	0	36
Probable	8	36	14	64	0	0	0	0	22
Possible	24	38	40	63	0	0	0	0	64
<b>Total</b>	<b>52</b>	<b>43</b>	<b>70</b>	<b>57</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>122</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Black-necked Stilt records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# American Oystercatcher/Ostrero

## *Haematopus palliatus*

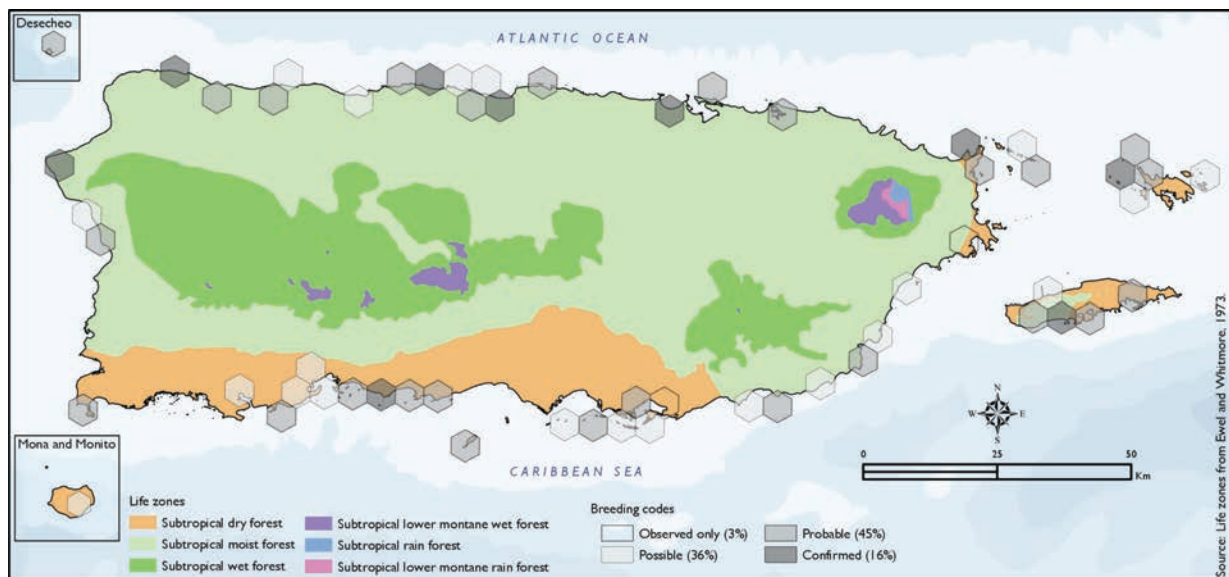


Photo by José Salguero

### Distribution and Habitat

The American Oystercatcher occurs from the eastern coast of the United States south through Central and South America including the West Indies (Raffaele and others 1998). It is an uncommon and local species in Puerto Rico, Culebra, Desecheo, Mona (Oberle 2018, Ventosa-Febles and others 2005), Vieques (Gemmill 2015, Oberle 2018), and small cays around the islands, and is even considered migratory on Puerto Rico due to its rarity on the coast (Biaggi 1997). On Vieques, its abundance changes with season, ranging from uncommon resident in spring to extremely rare in fall

and winter (Gemmill 2015). This is a shorebird restricted to marine habitats including stony and sandy beaches, coastal salt marshes, and offshore islands and cays (Raffaele and others 1998). The atlas fieldwork yielded a total of 85 records within 58 hexagons or 12 percent of the 479 total hexagons (see map). Of the 58 hexagons where this species was found, breeding met the atlas definition of confirmed in 16 percent (9) of the hexagons, probable in 45 percent (26), and possible in 36 percent (21), while the species was observed in 3 percent (2) of the hexagons but without evidence of breeding (see map).



American Oystercatcher distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



### Breeding Ecology

This species nests on sand, pebbles, or coral rubble beaches from May to July, according to previously published reports (Raffaele and others 1998). Atlas results indicate that the American Oystercatcher breeding season extends throughout the year, but it is most active from April to July with a peak during April and June (see chart). Results show that the American Oystercatcher breeds within

subtropical dry and subtropical moist forest life zones (52 and 48 percent of the hexagons, respectively) (see table and map). The seasonal pattern of breeding appears to coincide in each of the ecological life zones with no evidence to suggest that breeding times differ between the life zones.

### Population Status and Conservation

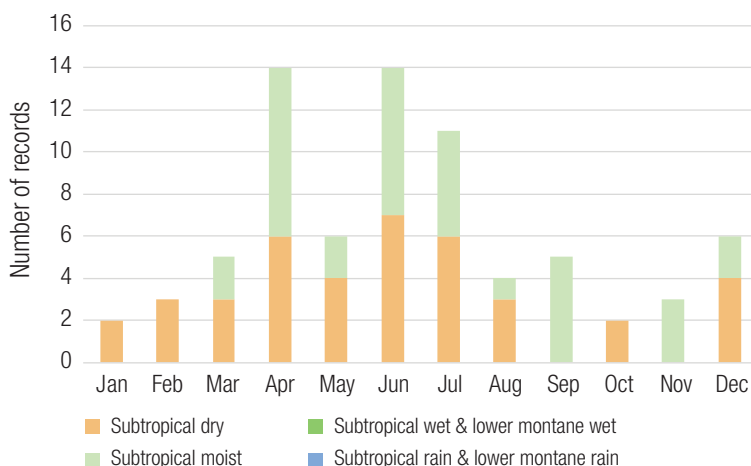
The American Oystercatcher is listed as a species of least

concern by the IUCN (BirdLife International 2016). Locally, this species is listed as vulnerable (PRDNER 2015). In Puerto Rico, the American Oystercatcher has a protected habitat in land of 11 percent or 150 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1338 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where American Oystercatcher breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	3	33	6	67	0	0	0	0	9
Probable	15	58	11	42	0	0	0	0	26
Possible	11	52	10	48	0	0	0	0	21
<b>Total</b>	<b>29</b>	<b>52</b>	<b>27</b>	<b>48</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>56</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of American Oystercatcher records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Killdeer/Chorlito Sabanero

## *Charadrius vociferus*



Photo by Joseph Wunderle

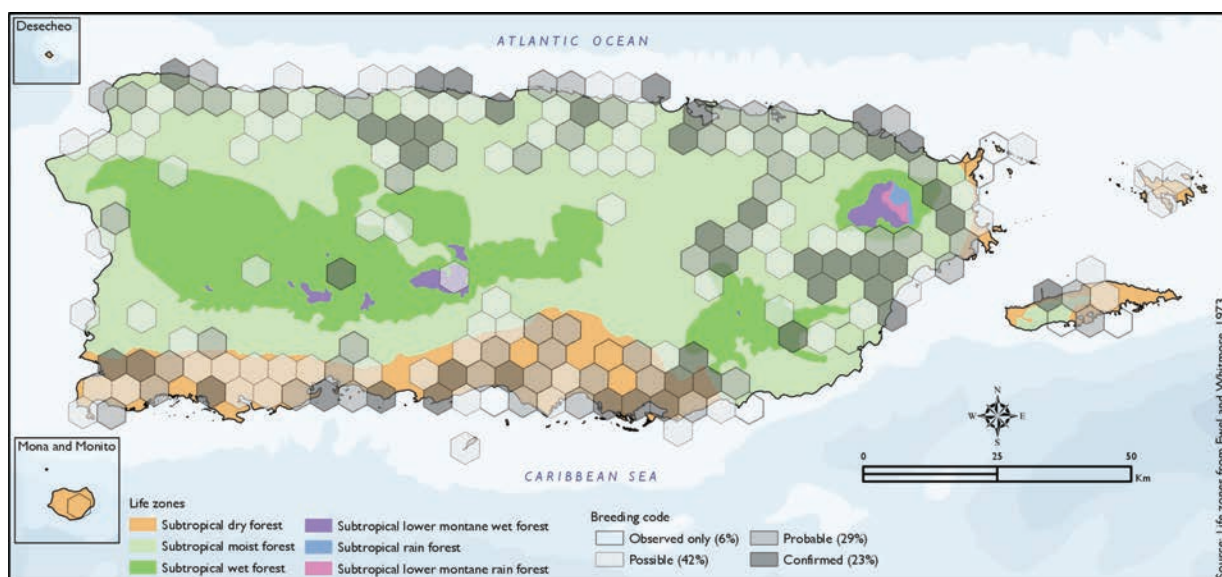
### Distribution and Habitat

The Killdeer occurs from North America through western South America including the Caribbean, where it is a common resident in The Bahamas and Greater Antilles and to a lesser extent in the Virgin Islands. It ranges from uncommon to very rare in the rest of the West Indies (Raffaele and others 1998). It is common and fairly abundant in Puerto Rico (Biaggi 1997, Oberle 2018) and is considered a fairly common resident on Vieques (Gemmill 2015). This species is mostly associated with wet fields, mudholes (Raffaele and others 1998), pond edges, mudflats, golf courses, and residential

lawns (Oberle 2018). The atlas fieldwork yielded a total of 339 records within 192 hexagons or 40 percent of the 479 total hexagons (see map). Of the 192 hexagons where this species was found, breeding met the atlas definition of confirmed in 23 percent (44) of the hexagons, probable in 29 percent (56), and possible in 42 percent (81), while the species was observed in 6 percent (11) of the hexagons but without evidence of breeding (see map).

### Breeding Ecology

The Killdeer's nest consists of a slightly lined concavity on the ground (Biaggi 1997, Raffaele



Killdeer distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

and others 1998), which is sometimes bordered with dry weeds or small rocks (Biaggi 1997). Previously published reports indicate that it breeds from March to October (Raffaele and others 1998). Atlas results show that this species' breeding season extends throughout the year with most breeding activity from March to July (see chart). Overall, the breeding activity peaks in May at the onset of the rainy season, and it mostly takes place in the subtropical moist forest life zone (see chart). Results show that this species occurs primarily on the coastal

plain and breeds mostly within the subtropical moist forest life zone (63 percent of the hexagons), with some breeding in the subtropical dry forest life zone (33 percent of the hexagons) and in subtropical wet and lower montane wet forest life zones at higher elevations (4 percent of the hexagons) (see table and map).

**Population Status and Conservation**

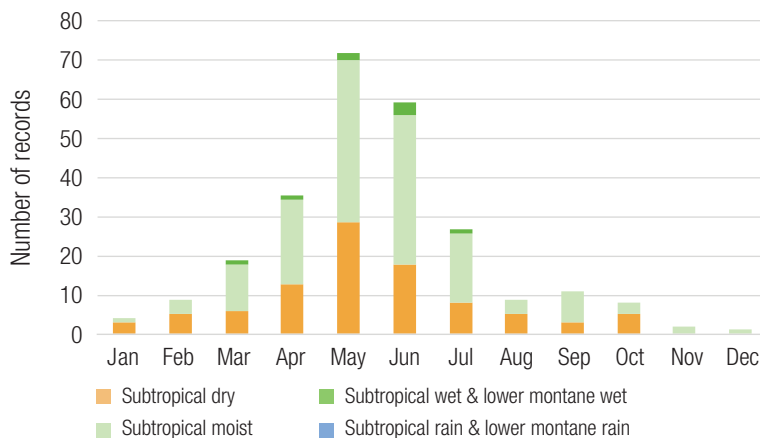
The current population trend of the Killdeer is described as 'decreasing,' although some

populations are stable or have unknown trends (Wetlands International 2012). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Killdeer has a protected habitat in land of 11 percent or 458 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (4327 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Killdeer breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	13	30	28	64	3	7	0	0	44
Probable	20	36	36	64	0	0	0	0	56
Possible	26	32	50	62	5	6	0	0	81
<b>Total</b>	<b>59</b>	<b>33</b>	<b>114</b>	<b>63</b>	<b>8</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>181</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Killdeer records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Wilson's Plover/Chorlito Marítimo

## *Charadrius wilsonia*



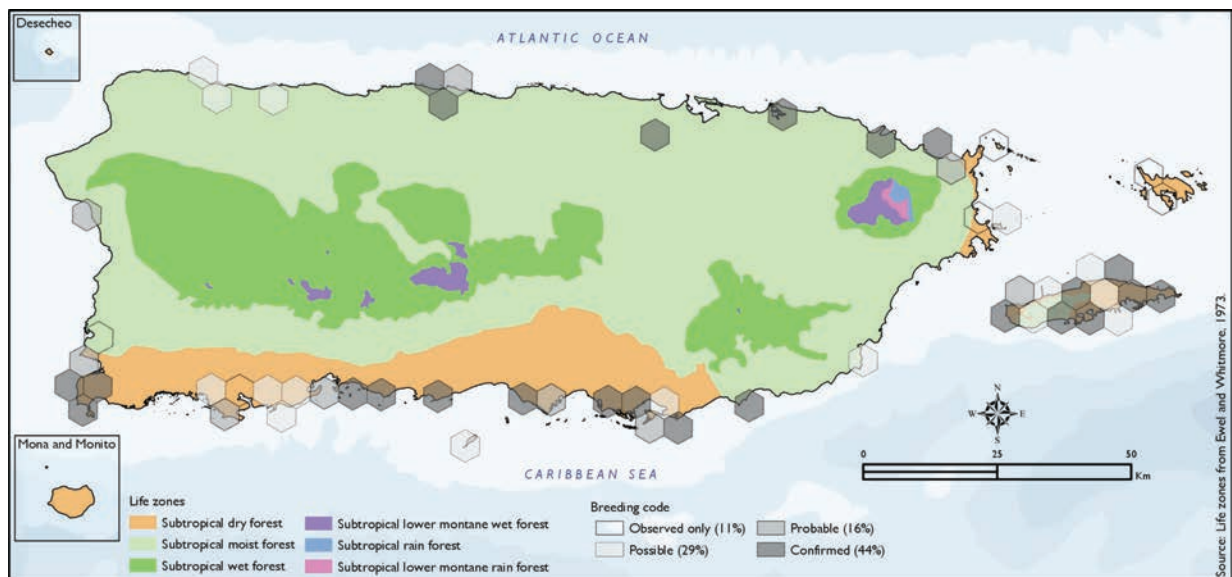
Photo by Alcides Morales

### Distribution and Habitat

The Wilson's Plover occurs in warm coastal areas of the Western Hemisphere but mostly from the Southeastern United States through the north coast of South America including the West Indies (Biaggi 1997, Raffaele and others 1998). It declines in numbers from September to March on some

islands like Puerto Rico and Cuba when the birds are not breeding (Raffaele and others 1998). It is described as fairly common and abundant throughout the coastal areas of Puerto Rico (Biaggi 1997). On Vieques, it is a common resident throughout the year (Gemmill 2015), and it also occurs on Culebra, Caja de Muerto, and

other small cays with sandy beaches (Ventosa-Febles and others 2005). It usually inhabits borders of salt ponds (Raffaele and others 1998), edges of mangroves, sandy beaches, and sometimes freshwater lagoons (Biaggi 1997), as well as mudflats and salt pans (Oberle 2018). The atlas fieldwork yielded a total of 109 records within 55 hexagons or 11 percent of the 479 total hexagons (see map). Of the 55 hexagons where this species was found, breeding met the atlas definition of confirmed in 44 percent (24) of the hexagons, probable in 16 percent (9), and possible in 29 percent (16), while the species was observed in 11 percent (6) of the hexagons but without evidence of breeding (see map).



Wilson's Plover distribution. The map shows the distribution and highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

## Breeding Ecology

Previously published reports indicate that the Wilson's Plover breeds primarily from March to July (Raffaele and others 1998). The nest is a concavity in the sand sometimes bordered with pieces of shell (Biaggi 1997, Raffaele and others 1998). Atlas results show that this species breeds from December to September with the most breeding activity during May, June, and July (see chart). Overall, the breeding activity peaks in June, and it mostly

takes place within the subtropical dry forest life zone (see chart). Results show that this species breeds exclusively in coastal areas and mostly within the subtropical dry forest life zone (65 percent of the hexagons) and less frequently within the subtropical moist forest life zone (35 percent of the hexagons) (see table and map).

## Population Status and Conservation

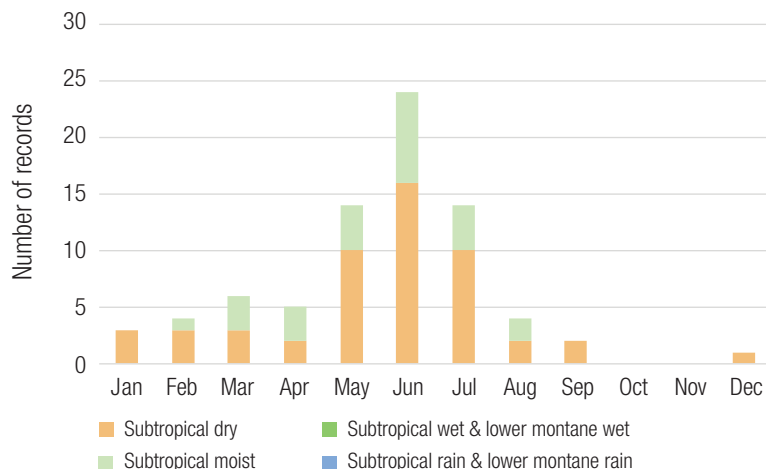
The current population trend of the Wilson's Plover is described as 'decreasing' in North America

(Butcher and Niven 2007), and it is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Wilson's Plover has a protected habitat in land of 17 percent or 196 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1171 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Wilson's Plover breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	16	67	8	33	0	0	0	0	24
Probable	6	67	3	33	0	0	0	0	9
Possible	10	63	6	38	0	0	0	0	16
<b>Total</b>	<b>32</b>	<b>65</b>	<b>17</b>	<b>35</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>49</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Wilson's Plover records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Snowy Plover/Chorlito Blanco

## *Charadrius nivosus*



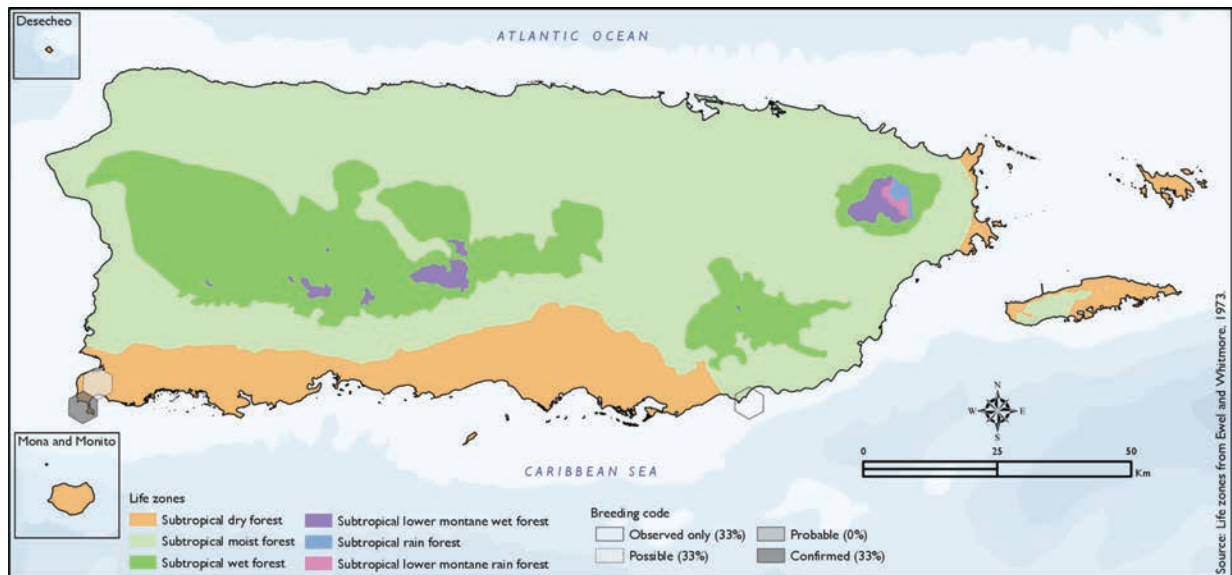
Photo by Alcides Morales

### Distribution and Habitat

The Snowy Plover ranges from the Western and Southern United States to northern and western

South America and the Caribbean (Raffaele and others 1998). Within the Caribbean, it occurs commonly in the southern Bahamas north to San Salvador, and in Hispaniola and Anguilla, while it is considered uncommon in the northern Bahamas, Puerto Rico, the Virgin Islands, St. Martin, and St. Barthélemy, and very rare on Cuba (Raffaele and others 1998). It is an uncommon and localized permanent resident in Puerto Rico (Oberle 2018, Raffaele and others 1998), limited to the extreme southwestern corner of the main island, where it can be regularly seen in the salt flats of Cabo Rojo. The species has not been recorded from Vieques (Gemmill 2015), and only one published record exists for Culebra, at least at the

time of publication of the field guide by Raffaele and others (1998). This species' habitat includes mostly sandy beaches and lagoon edges with salt flats or salt ponds (Oberle 2018, Raffaele and others 1998). The atlas fieldwork yielded a total of 14 records within three hexagons or 0.6 percent of the 479 total hexagons (see map). Of the three hexagons where this species was found, breeding met the atlas definition of confirmed in 33 percent (one) of the hexagons and possible in 33 percent (one) as well, while the species was observed in 33 percent (one) of the hexagons but without evidence of breeding (see map).



Snowy Plover distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

The Snowy Plover’s nest consists of a depression made in the sand, sometimes bordered with shell pieces (Biaggi 1997, Oberle 2018, Raffaele and others 1998), and it generally nests in small colonies (Biaggi 1997). Previously published reports indicate that it breeds from January to August (Raffaele and others 1998). Atlas results based on small sample size show that this species breeds mostly from October to December but also during the months of March, May, June, and August (see chart). Overall, the breeding

activity peaks in October and takes place in coastal areas within the subtropical dry forest life zone (100 percent of the hexagons) (see table and map).

**Population Status and Conservation**

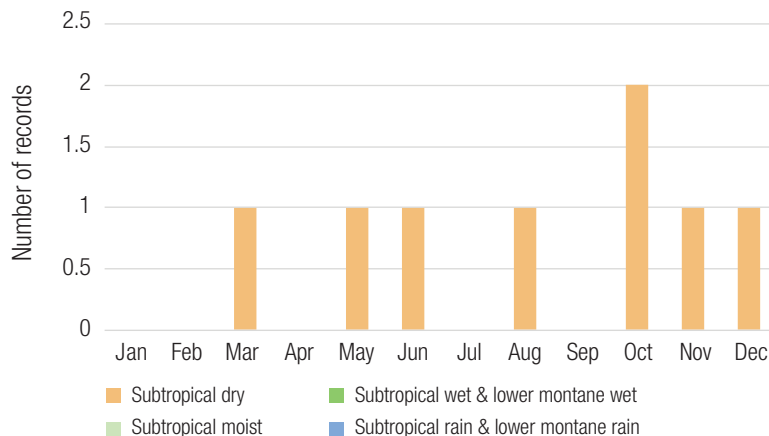
The current population trend of the Snowy Plover is described as ‘decreasing’ throughout the Western Hemisphere following evidence of regional declines and due to ongoing threats like habitat degradation and disturbance (Page and others 2009, Thomas and others 2012). This species is currently listed as a Near Threatened species by

the IUCN (BirdLife International 2017), and locally it is classified as critically endangered (PRDNER 2016). In Puerto Rico, the Snowy Plover has a protected habitat in land of 21 percent or 10 km<sup>2</sup> of the total area where evidence of breeding was found for this species (48 km<sup>2</sup>). However, this value represents an underestimation of the actual terrestrial habitat protected (estimated to be about 80–100 percent) as a large portion of the hexagons for this species lay on the water.

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Snowy Plover breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	1	100	0	0	0	0	0	0	1
Probable	0	0	0	0	0	0	0	0	0
Possible	1	100	0	0	0	0	0	0	1
<b>Total</b>	<b>2</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Snowy Plover records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Willet/Playero Aliblanco

## *Tringa semipalmata*

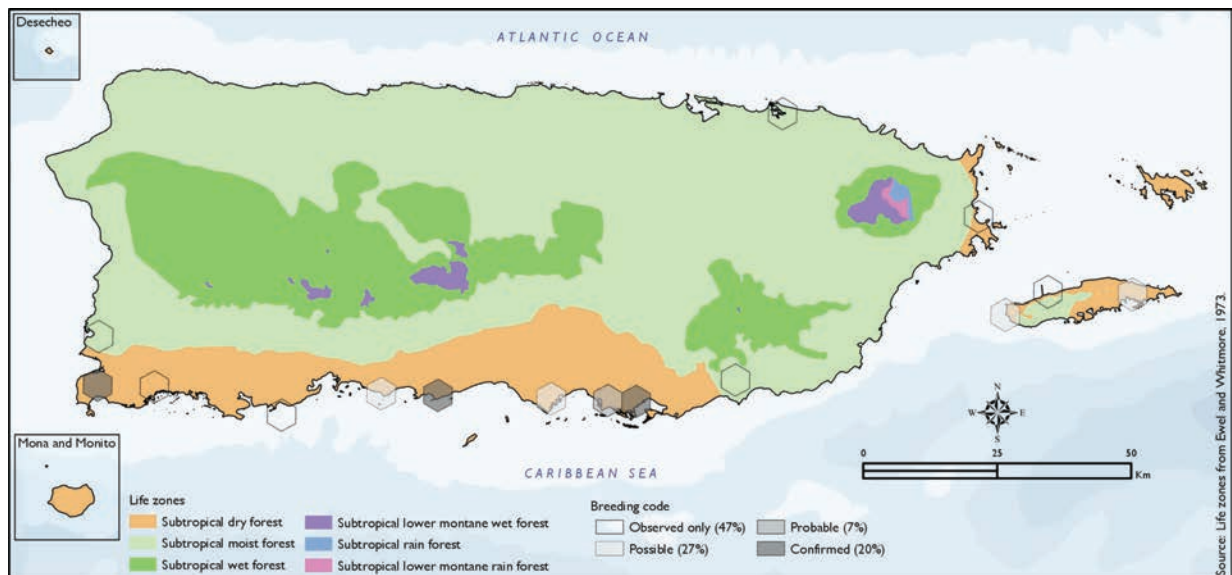


Photo by José A. Colon

### Distribution and Habitat

The Willet is widespread in the Western Hemisphere including the West Indies, where it is a year-round resident in The Bahamas, Greater Antilles, and Cayman Islands, particularly from August to November when breeding resident populations are joined by migrants from North America (Raffaele and others 1998). It is observed mostly from August to April on Puerto Rico (Biaggi 1997), regularly in the municipality of Cabo Rojo (Oberle 2018). It also occurs on Vieques, where it is a rare passage migrant during fall, late winter, and spring, and is extremely rare in summer (Gemmill 2015). This species'

habitat includes mostly tidal flats, edges of both saltwater and freshwater bodies (Raffaele and others 1998), mudflats, mangroves (Oberle 2018), and beaches (Biaggi 1997). The atlas fieldwork yielded a total of 23 records within 15 hexagons or 3 percent of the 479 total hexagons with all records occurring in coastal hexagons (see map). Of the 15 hexagons where this species was found, breeding met the atlas definition of confirmed in 20 percent (three) of the hexagons, probable in 7 percent (one), and possible in 27 percent (four), while the species was observed in 47 percent (seven) of the hexagons but without evidence of breeding (see map).



Willet distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

The Willet’s nest is a slightly lined concavity in the sand, sometimes with dried weeds in the center (Biaggi 1997, Raffaele and others 1998). Previously published reports indicate that breeding occurs from April to July (Raffaele and others 1998). Atlas results show that this species’ breeding season extends mostly from May to August and to a lesser extent in February, with the most breeding activity

during July (see chart). Results show that this species breeds within the subtropical dry forest life zone (100 percent of the hexagons) on the south coast of Puerto Rico (see table and map).

**Population Status and Conservation**

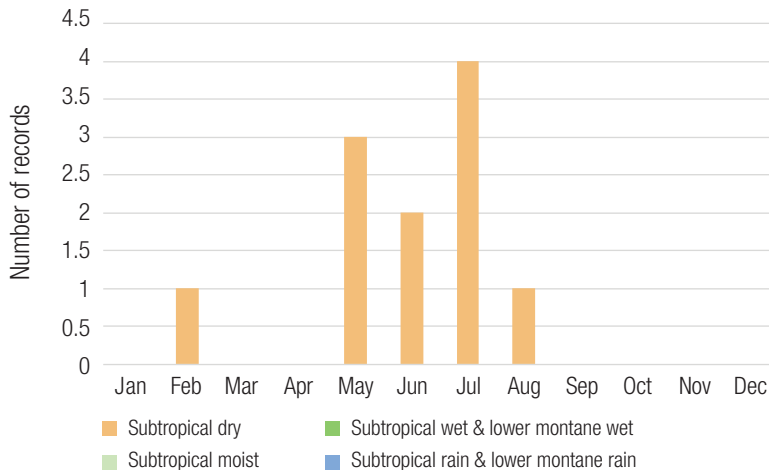
The current global population trend of the Willet is described as ‘stable,’ although some populations have unknown trends (Wetlands International 2012). This species is currently

listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Willet has a protected habitat in land of 20 percent or 38 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (191 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Willet breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	3	100	0	0	0	0	0	0	3
Probable	1	100	0	0	0	0	0	0	1
Possible	4	100	0	0	0	0	0	0	4
<b>Total</b>	<b>8</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Willet records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Laughing Gull/*Gaviota Gallega*

## *Leucophaeus atricilla*

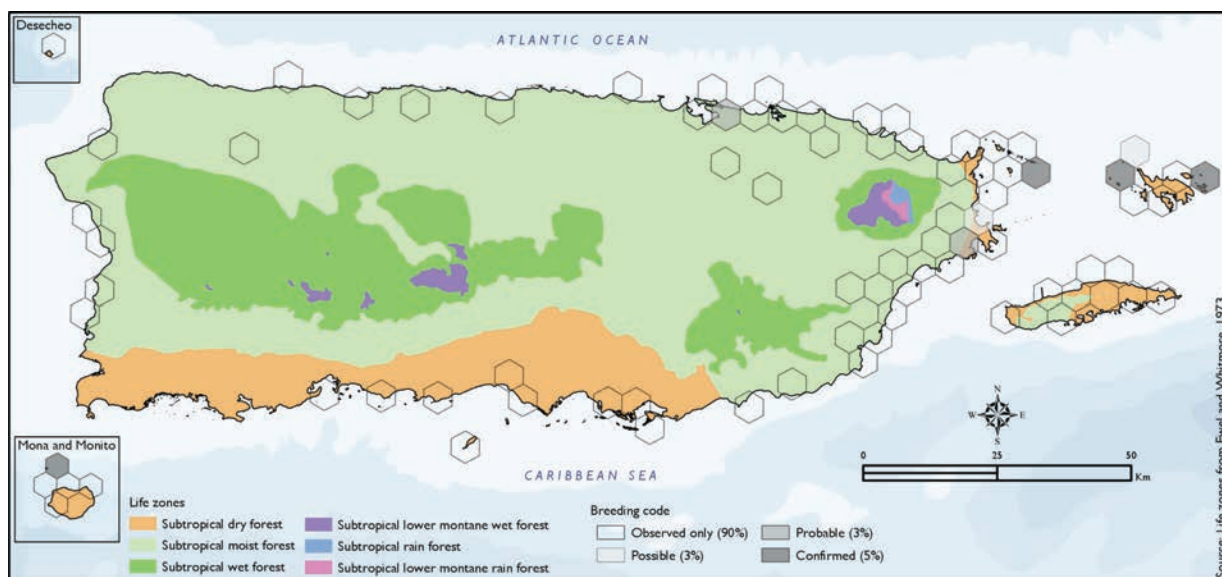


Photo by Joseph Wunderle

### Distribution and Habitat

The Laughing Gull occurs through the tropical, subtropical, and some temperate areas of the Western Hemisphere including the West Indies, where it is generally common from April to September and becomes irregular and rare during the rest of the year throughout most of the islands (Raffaele and others 1998). It usually nests on offshore rocky cays around Culebra, Mona, and Monito (Oberle 2018). On Vieques, it ranges from fairly common to rare (Gemmill 2015). It usually inhabits marshes, coastal marine waters, tidal flats (Oberle 2018),

calm bays, and offshore islets (Raffaele and others 1998). Although it is most common in coastal areas, it may move inland and frequent landfills and reservoirs. The atlas fieldwork yielded a total of 124 records within 80 hexagons or 17 percent of the 479 total hexagons (see map). Of the 80 hexagons where this species was found, breeding met the atlas definition of confirmed in 5 percent (4) of the hexagons, probable in 3 percent (2), and possible in 3 percent (2) as well, while the species was observed in 90 percent (72) of the hexagons but without evidence of breeding (see map).



Laughing Gull distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the Laughing Gull breeds from May to July (Raffaele and others 1998). The nest consists of a scrape with lined grass, usually made on the ground of a beach or in a crevice of a rocky cay, and sometimes near a colony of other seabirds (Oberle 2018, Raffaele and others 1998). Atlas results show that this species breeds mostly from May to July, and to a lesser extent also during March (see chart). Overall, the breeding activity

peaks in July, and it mostly takes place within the subtropical dry forest life zone (see chart). Results (see table and map) show that this species breeds mostly in coastal areas within the subtropical dry forest life zone (75 percent of the hexagons), but it may also breed within the subtropical moist forest life zone (25 percent of the hexagons).

**Population Status and Conservation**

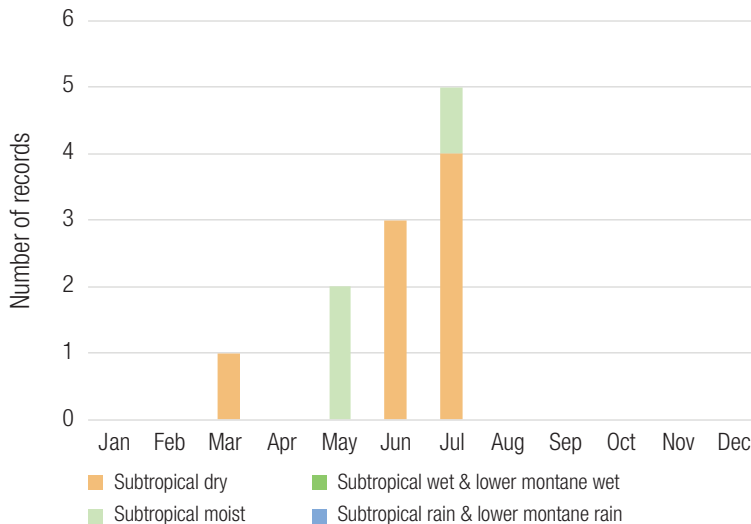
The overall population trend of the Laughing Gull is described as ‘increasing,’ although some

populations have unknown trends (Butcher and Niven 2007, Wetlands International 2012), and it is currently listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Laughing Gull has a protected habitat in land of 6 percent or 12 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (191 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Laughing Gull breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	4	100	0	0	0	0	0	0	4
Probable	0	0	2	100	0	0	0	0	2
Possible	2	100	0	0	0	0	0	0	2
<b>Total</b>	<b>6</b>	<b>75</b>	<b>2</b>	<b>25</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Laughing Gull records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Brown Noddy/*Cervera Pardea*

## *Anous stolidus*

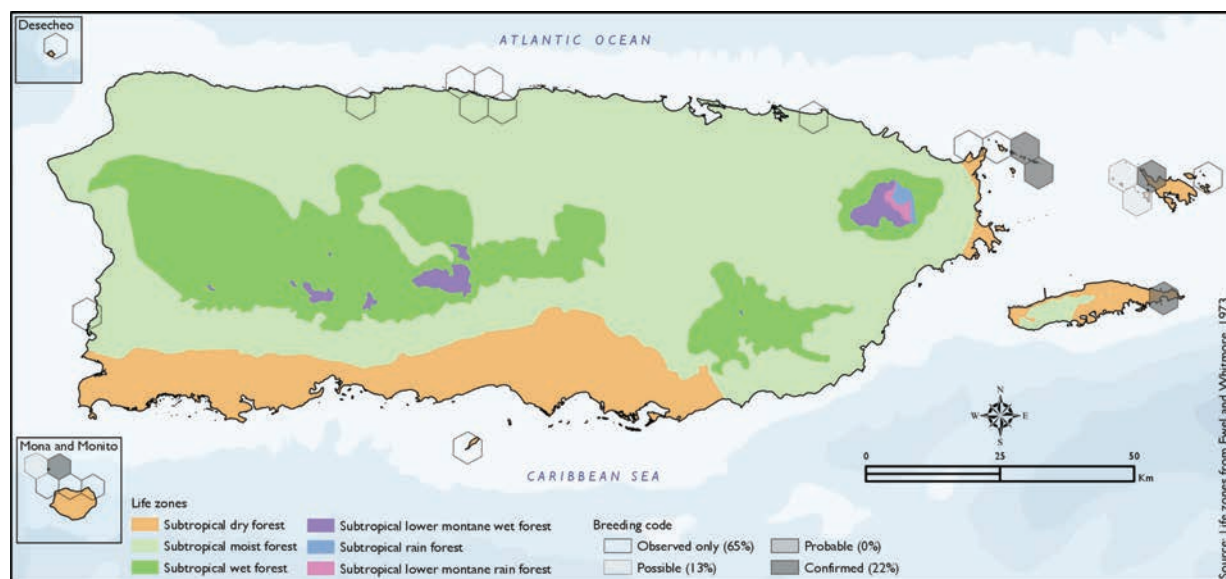


Photo by Dave Currie

### Distribution and Habitat

The Brown Noddy occurs through the tropical and subtropical oceans of the world (Raffaele and others 1998). It is a resident seabird in Puerto Rico (Raffaele 1989a) and breeds colonially on the islands of Mona, Monito, and Culebra, and islets of the Cordillera Natural Reserve (Oberle 2018), as well as Desecheo (Biaggi 1997). It is considered unconfirmed on Vieques (Gemmill 2015). The species is seldom seen near land, is highly pelagic (Chardine and others 2020), and mostly

occurs around isolated, bare or vegetated islets and offshore cays where it breeds (Oberle 2018, Raffaele and others 1998). The atlas fieldwork yielded a total of 35 records within 23 hexagons or 5 percent of the 479 total hexagons (see map). Of the 23 hexagons where this species was found, breeding met the atlas definition of confirmed in 22 percent (5) of the hexagons and possible in 13 percent (3), while the species was observed in 65 percent (15) of the hexagons but without evidence of breeding (see map).



Brown Noddy distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

The Brown Noddy nests in colonies and constructs a simple layer of debris or of seaweed and sticks in flat shingle beaches, bare ground, cliff ledges, offshore stacks, low bushes, and tall trees (BirdLife International 2018). Previously published reports indicate that this species breeds from April to July (Raffaele and others 1998). Atlas results indicate that the breeding activity for this species peaks in

June and July (see chart). Results show that this species only nests within the subtropical dry forest life zone (100 percent of the hexagons) (see table and map).

**Population Status and Conservation**

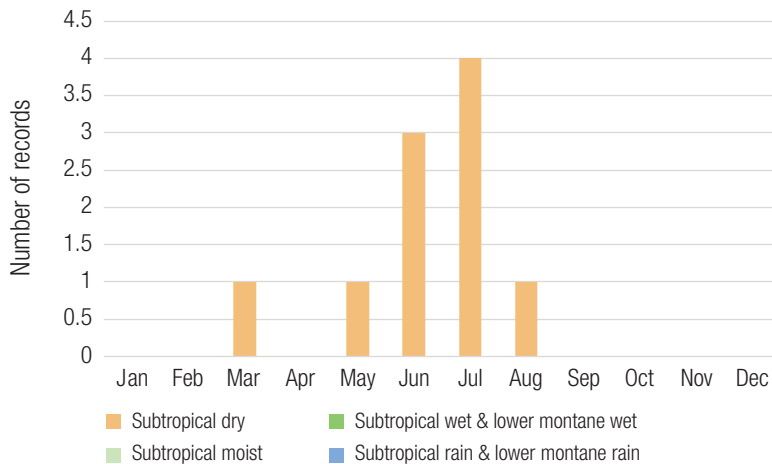
Population trends for the Brown Noddy across its distribution range are unknown. Since the Brown Noddy is relatively common, it is listed as a species of least concern by the IUCN (BirdLife International 2018),

while locally this species is listed as Data Deficient (PRDNER 2015). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Brown Noddy has a protected habitat in land of 6 percent or 11 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (191 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Brown Noddy breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	5	100	0	0	0	0	0	0	5
Probable	0	0	0	0	0	0	0	0	0
Possible	3	100	0	0	0	0	0	0	3
<b>Total</b>	<b>8</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Brown Noddy records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Sooty Tern/Charrán Oscuro

## *Onychoprion fuscatus*

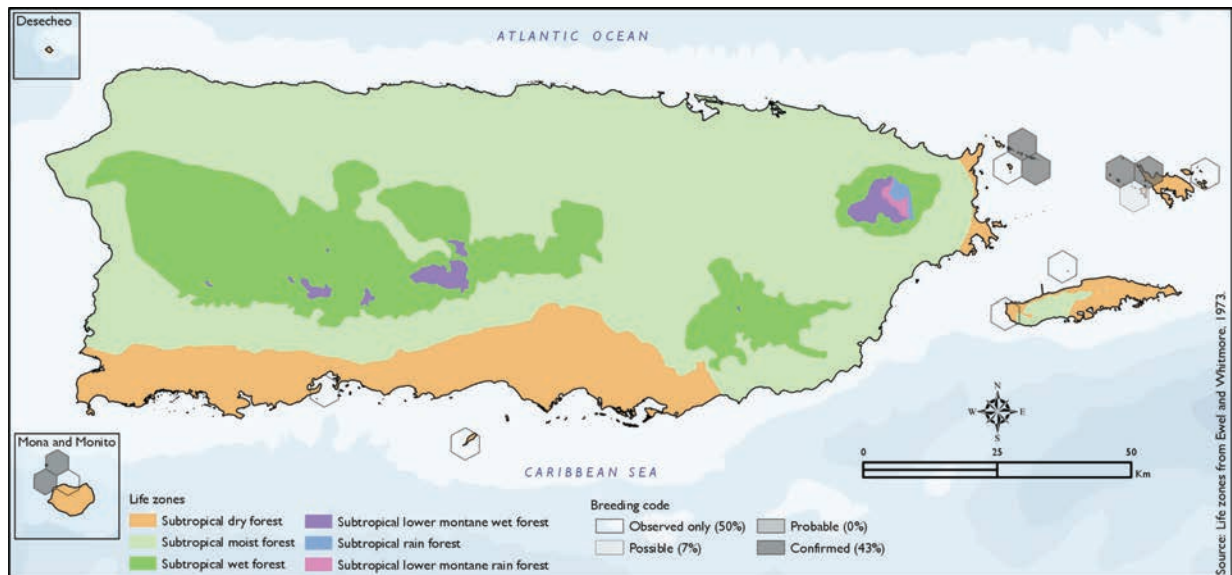


Photo by Jan Zegarra

### Distribution and Habitat

The Sooty Tern occurs through the tropical oceans of the world (Oberle 2018, Raffaele and others 1998). In the West Indies, it is generally a common breeding resident from May to August (Raffaele and others 1998). It is fairly abundant in Puerto Rico during the summer months (Biaggi 1997), and it can be seen on the nesting colonies in Mona, Monito, and Culebra, as well as the Cordillera Natural Reserve (Oberle 2018). It is also found on Vieques, where it is considered an extremely rare summer

visitor (Gemmill 2015). It mostly occurs far offshore (Raffaele and others 1998), except when nesting (Oberle 2018). The atlas fieldwork yielded a total of 24 records within 14 hexagons or 3 percent of the 479 total hexagons (see map). Of the 14 hexagons where this species was found, breeding met the atlas definition of confirmed in 43 percent (six) of the hexagons and possible in 7 percent (one), while the species was observed in 50 percent (seven) of hexagons but without evidence of breeding (see map).



Sooty Tern distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the Sooty Tern breeds from April to August (Raffaele and others 1998). The nest is a scrape made on coral rubble or below overhanging vegetation, mostly in large and gregarious colonies (Raffaele and others 1998). Atlas results show that this species breeds from March to July (see chart). The breeding activity peaks in June and takes place in the

subtropical dry forest life zone (see chart). Results show that this species breeds in coastal areas within the subtropical dry forest life zone (100 percent of the hexagons) (see table and map).

**Population Status and Conservation**

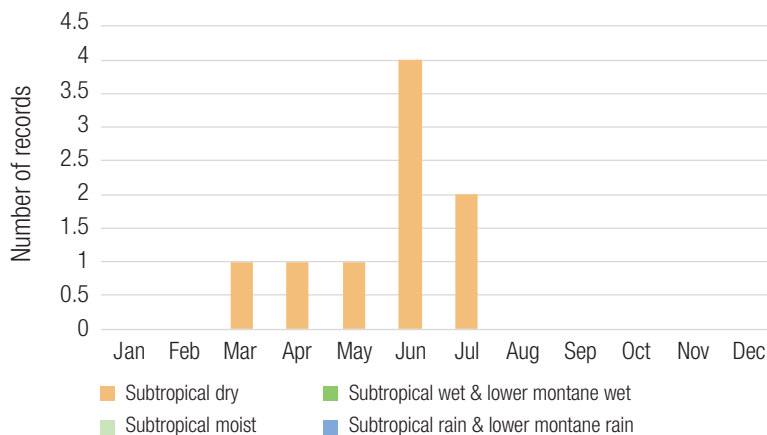
The current overall population trend of the Sooty Tern is described as ‘unknown,’ as some of the populations are decreasing and others are increasing or have unknown trends (Delany

and Scott 2006). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Sooty Tern has a protected habitat in land of 2 percent or 3 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (167 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Sooty Tern breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	6	100	0	0	0	0	0	0	6
Probable	0	0	0	0	0	0	0	0	0
Possible	1	100	0	0	0	0	0	0	1
<b>Total</b>	<b>7</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>7</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Sooty Tern records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Bridled Tern/Charrán Monja

## *Onychoprion anaethetus*

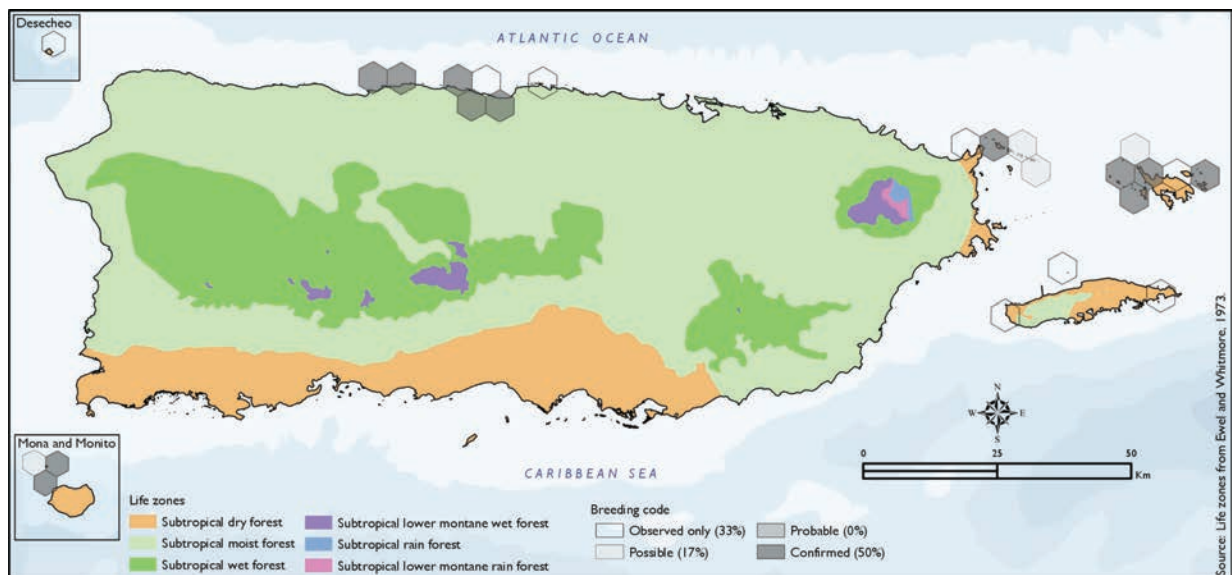


Photo by Alcides Morales

### Distribution and Habitat

The Bridled Tern occurs throughout the tropical and subtropical seas of the world (Raffaele and others 1998). It is a resident species in Puerto Rico (Raffaele and others 1998), regularly seen during breeding season in waters off Mona and Monito, as well as in the Cordillera Natural Reserve and Culebra (Kepler 1978, Oberle 2018), but it is an extremely rare spring and summer visitor in Vieques (Gemmill 2015). However, during the breeding season it can also be seen commonly on the north coast of Puerto Rico between Isabela

and Barceloneta (Oberle 2018). This species often occurs far offshore (Raffaele and others 1998) or near islets where it breeds (Oberle 2018, Raffaele and others 1998). The atlas fieldwork yielded a total of 37 records within 24 hexagons or 5 percent of the 479 total hexagons (see map). Of the 24 hexagons where this species was found, breeding met the atlas definition of confirmed in 50 percent (12) of the hexagons and possible in 17 percent (4), while the species was observed in 33 percent (8) of the hexagons but without evidence of breeding (see map).



Bridled Tern distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

The Bridled Tern nests in small colonies on a coral rubble beach or under the protection of vegetation and rocks on isolated islands or cays from April to July, according to previously published reports (Oberle 2018, Raffaele and others 1998). Atlas results indicate that this species mostly breeds in May, June, and July (see chart). Results show that breeding most commonly

occurs in the subtropical dry and subtropical moist forest life zones (69 and 31 percent of the hexagons, respectively) (see table and map).

**Population Status and Conservation**

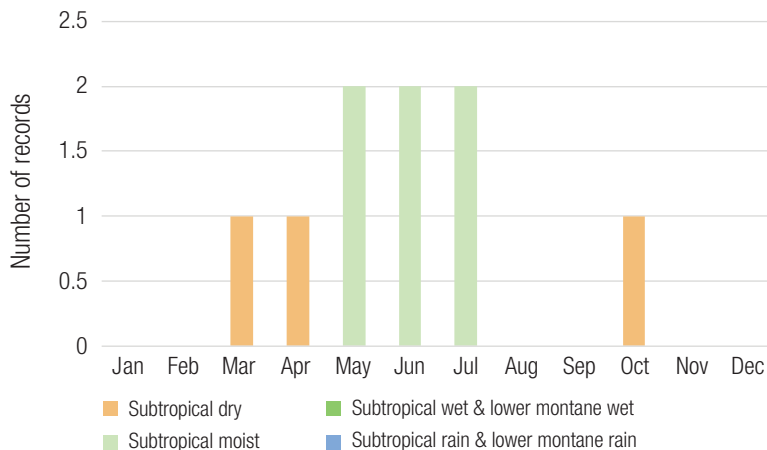
Although the overall population trend of the Bridled Tern is uncertain, it is listed as a species of least concern by the IUCN (BirdLife International 2019), and locally it is not listed in any

of the threatened categories used by PRDNER and USFWS. In Puerto Rico, the Bridled Tern has a protected habitat in land of 6 percent or 23 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (382 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Bridled Tern breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	7	58	5	42	0	0	0	0	12
Probable	0	0	0	0	0	0	0	0	0
Possible	4	100	0	0	0	0	0	0	4
<b>Total</b>	<b>11</b>	<b>69</b>	<b>5</b>	<b>31</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>16</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Bridled Tern records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by Michael Morel

## Least Tern/Charrancito

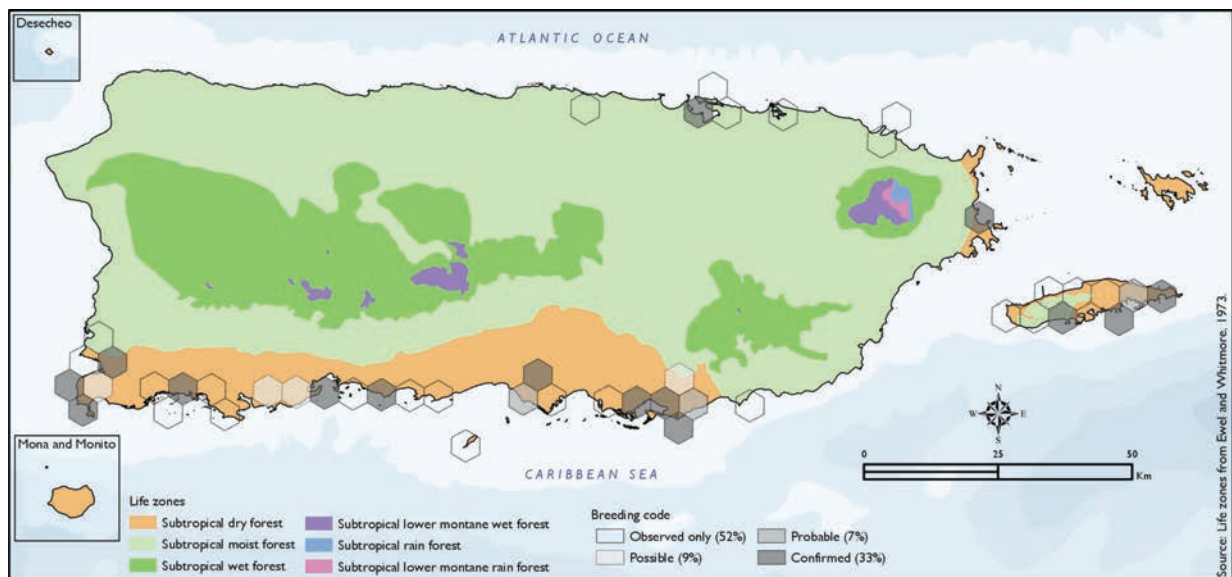
*Sternula antillarum*

### Distribution and Habitat

The Least Tern is widespread and local in North America (Raffaele and others 1998), and winters off Central and South America (Oberle 2018). In the West Indies, it is a common breeding resident in The Bahamas, Greater Antilles, Cayman Islands, St. Martin,

Antigua, and Barbuda mostly from May to August (Raffaele and others 1998). However, it is an uncommon breeder in the Virgin Islands and some of the other northern Lesser Antilles south to St. Christopher, while it ranges from uncommon to rare among the more southern Lesser Antilles (Raffaele and others 1998). It is described as ‘fairly common’ in the coastal areas of Puerto Rico, especially on the southwestern region where colonies of this species nest near the Cabo Rojo lighthouse (Biaggi 1997). On Vieques, it is a fairly common breeding visitor in summer, rare in fall, extremely rare in winter, and uncommon

in spring (Gemmill 2015). It usually inhabits shallow coastal waters (Oberle 2018), harbors, and lagoons (Raffaele and others 1998), and more recently has been nesting on the roofs of shopping centers. The atlas fieldwork yielded a total of 82 records within 46 hexagons or 10 percent of the 479 total hexagons (see map). Of the 46 hexagons where this species was found, breeding met the atlas definition of confirmed in 33 percent (15) of the hexagons, probable in 7 percent (3), and possible in 9 percent (4), while the species was observed in 52 percent (24) of the hexagons but without evidence of breeding (see map).



Least Tern distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the Least Tern breeds from April to July (Raffaele and others 1998). The nest consists of a scrape that can be located in a wide variety of habitats ranging from industrial sites (Raffaele and others 1998) and gravel-roofed buildings to undisturbed beaches (Oberle 2018), and Least Terns either nest as single pairs or in colonies (Raffaele and others 1998). Atlas results show that this species breeds from April to August with the most breeding activity from May to July (see chart). Overall, the breeding activity peaks during May and June, and

it mostly takes place within the subtropical dry forest life zone (see chart). Atlas results show that this species breeds mostly in southern coastal areas within the subtropical dry forest life zone (91 percent of the hexagons) and less commonly in the subtropical moist forest life zone (9 percent of the hexagons) (see table and map).

**Population Status and Conservation**

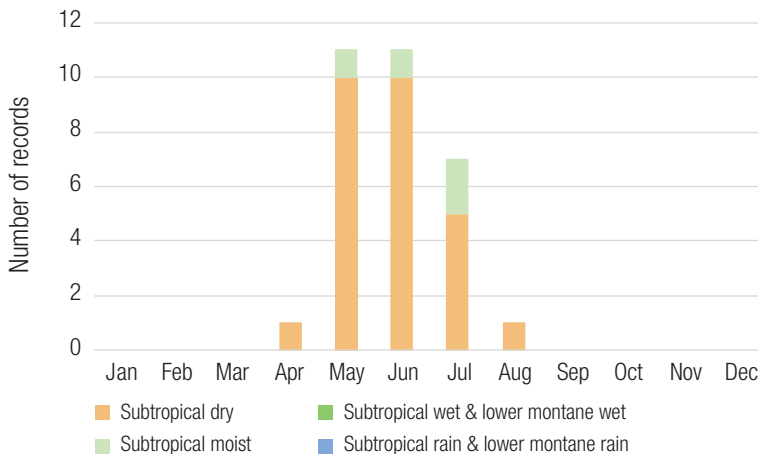
The current overall population trend of the Least Tern is described as ‘decreasing,’ although some populations are increasing and others have unknown trends (Delany and Scott 2006). The Least Tern is

currently listed as a species of least concern by the IUCN (BirdLife International 2018), and locally it is not listed in any of the threatened categories of PRDNER and USFWS. As a ground nester, the nests are subject to nest predation by mongooses (*Herpestes auropunctatus*), cats (*Felis* spp.), dogs (*Canis* spp.), and humans, which may cause breeding birds to abandon nests. In Puerto Rico, the Least Tern has a protected habitat in land of 18 percent or 94 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (527 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Least Tern breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	13	87	2	13	0	0	0	0	15
Probable	3	100	0	0	0	0	0	0	3
Possible	4	100	0	0	0	0	0	0	4
<b>Total</b>	<b>20</b>	<b>91</b>	<b>2</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>22</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Least Tern records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Roseate Tern/Palometa

## *Sterna dougallii*

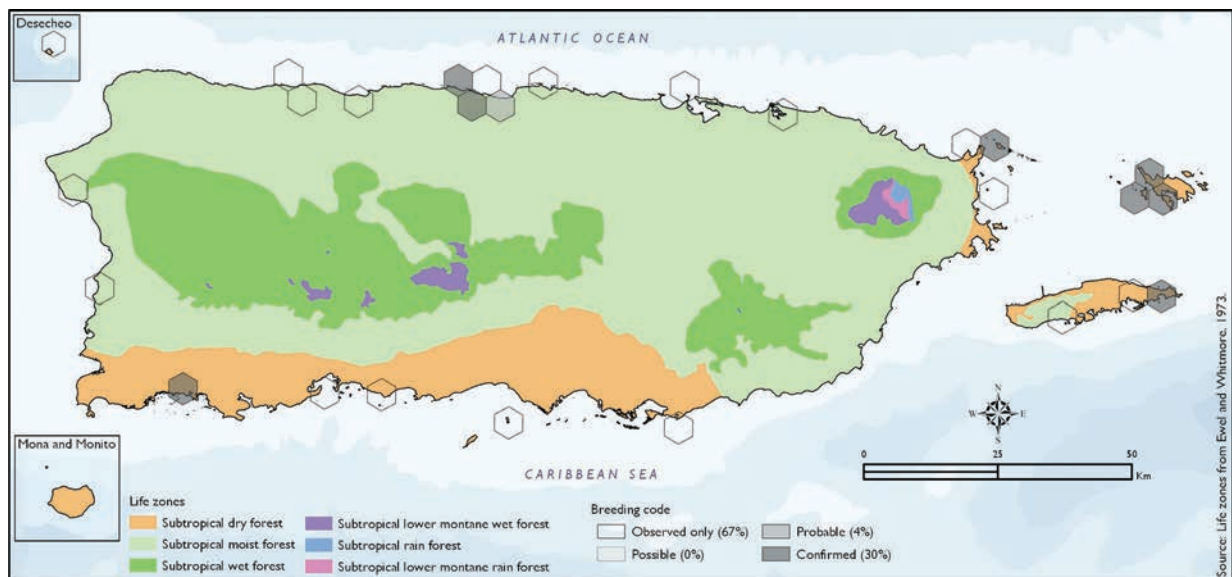
### Distribution and Habitat

The Roseate Tern occurs throughout the world's tropical and subtropical oceans, and it is generally uncommon to rare in the West Indies (Raffaele and others 1998). Small breeding colonies can be found from The Bahamas through the Greater Antilles, especially in the Virgin Islands and cays off southwestern Puerto Rico (Oberle 2018), which support the largest population of Roseate Terns in the tropical Atlantic Ocean (Raffaele and others 1998). It is described as 'fairly abundant' during the summer in coastal areas of Puerto Rico (Biaggi 1997) and is a regular breeder off Culebra and cays south of La Parguera in the municipality of Lajas

(Oberle 2018), as well as other cays near Puerto Rico (Biaggi 1997). On Vieques, it is a fairly common breeding visitor in summer (Gemmill 2015, Johnson 1988), extremely rare in fall, and rare in spring (Gemmill 2015). It usually inhabits coastal areas, harbors, and lagoons (Raffaele and others 1998). The atlas fieldwork yielded a total of 42 records within 27 hexagons or 6 percent of the 479 total hexagons (see map). Of the 27 hexagons where this tern was found, breeding met the atlas definition of confirmed in 30 percent (8) of the hexagons and probable in 4 percent (1), while the species was observed in 67 percent (18) of the hexagons but without evidence of breeding (see map).



Photo by Jan Zegarra



Roseate Tern distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

### Breeding Ecology

Previously published reports indicate that the Roseate Tern breeds from May to July (Raffaele and others 1998). Nesting is usually colonial on offshore cays, and the nest consists of a scrape in the sand or a rocky depression (Raffaele and others 1998). On Culebra, the terns nest on cliffs between boulders (Oberle 2018). Breeding colonies are very local, but birds are regularly observed along coastal waters during the breeding season (see map). Atlas results show that this species breeds from May to July (see

chart). Overall, the breeding activity peaks in June, and it mostly takes place within the subtropical dry forest life zone (see chart). Results show that this species breeds mostly in coastal areas within the subtropical dry forest life zone (67 percent of the hexagons) and the subtropical moist forest life zone (33 percent of the hexagons) (see table and map).

### Population Status and Conservation

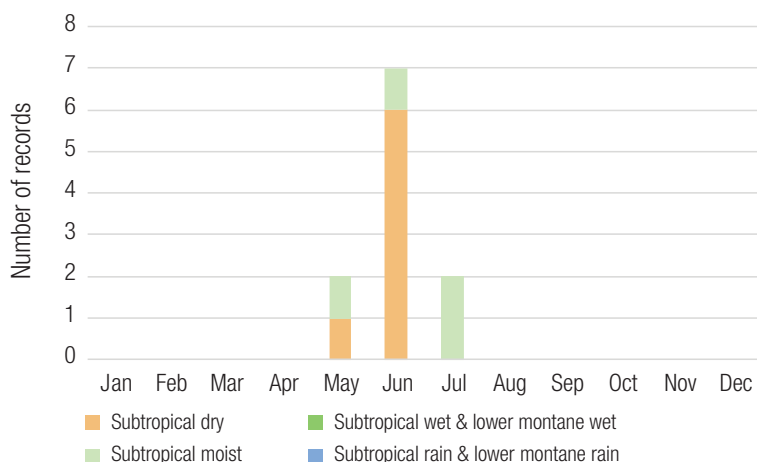
The current overall population trend of the Roseate Tern is described as ‘uncertain or

unknown’ as some populations are decreasing, while others are stable or increasing (Wetlands International 2012). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2018). However, it is locally listed as a threatened species by Federal laws (Oberle 2018, USFWS 1973). In Puerto Rico, the Roseate Tern has a protected habitat in land of 16 percent or 35 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (214 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Roseate Tern breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	6	75	2	25	0	0	0	0	8
Probable	0	0	1	100	0	0	0	0	1
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>6</b>	<b>67</b>	<b>3</b>	<b>33</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>9</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Roseate Tern records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Royal Tern/Charrán Real

*Thalasseus maximus*

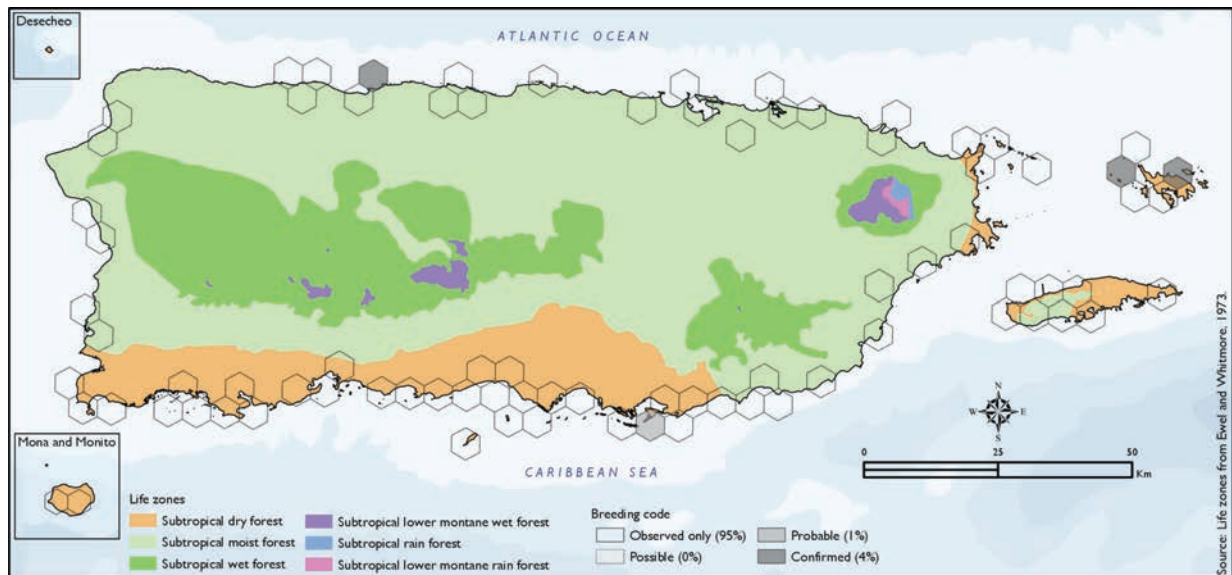


Photo by Dave Currie

## Distribution and Habitat

The Royal Tern occurs on the western coast of Africa (Biaggi 1997, Oberle 2018, Raffaele and others 1998) and from the Southern United States through much of coastal South America including the West Indies (Raffaele and others 1998). In Puerto Rico, it is a common visitor during winter in the San Juan Harbor, Laguna San José, Laguna Torrecilla, Boquerón Bay, and Mayagüez (Oberle 2018). On Vieques, it is considered a common non-breeder in all seasons (Gemmill 2015). It has been known to nest on Mona (McCandless 1958) and cays near

Culebra (Kepler and Kepler 1978, Oberle 2018). It usually inhabits coastal marine waters (Oberle 2018), harbors, and lagoons (Raffaele and others 1998). The atlas fieldwork yielded a total of 134 records within 82 hexagons or 17 percent of the 479 total hexagons (see map). Of the 82 hexagons where the Royal Tern was found, breeding met the atlas definition of confirmed in 4 percent (3) of the hexagons and probable in 1 percent (1), while the species was observed in 95 percent (78) of the hexagons but without evidence of breeding (see map).



Royal Tern distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the Royal Tern breeds from April to July but is irregular as to number of pairs and location (Raffaele and others 1998). Nesting is generally colonial and on small cays, and the nest consists of a scrape made on a sandy beach or in a rocky depression (Oberle 2018, Raffaele and others 1998). Atlas results show that this species breeds during May and June (see chart). Overall, the breeding activity peaks in June, and it mostly takes place within the subtropical dry forest life zone (see chart). Results show that this

species breeds in coastal areas mostly within the subtropical dry forest life zone (75 percent of the hexagons) (see table), but it also breeds within the subtropical moist forest life zone (25 percent of the hexagons) (see table and map).

**Population Status and Conservation**

The current overall population trend of the Royal Tern is described as ‘stable,’ although some populations have unknown trends (Wetlands International 2012), and it is currently listed as a species of least concern by the IUCN (BirdLife International 2018). In Puerto Rico, Oberle

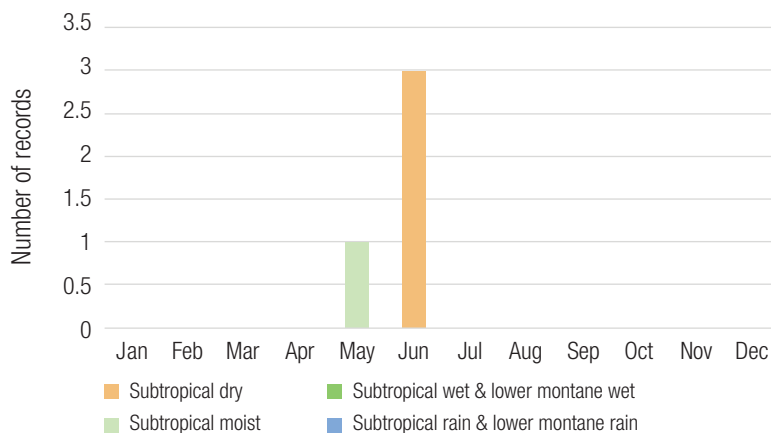
(2018) noted that the only confirmed breeding sites for Royal Terns were on cays off Culebra, but that breeding on these sites was reduced since 1988 to just a “sporadic handful of breeding pairs.” Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS.

In Puerto Rico, the Royal Tern has a protected habitat in land of 3 percent or 3 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (95 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Royal Tern breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	2	67	1	33	0	0	0	0	3
Probable	1	100	0	0	0	0	0	0	1
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>3</b>	<b>75</b>	<b>1</b>	<b>25</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Royal Tern records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Sandwich Tern/Charrán Piquiagudo

## *Thalasseus sandvicensis*

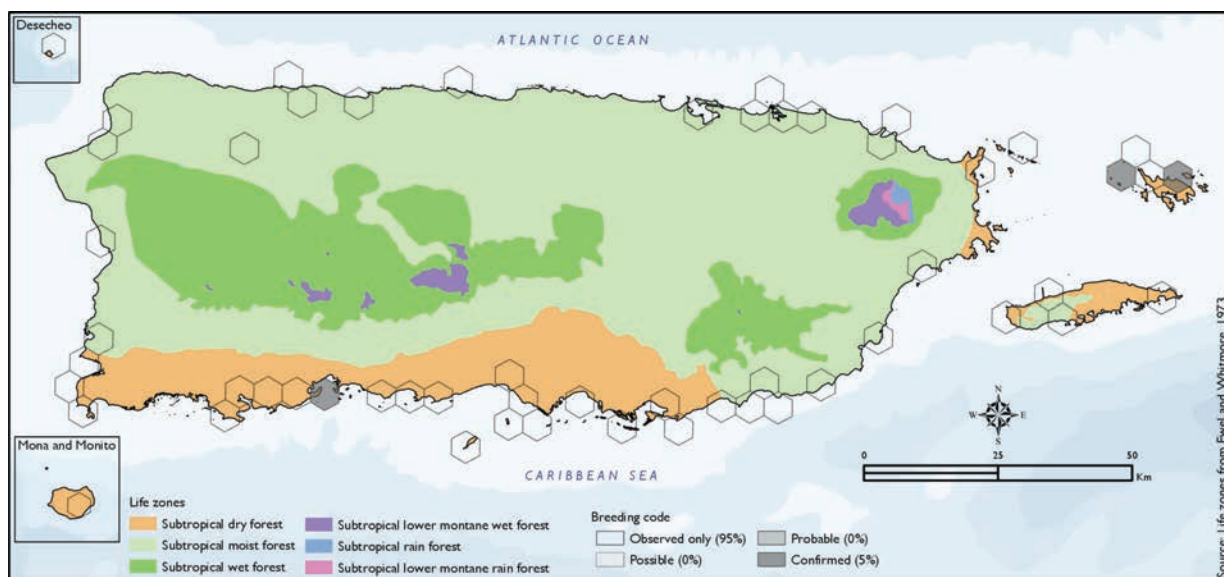


Photo by Alcides Morales

### Distribution and Habitat

The Sandwich Tern occurs through the tropical, subtropical, and temperate coastal regions of the Atlantic Ocean (Raffaele and others 1998). In Puerto Rico, it can be seen throughout the year, but it is most abundant from September to November and from March to May (Biaggi 1997). It nests on and around Culebra and some islets off Guayanilla and La Parguera in the municipality of Lajas, while it is a regular visitor during the winter in the San Juan harbor and the bays of Boquerón and Mayagüez (Kepler and Kepler 1978, Oberle 2018). It is also

present on Vieques, where it is considered a rare visitor in summer and fall, and extremely rare in spring (Gemmill 2015). It usually inhabits coastal areas, harbors, and lagoons (Raffaele and others 1998). The atlas fieldwork yielded a total of 76 records within 55 hexagons or 11 percent of the 479 total hexagons (see map). Of the 55 hexagons where this species was found, breeding met the atlas definition of confirmed in 5 percent (3) of the hexagons, while this species was observed in 95 percent (52) of the hexagons but without evidence of breeding (see map).



Sandwich Tern distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



### Breeding Ecology

Previously published reports indicate that the Sandwich Tern breeds from May to July (Raffaele and others 1998). A simple scrape nest is made on a sand bar or in coral rubble (Raffaele and others 1998). Atlas results confirm that this species breeds in June and that the breeding activity takes place in the subtropical dry forest life zone (see chart). Results show that this

species breeds in coastal areas within the subtropical dry forest life zone (100 percent of the hexagons) (see table and map).

### Population Status and Conservation

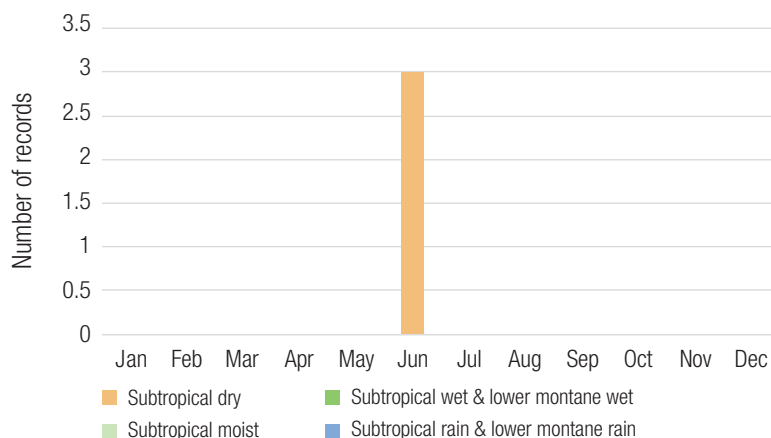
The current overall population trend of the Sandwich Tern is fluctuating, although some of the populations are stable and others have unknown trends (Wetlands International 2012). This species is currently listed

as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Sandwich Tern has a protected habitat in land of 3 percent or 2 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (72 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Sandwich Tern breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	3	100	0	0	0	0	0	0	3
Probable	0	0	0	0	0	0	0	0	0
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>3</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Sandwich Tern records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by Joseph Wunderle

# White-tailed Tropicbird/ Chirre Coliblanco

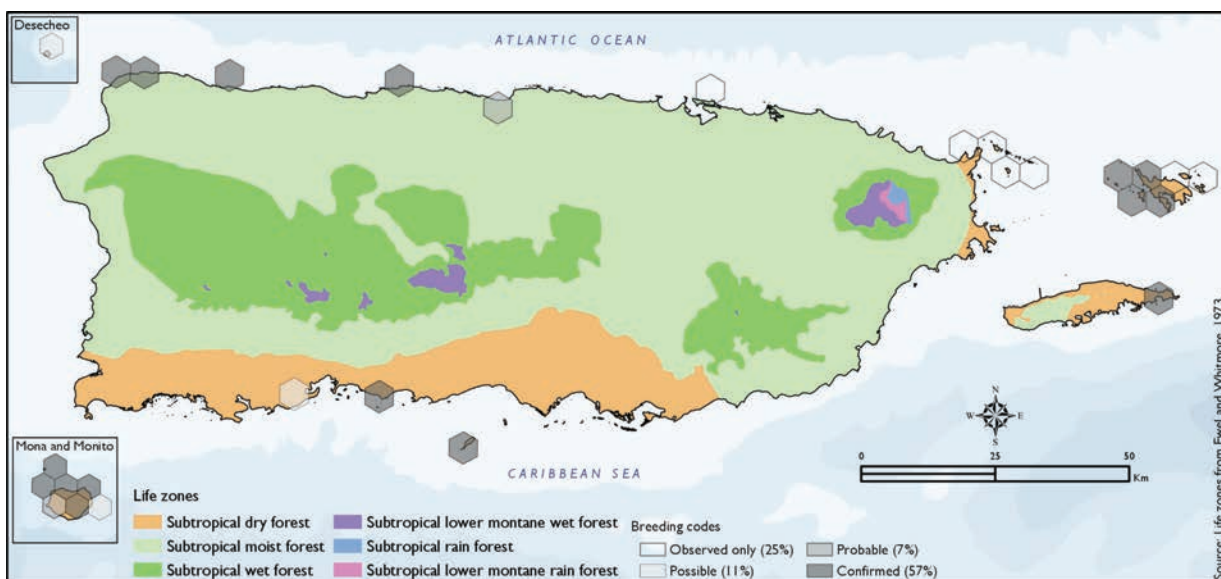
*Phaethon lepturus*

## Distribution and Habitat

The White-tailed Tropicbird occurs in tropical and subtropical oceans of the world (Oberle 2018, Raffaele and others 1998). It is a locally common breeding resident in the West Indies, especially from March to June (Raffaele and others 1998), although birds actually start

arriving in late December and are already in breeding mode by January. It has declined dramatically in recent centuries on Puerto Rico, as it once nested on cliffs of the southwestern and northern coasts of the mainland and is now restricted mostly to the northwestern coast as well as Culebra and associated cays (Schaffner 1991), Caja de Muerto, and Mona and Monito islands (Biaggi 1997, Kepler 1978, Oberle 2018). However, it is also present near Desecheo (Biaggi 1997), and on Vieques it is considered rare in spring and summer, and extremely rare in winter (Gemmill 2015). It is regularly seen around the

cliffs between the municipalities of Isabela and Barceloneta, especially near Guajataca (Oberle 2018). It usually occurs far out at sea, except when visiting sea cliffs for nesting (Raffaele and others 1998). The atlas fieldwork yielded a total of 45 records within 28 hexagons or 6 percent of the 479 total hexagons (see map). Of the 28 hexagons where this species was found, breeding met the atlas definition of confirmed in 57 percent (16) of the hexagons, probable in 7 percent (2), and possible in 11 percent (3), while the species was observed in 25 percent (7) of the hexagons but without evidence of breeding (see map).



White-tailed Tropicbird distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the White-tailed Tropicbird breeds primarily from March to July (Raffaele and others 1998). This species' nesting is now mostly restricted to rocky crevices and bare ledges on sea cliffs or talus slopes (Oberle 2018, Raffaele and others 1998, Schaffner 1991). Atlas results show that this species breeds from February to July with the most breeding activity during the months of March and April (see chart). The breeding

activity peaks in April, and it mostly takes place within the subtropical dry forest life zone (see chart). Results show that this species breeds in coastal areas mostly within the subtropical dry forest life zone (76 percent of the hexagons) (see table) but also within the subtropical moist forest life zone (24 percent of the hexagons) (see table and map).

**Population Status and Conservation**

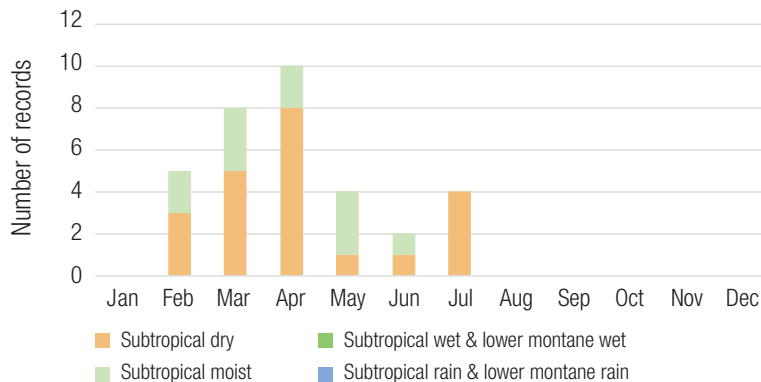
The current global population trend of the White-tailed Tropicbird is suspected to be

in decline due to predation by invasive species (BirdLife International 2018). Nonetheless, it is currently listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the White-tailed Tropicbird has a protected habitat in land of 18 percent or 89 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (503 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where White-tailed Tropicbird breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	12	75	4	25	0	0	0	0	16
Probable	1	50	1	50	0	0	0	0	2
Possible	3	100	0	0	0	0	0	0	3
<b>Total</b>	<b>16</b>	<b>76</b>	<b>5</b>	<b>24</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>21</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of White-tailed Tropicbird records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Red-billed Tropicbird/Chirre Piquirrojo

*Phaethon aethereus*



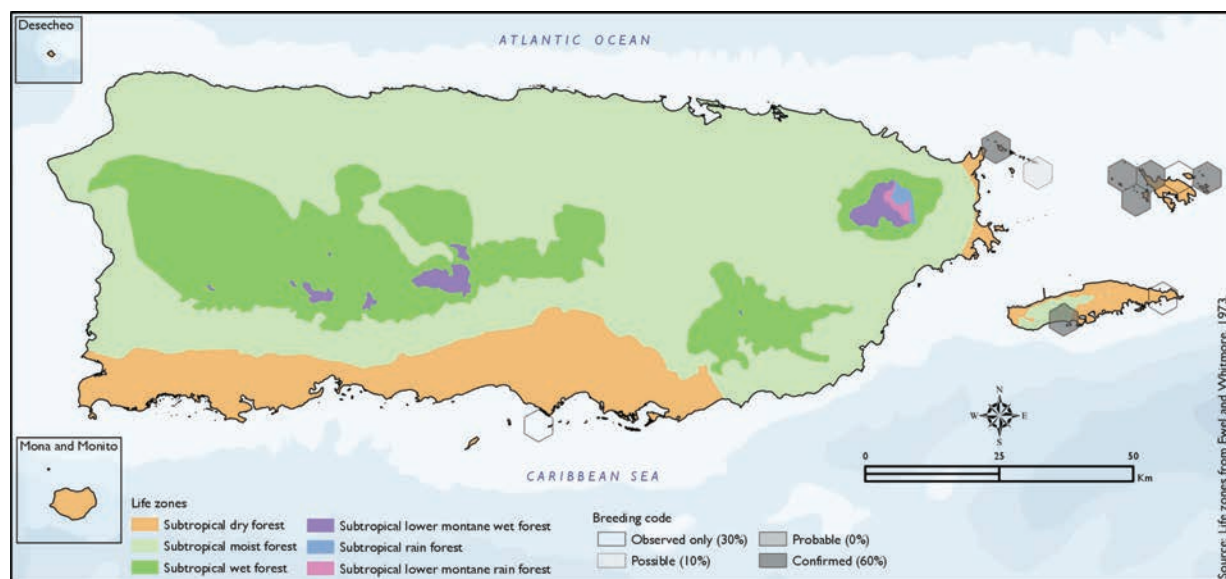
Photo by Alcides Morales

## Distribution and Habitat

The Red-billed Tropicbird occurs throughout the tropical and subtropical Atlantic Ocean, as well as through the northwestern Indian and eastern Pacific Oceans (Biaggi 1997, Raffaele and others 1998). It has been described as common in the

Virgin Islands and uncommon in the Lesser Antilles (Kepler and Kepler 1978, Raffaele and others 1998). In Puerto Rico, it is described as ‘uncommon’ off its nesting sites near Culebra (Oberle 2018). However, it is also present on Vieques, where it is considered rare in spring

and extremely rare in summer, fall, and winter (Gemmill 2015). It nests on small rocky islands and cays, and will nest on sea cliffs on larger islands. Rarely seen around land except when breeding, it otherwise feeds well out at sea (Biaggi 1997, Raffaele and others 1998). The atlas fieldwork yielded a total of 15 records within 10 hexagons or 2 percent of the 479 total hexagons (see map). Of the 10 hexagons where this species was found, breeding met the atlas definition of confirmed in 60 percent (six) of the hexagons and possible in 10 percent (one), while the species was observed in 30 percent (three) of the hexagons but without evidence of breeding (see map).



Red-billed Tropicbird distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the Red-billed Tropicbird breeds primarily from January to June, but breeding has been recorded as early as late September (Raffaele and others 1998). This species nests in small colonies on sea cliffs, roofs of coastal rocky caves, and rock crevices of small remote cays (Biaggi 1997, Raffaele and others 1998). Atlas results indicate that this species breeds between March and June with the most breeding activity during the months of March and June,

and to a lesser extent also during April (see chart). Results show that this species breeds mostly in coastal areas within the subtropical dry forest life zone (86 percent of the hexagons) (see table and map). It also breeds within the subtropical moist forest life zone (14 percent of the hexagons) (see table and map).

**Population Status and Conservation**

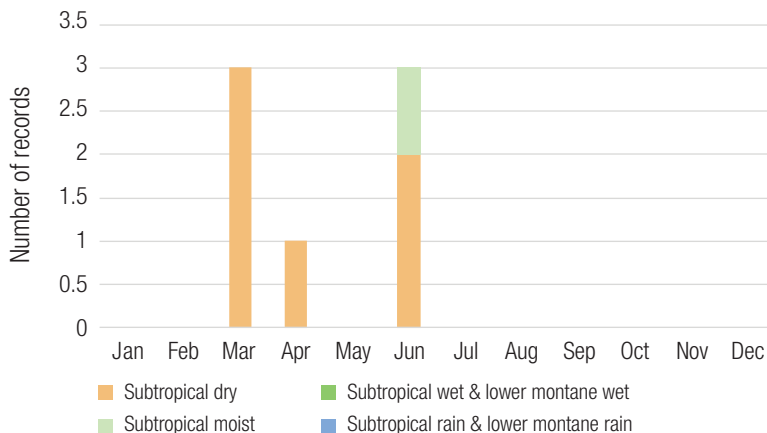
The Red-billed Tropicbird is currently listed as a species of least concern by the IUCN (BirdLife International 2018).

Nesting success can be reduced by cats (*Felis* spp.) and rats (*Rattus* spp.). Oberle (2018) notes that the population is approximately 1,800 breeding pairs and that the species has undergone a major decline in the last several centuries. Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Red-billed Tropicbird has a protected habitat in land of 4 percent or 7 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (166 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Red-billed Tropicbird breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	5	83	1	17	0	0	0	0	6
Probable	0	0	0	0	0	0	0	0	0
Possible	1	100	0	0	0	0	0	0	1
<b>Total</b>	<b>6</b>	<b>86</b>	<b>1</b>	<b>14</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>7</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Red-billed Tropicbird records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Audubon's Shearwater/Pampero de Audubon

## *Puffinus lherminieri*



Photo by Alcides Morales

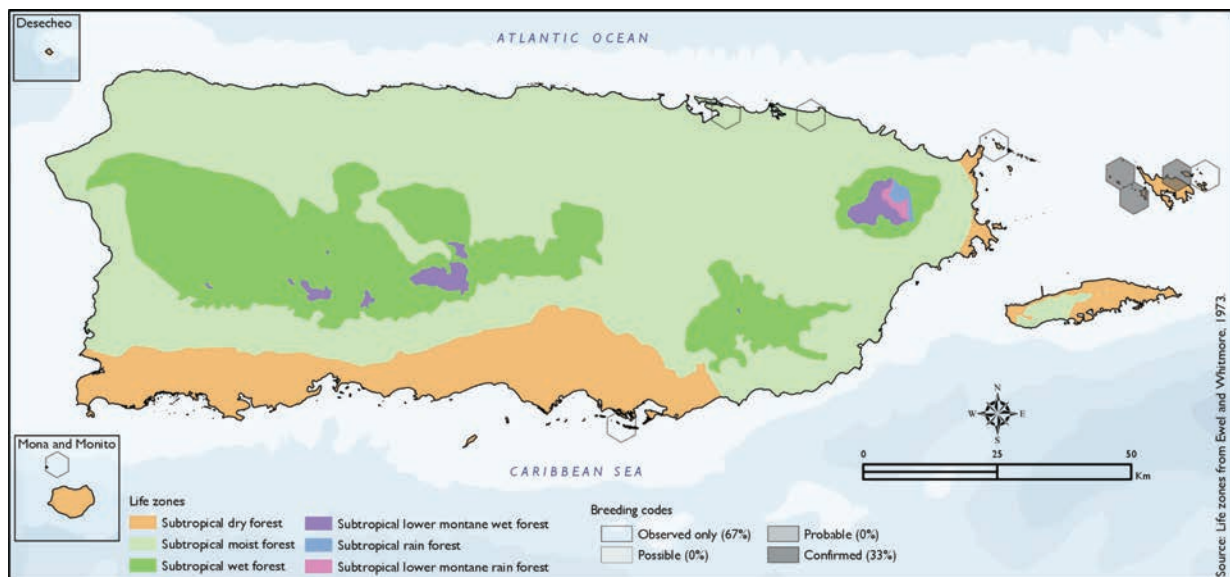
### Distribution and Habitat

The Audubon's Shearwater occurs throughout the warmer oceans of the world including the West Indies (Raffaele and others 1998). It is a resident pelagic seabird in Puerto Rico very rarely seen on land (Raffaele and others 1998), but it is known to breed in the cays around Culebra (Oberle 2018). The shearwater is classified as an unconfirmed species on Vieques (Gemmill 2015), although some have speculated that it may breed on associated cays. The atlas fieldwork yielded a total of 15 records within nine hexagons or 2 percent of the 479 total hexagons (see map). Of the nine

hexagons where this species was found, breeding met the atlas definition of confirmed in 33 percent (three) of the hexagons, while the species was observed in 67 percent (six) of the hexagons but without evidence of breeding (see map). When not breeding, this species mostly occurs out at sea (Raffaele and others 1998).

### Breeding Ecology

The Audubon's Shearwater breeds on oceanic islands and rocky offshore islets, and builds its nest under or amongst rocks in cliff crevices and barren slopes, and caves with little vegetation (BirdLife International



Audubon's Shearwater distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

2018), from February to July, according to previously published reports (Raffaele and others 1998). Atlas results indicate a peak of the breeding activity in March, but breeding activity also included April and June (see chart). Results show that the Audubon's Shearwater is only associated with the subtropical dry forest life zone (100 percent of the hexagons), as this life zone dominates

the south coast of Puerto Rico and associated islands where this species occurs (see table and map).

**Population Status and Conservation**

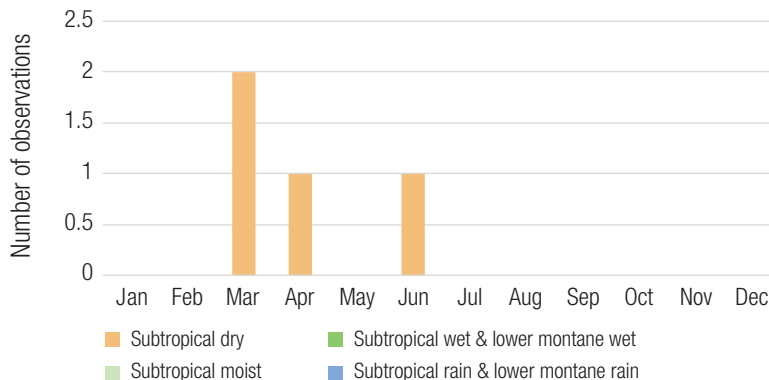
The population of the Audubon's Shearwater is suspected to be declining due to predation by introduced species (e.g., rats [*Rattus* spp.] and cats [*Felis* spp.]) on the small islands where it breeds, but since it

has an extremely large range, it is listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is listed as vulnerable (PRDNER 2015). In Puerto Rico, the Audubon's Shearwater has a protected habitat in land of 8 percent or 6 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (~71 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Audubon's Shearwater breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	3	100	0	0	0	0	0	0	3
Probable	0	0	0	0	0	0	0	0	0
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>3</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Audubon's Shearwater records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by Jan Zegarra

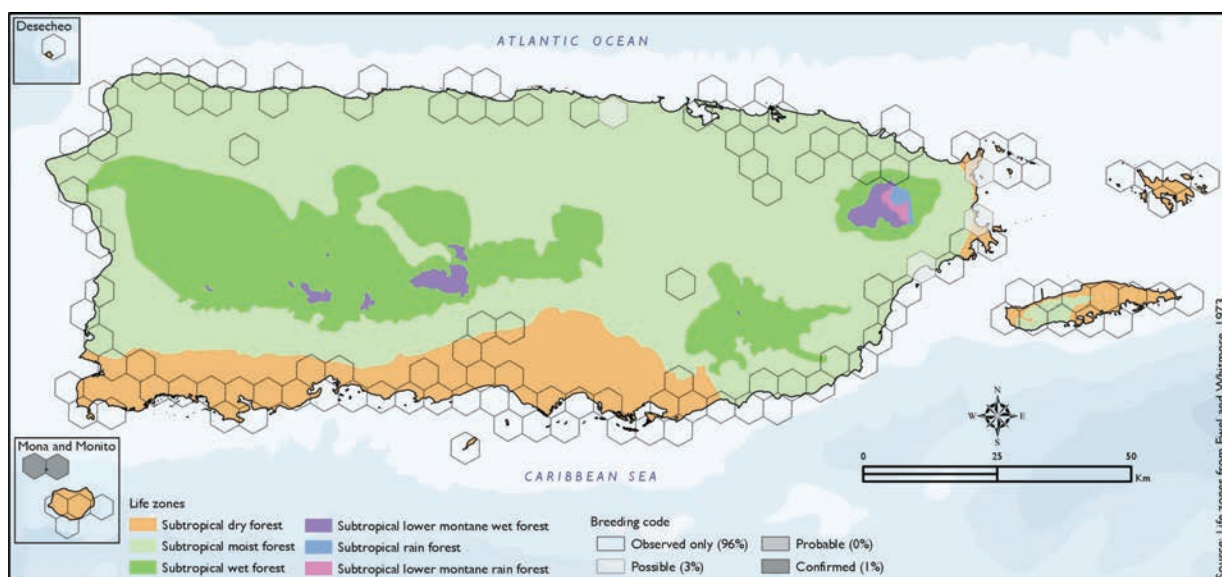
# Magnificent Frigatebird/ *Fragata Magnífica* *Fregata magnificens*

## Distribution and Habitat

The Magnificent Frigatebird occurs through the tropical and subtropical coastal waters of the Western Hemisphere including the West Indies, where it is generally a common resident throughout the islands (Raffaele

and others 1998). In addition, it occurs on the Cape Verde Islands off the coast of West Africa (Biaggi 1997, Oberle 2018, Raffaele and others 1998). It is described as common along most coastal areas of Puerto Rico (Oberle 2018), and it inhabits/nests on Monito (Oberle 2018) as well as other adjacent offshore cays around Puerto Rico (Biaggi 1997), although it formerly nested in Desecheo. On Vieques, it is described as a fairly common non-breeding resident (Gemmill 2015). It usually occurs over bays, coastal lakes and lagoons, inshore waters, mangrove

islands, and offshore cays but can also wander well inland soaring on thermal currents or after storms or hurricanes (Biaggi 1997, Oberle 2018, Raffaele and others 1998). The atlas fieldwork yielded a total of 138 records within 138 hexagons or 29 percent of the 479 total hexagons (see map). Of the 138 hexagons where this species was found, breeding met the atlas definition of confirmed in 1 percent (2) of the hexagons and possible in 3 percent (4), while the species was observed in 96 percent (132) of the hexagons but without evidence of breeding (see map).



Magnificent Frigatebird distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

Previously published reports indicate that the Magnificent Frigatebird’s breeding season is highly variable but appears to peak in November and February (Raffaele and others 1998). It nests colonially, sometimes among other seabirds, and the nest usually consists of a crude structure made of sticks and twigs, normally built in a tree or bush but sometimes directly on the ground (Biaggi 1997, Oberle 2018, Raffaele and others 1998). Atlas results suggest that this species breeds mostly

from February to April and to a lesser extent also during August, October, and December (see chart). Overall, the breeding activity appears to peak in April, and it equally takes place within the subtropical dry and moist forest life zones (see chart). Results show that this species breeds mostly in coastal areas within the subtropical dry forest life zone (67 percent of the hexagons) (see table and map).

**Population Status and Conservation**

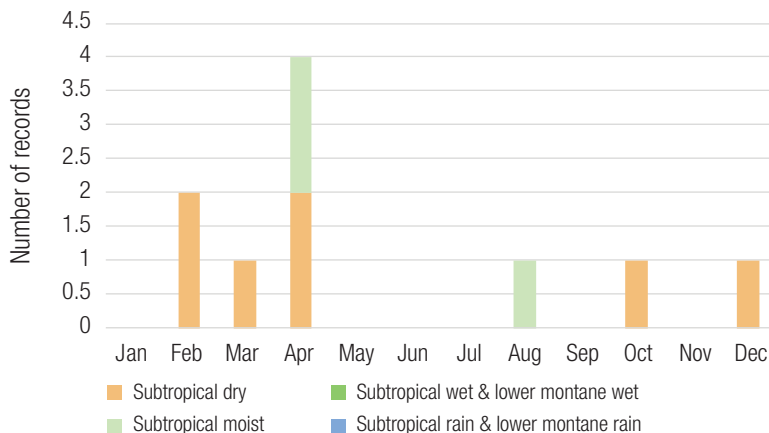
The current population trend of the Magnificent Frigatebird

is described as ‘increasing’ in southern North America (Butcher and Niven 2007), and it is currently listed as a species of Least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Magnificent Frigatebird has a protected habitat in land of 6 percent or 9 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (144 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Magnificent Frigatebird breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	2	100	0	0	0	0	0	0	2
Probable	0	0	0	0	0	0	0	0	0
Possible	2	50	2	50	0	0	0	0	4
<b>Total</b>	<b>4</b>	<b>67</b>	<b>2</b>	<b>33</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Magnificent Frigatebird records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Masked Booby/Boba Enmascarada

## *Sula dactylatra*



Photo by Ramon Luis Rivera

### Distribution and Habitat

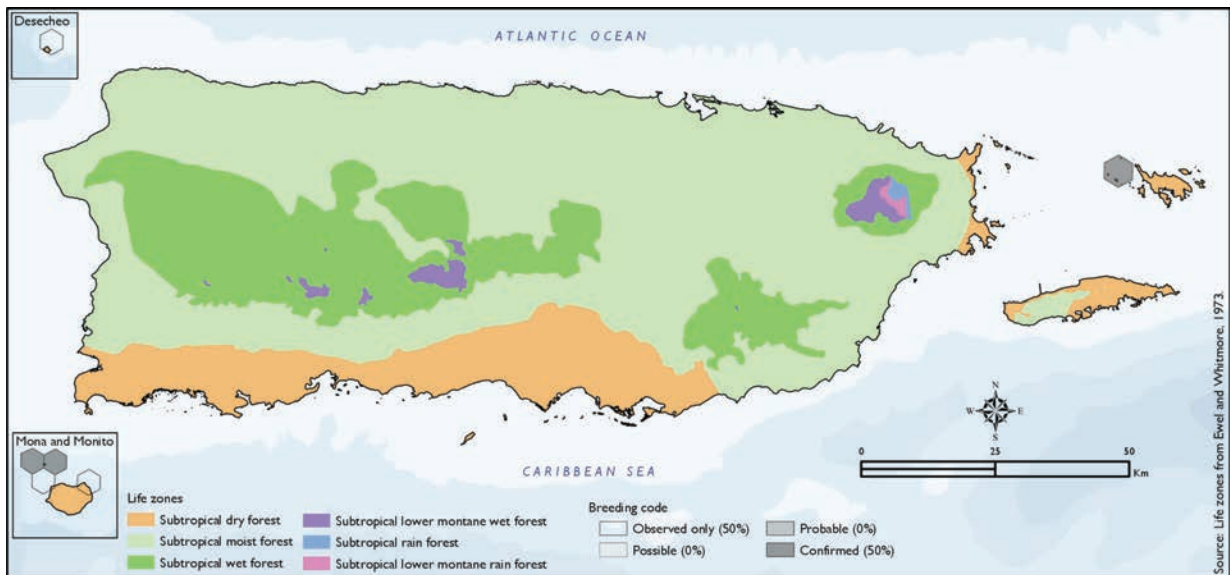
The Masked Booby occurs throughout the world's tropical and subtropical oceans (Raffaele and others 1998). It is a very rare and local year-round

resident in the West Indies, where known breeding areas include the southern Bahamas, Jamaica, Puerto Rico, the Virgin Islands, Anguilla, Antigua, and the Grenadines (Raffaele and others 1998). It is described as uncommon in Puerto Rico and has been documented near Culebra, Monito (Oberle 2018), and Desecheo islands (McCandless 1958). It usually inhabits warm tropical waters out at sea (Oberle 2018), except when attending its nest (Raffaele and others 1998). The atlas fieldwork yielded a total of 10 records within six hexagons or 1 percent of the 479 total hexagons (see map). Of the six hexagons

where this species was found, breeding met the atlas definition of confirmed in 50 percent (three) of the hexagons, while the species was observed in 50 percent (three) of the hexagons but without evidence of breeding (see map).

### Breeding Ecology

Previously published reports indicate that the Masked Booby generally breeds from February to August (Oberle 2018) and occasionally during September (Raffaele and others 1998). This is a colonial species, and the nest usually consists of a scrape cushioned with a fine layer



Masked Booby distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

of weeds or grasses, usually made on the ground in small rocky islands (Biaggi 1997) or near a cliff face (Raffaele and others 1998). Atlas results show that this species breeds mostly from February to April, and to a lesser extent also during July and October (see chart). Overall, the breeding activity peaks in March, and it takes place on small offshore islands within the subtropical dry forest life zone (see chart). Results show that this

species breeds in coastal areas within the subtropical dry forest life zone (100 percent of the hexagons) (see table and map).

**Population Status and Conservation**

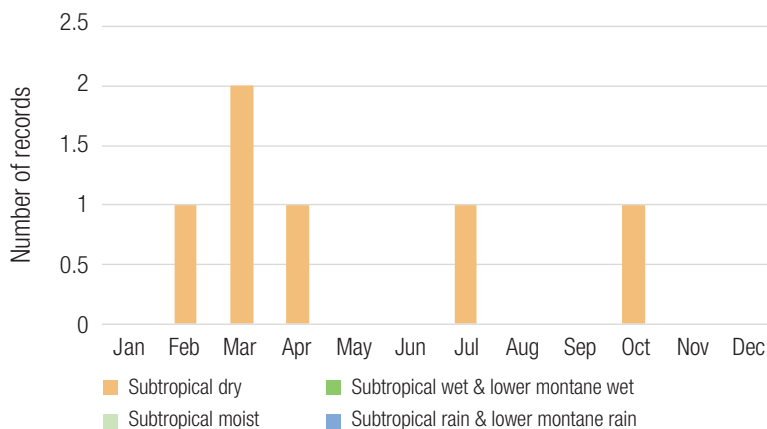
The global population trend of the Masked Booby has not been quantified or assessed, but the species is described as ‘fairly common’ (Stotz and others 1996), and it is currently listed as a species of least concern by

the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Masked Booby has a protected habitat in land of 2 percent or 1.5 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (96 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Masked Booby breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	3	100	0	0	0	0	0	0	3
Probable	0	0	0	0	0	0	0	0	0
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>3</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Masked Booby records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Brown Booby/Boba Parđa

## *Sula leucogaster*

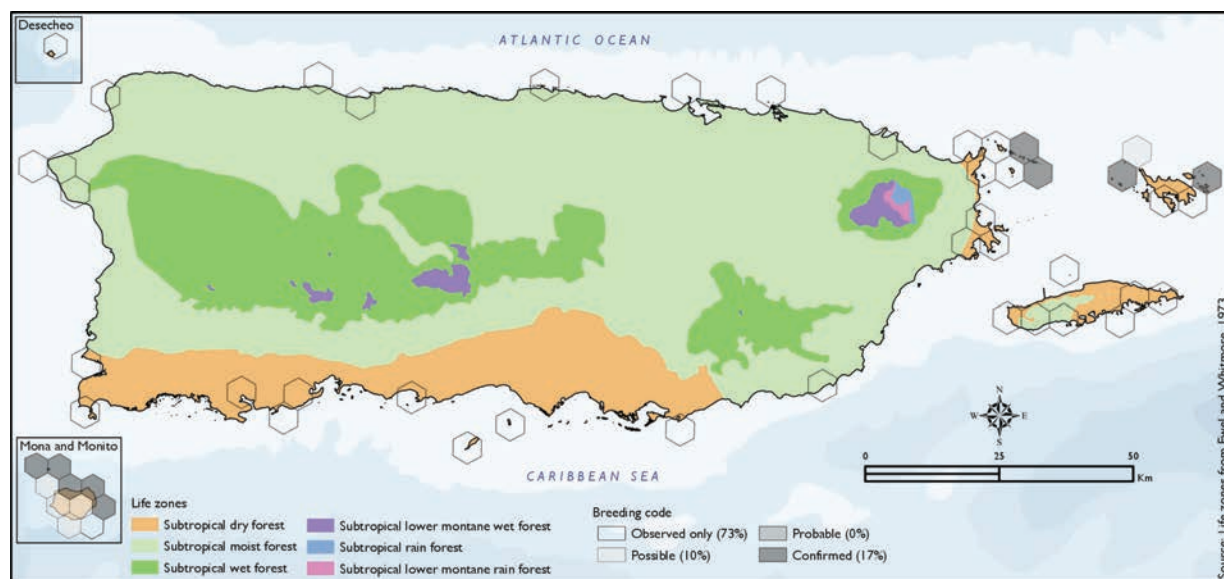


Photo by Jan Zegarra

### Distribution and Habitat

The Brown Booby occurs through the tropical and subtropical oceans of the world (Raffaele and others 1998). It is a fairly common resident in Puerto Rico (Raffaele and others 1998), especially in the far eastern and western coasts (Oberle 2018), and a fairly common non-breeding resident on Vieques from December to May but uncommon to rare at other times of the year (Gemmill 2015). This seabird is generally seen in rocky cays, on islets, and out at sea. It has a large breeding colony on Mona (Raffaele 1989a), although the largest colonies are currently found in La Cordillera Natural

Reserve between Fajardo and Culebra (Oberle 2018), while the large colony on Desecheo was eliminated shortly after the introduction of rhesus monkeys (*Macaca mulatta*) (Oberle 2018). The atlas fieldwork yielded a total of 93 records within 52 hexagons or 11 percent of the 479 total hexagons (see map). Of the 52 hexagons where this species was found, breeding met the atlas definition of confirmed in 17 percent (9) of the hexagons and possible in 10 percent (5), while the species was observed in 73 percent (38) of the hexagons but without evidence of breeding (see map).



Brown Booby distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

This species usually nests on the ground on remote islands or inaccessible sea cliffs, and breeding season peaks from March to June and from September to October, according to previously published reports (Raffaele and others 1998). Atlas results show that the Brown Booby’s breeding activity peaks in July (see chart). Results show that the Brown Booby breeds within the subtropical dry forest life zone (100 percent of the hexagons) in associated islands and cays around Puerto Rico including Culebra, Mona and

Monito, Desecheo, and Arrecifes de La Cordillera (see table and map).

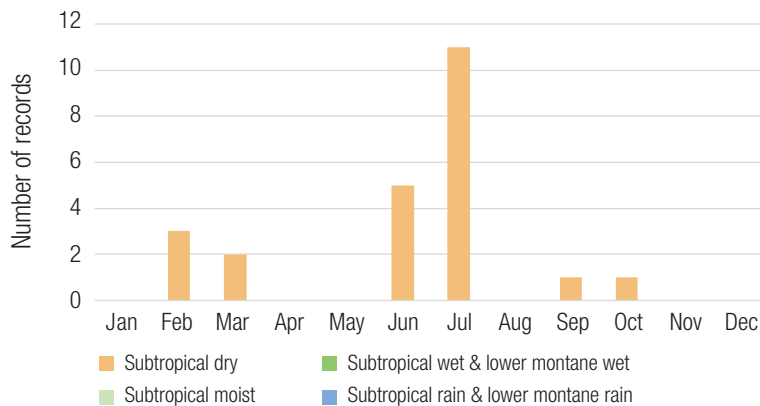
**Population Status and Conservation**

The Brown Booby is listed as a species of least concern by the IUCN (BirdLife International 2018), while locally this species is not listed in any of the threatened categories used by PRDNER and USFWS. In Puerto Rico, the Brown Booby has a protected habitat in land of 17 percent or 57 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (336 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Brown Booby breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	9	100	0	0	0	0	0	0	9
Probable	0	0	0	0	0	0	0	0	0
Possible	5	100	0	0	0	0	0	0	5
<b>Total</b>	<b>14</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>14</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Brown Booby records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Red-footed Booby/Boba Patirroja

## *Sula sula*



Photo by Jan Zegarra

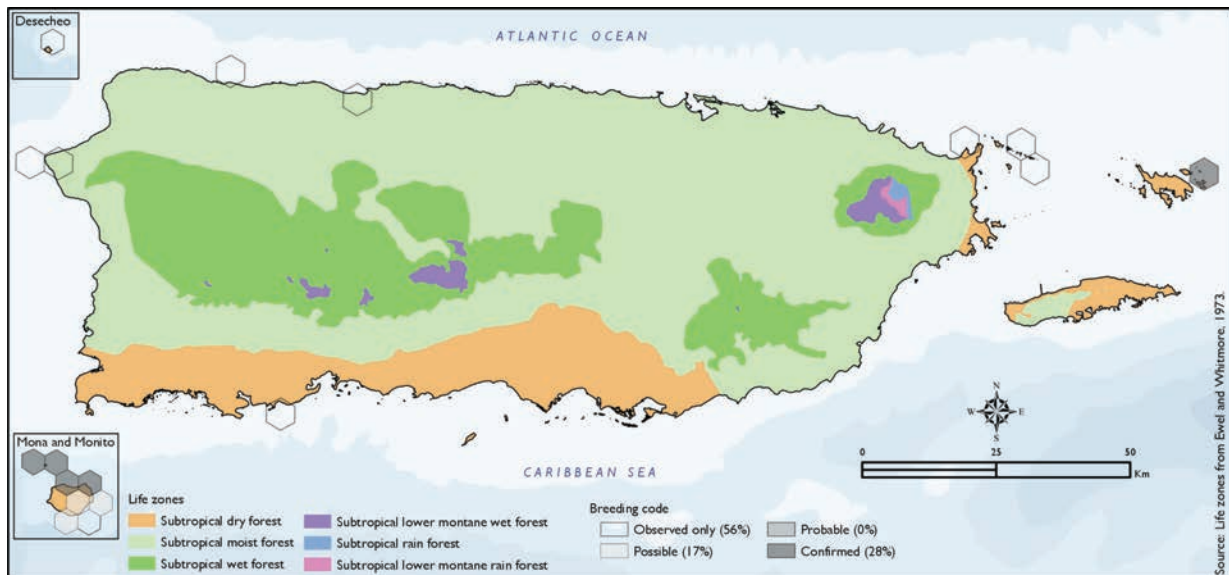
### Distribution and Habitat

The Red-footed Booby occurs throughout the world's tropical (Oberle 2018) and subtropical oceans, and it is a widespread but very local year-round resident through the West Indies (Raffaele and others 1998). In Puerto Rico, large colonies of this species can be found at Mona and Monito islands, as well as near Culebra but in smaller numbers (Biaggi 1997, Kepler 1978, Oberle 2018). It is usually found around remote islands and cays well out at sea (Biaggi 1997, Raffaele and others 1998). The atlas fieldwork yielded a total of 20 records within 18 hexagons

or 4 percent of the 479 total hexagons (see map). Of the 18 hexagons where this species was found, breeding met the atlas definition of confirmed in 28 percent (5) of the hexagons and possible in 17 percent (3), while the species was observed in 56 percent (10) of the hexagons but without evidence of breeding (see map).

### Breeding Ecology

Previously published reports indicate that the Red-footed Booby breeds primarily from April to June, typically nests in colonies on remote small islands, and constructs a nest made of



Red-footed Booby distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

twigs which is usually placed in a tree or bush (Biaggi 1997, Raffaele and others 1998). Atlas results show that this species breeds mostly from February to April and during June, July, and October (see chart). Overall, the breeding activity peaks in July, and it takes place within the subtropical dry forest life zone (see chart). Results show that this species breeds in remote coastal islands within the subtropical

dry forest life zone (100 percent of the hexagons) (see table and map).

**Population Status and Conservation**

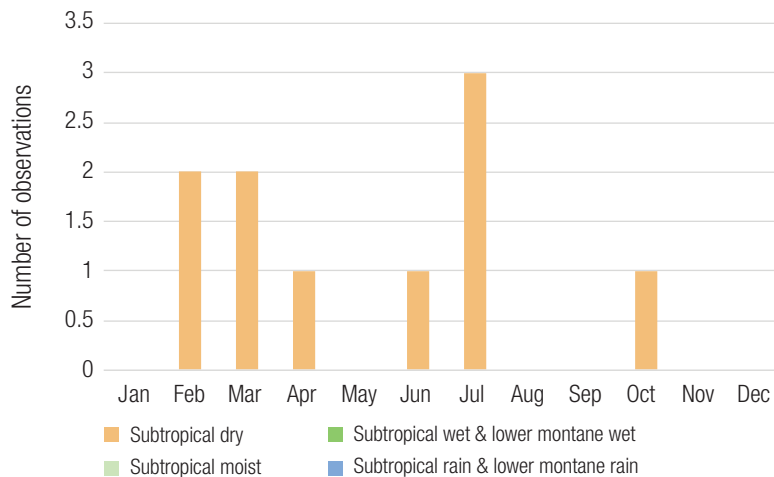
The Red-footed Booby is currently listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and

USFWS. In Puerto Rico, the Red-footed Booby has a protected habitat in land of 21 percent or 41 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (192 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Red-footed Booby breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	5	100	0	0	0	0	0	0	5
Probable	0	0	0	0	0	0	0	0	0
Possible	3	100	0	0	0	0	0	0	3
<b>Total</b>	<b>8</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Red-footed Booby records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Brown Pelican/Pelícano Pardo

## *Pelecanus occidentalis*

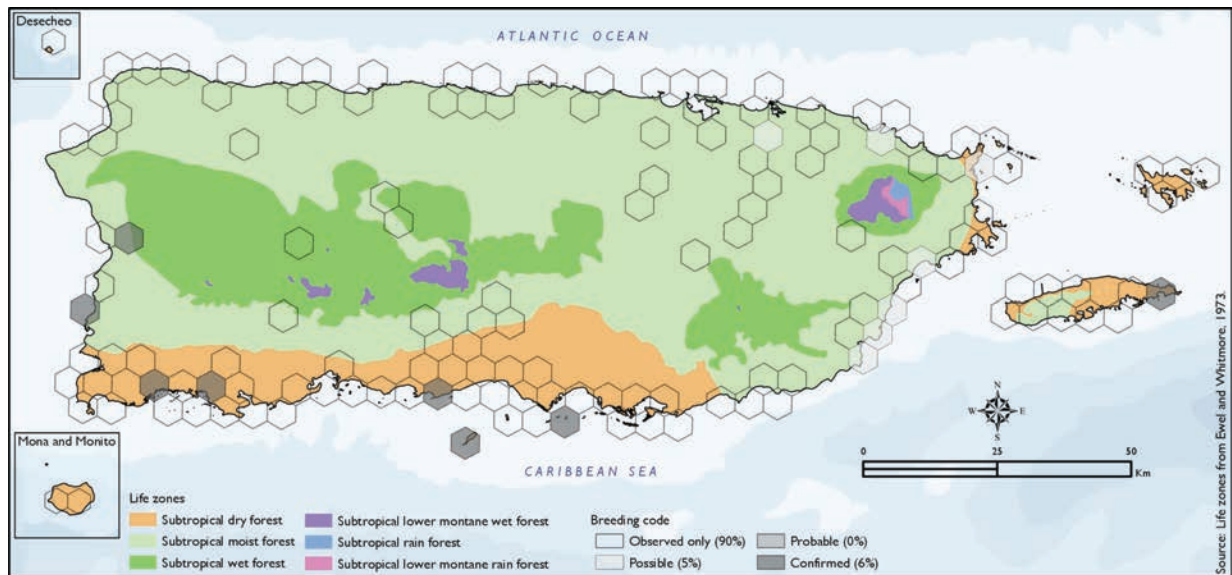


Photo by Jan Zegarra

### Distribution and Habitat

The Brown Pelican occurs through coastal areas of southern North America, Central America, and northern South America including the West Indies. It is a common resident seabird in Puerto Rico (Oberle 2018, Raffaele 1989a), with one of the largest breeding colonies in Vieques (Gemmill 2015), and two other important colonies used to monitor the breeding population: Cayo Don Luis and Cayo Fríos in the municipality of Lajas (USFWS 2009a). The population in Puerto Rico experiences major die-offs and low fledging success, mainly of juvenile individuals (Oberle 2018). This species

inhabits shallow inshore waters, estuaries, and bays, avoiding the open sea including lagoons and coastal areas in general, but is also present in inland freshwater reservoirs (BirdLife International 2018, Raffaele and others 1998). The atlas fieldwork yielded a total of 281 records within 144 hexagons or 30 percent of the 479 total hexagons (see map). Of the 144 hexagons where this species was found, breeding met the atlas definition of confirmed in 6 percent (eight) of the hexagons and possible in 5 percent (seven), while the species was observed in 90 percent (129) of the hexagons but without evidence of breeding (see map).



Brown Pelican distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

The Brown Pelican nests in colonies, on trees, sometimes on cliffs, near or on the ground mostly in offshore cays (BirdLife International 2018). Breeding is not associated with any season of the year, according to previously published reports (Raffaele and others 1998). Atlas results indicate that most of the breeding activity takes place from March to July, with a peak in June (see chart). Results show that this species is mostly associated with the subtropical moist and subtropical dry forest life zones (53 and 47 percent of the hexagons, respectively) (see table and map).

**Population Status and Conservation**

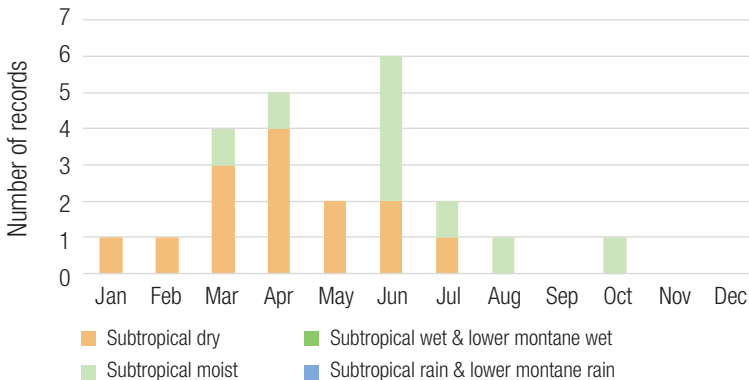
Overall, Brown Pelican populations are suspected to be increasing throughout the species distribution, and it is classified as a species of least concern by the IUCN (BirdLife International 2018). The Brown Pelican was on the Endangered Species List for many years due to several threats that drastically affected some populations, including organochlorine pesticides such as dichloro-diphenyl-trichloroethane (DDT); coastal development; disturbance of nesting colonies by fishermen, boaters, and other recreationists; loss and disturbance of roosts; hurricanes; declines in prey

fish; and oil spills (USFWS 2009b). In 2009, the species was delisted and is now considered a recovered species in Puerto Rico (USFWS 2009b) but is still classified as locally endangered and protected by Commonwealth laws in Puerto Rico (PRDNER 2016). In Puerto Rico, the Brown Pelican has a protected habitat in land of 9 percent or 33 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (~359 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Brown Pelican breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	6	75	2	25	0	0	0	0	8
Probable	0	0	0	0	0	0	0	0	0
Possible	1	14	6	86	0	0	0	0	7
<b>Total</b>	<b>7</b>	<b>47</b>	<b>8</b>	<b>53</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>15</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Brown Pelican records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Least Bittern/Martinetito

## *Ixobrychus exilis*

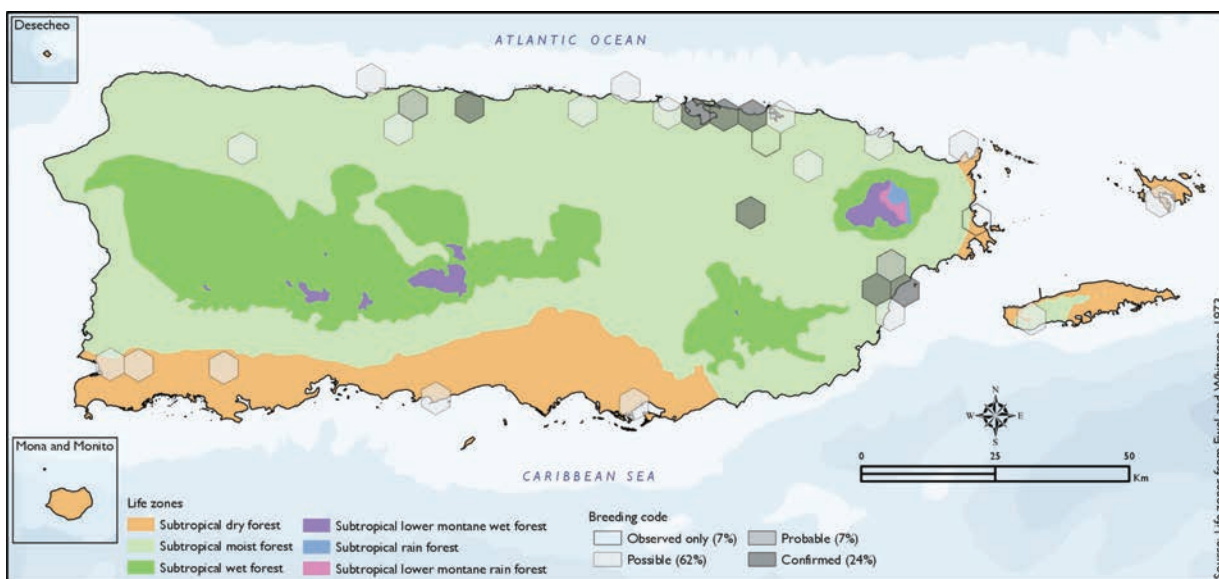


Photo by Gloria Archilla

### Distribution and Habitat

The Least Bittern occurs from North America through Central and South America including the West Indies (Raffaele and others 1998), where it is an uncommon to locally common resident in Puerto Rico (J.A. Salguero-Faría, personal observation 2009). It is regularly seen at the Humacao Natural Reserve (Oberle 2018). It is present on Vieques, where it ranges from rare to extremely rare (Gemmill 2015), and is also present on Culebra. It usually inhabits shallow marshes, pond edges, mangroves (Oberle 2018),

and freshwater swamps with dense emergent vegetation, often cattails (*Typha* spp.) (Raffaele and others 1998). The atlas fieldwork yielded a total of 44 records within 29 hexagons or 6 percent of the 479 total hexagons (see map). Of the 29 hexagons where this species was found, breeding met the atlas definition of confirmed in 24 percent (7) of the hexagons, probable in 7 percent (2), and possible in 62 percent (18), while the species was observed in 7 percent (2) of the hexagons but without evidence of breeding (see map).



Least Bittern distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the Least Bittern breeds from May to August (Raffaele and others 1998). The nest is usually constructed above standing water on aquatic vegetation, and it is made mostly of twigs, weeds, cattails, and other swamp plants (Biaggi 1997, Raffaele and others 1998). Atlas results suggest that this species breeds mostly from December to August with peak breeding activity in February, March, and May (see chart). The breeding

activity mostly takes place within the subtropical moist forest life zone (see chart). Results (see table and map) show that this species breeds mostly on the coastal plain or lowlands within the subtropical moist forest life zone (74 percent of the hexagons) with some evidence for breeding found in the subtropical dry forest life zone (26 percent of the hexagons).

**Population Status and Conservation**

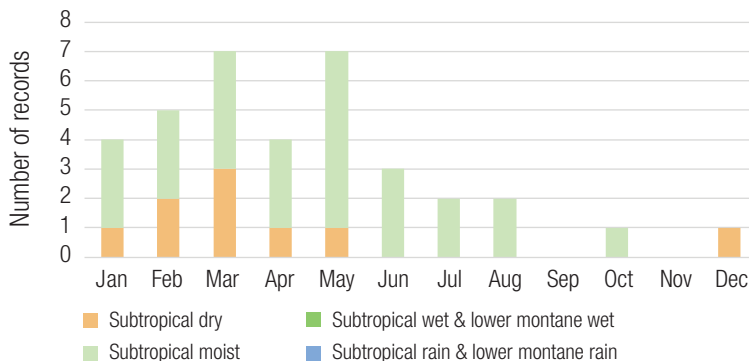
The current population trend of the Least Bittern is described

as ‘stable’ (Butcher and Niven 2007). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Least Bittern has a protected habitat in land of 14 percent or 91 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (645 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Least Bittern breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	7	100	0	0	0	0	7
Probable	0	0	2	100	0	0	0	0	2
Possible	7	39	11	61	0	0	0	0	18
<b>Total</b>	<b>7</b>	<b>26</b>	<b>20</b>	<b>74</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>27</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Least Bittern records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Great Egret/Garza Real

*Ardea alba*



Photo by Pedro W. Santana

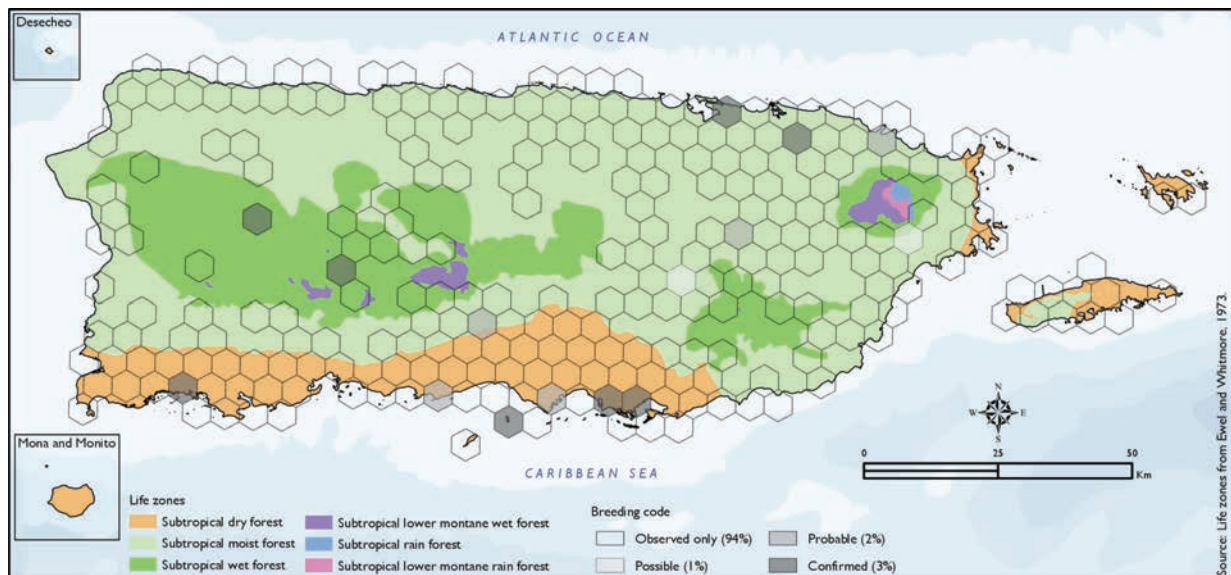
## Distribution and Habitat

The Great Egret occurs worldwide including the West Indies (Raffaele and others 1998), where it is a common resident species in Puerto Rico (Oberle 2018). This species occurs in freshwater and saltwater ponds, canals, mangroves, lagoons, moist grassy fields, and urban streams (Oberle 2018). The atlas fieldwork yielded a total of 465 records within 253 hexagons or 53 percent of the 479 total hexagons (see map). Of the 253 hexagons where this species was found, breeding met the atlas definition of confirmed in 3 percent (8) of the hexagons,

probable in 2 percent (5), and possible in 1 percent (2), while the species was observed in 94 percent (238) of the hexagons but without evidence of breeding (see map).

## Breeding Ecology

The Great Egret breeds and roosts colonially and builds a loose platform of sticks on a tree branch or in a shrub, primarily from April to June, according to previously published reports (Raffaele and others 1998). Atlas results indicate that most breeding activity for this species occurs during March, April, and May (see chart). Atlas findings



Great Egret distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

show that the Great Egret breeds within the subtropical moist and subtropical dry forest life zones in the lowlands (47 and 40 percent of the hexagons, respectively), and also within the subtropical wet forest life zone (13 percent of the hexagons) in the mountains (see table and map).

**Population Status and Conservation**

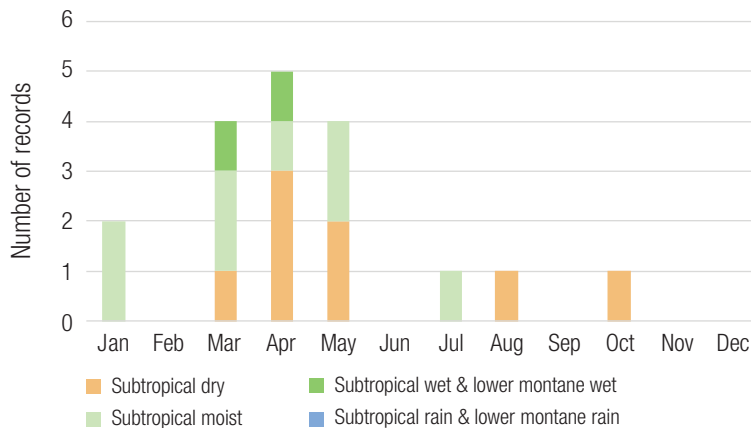
The overall population trend for the Great Egret is unknown,

but since this species has an extremely large range, it is listed as a species of least concern by the IUCN (BirdLife International 2019). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Great Egret has a protected habitat in land of 7 percent or 25 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (359 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Great Egret breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	4	50	2	25	2	25	0	0	8
Probable	2	40	3	60	0	0	0	0	5
Possible	0	0	2	100	0	0	0	0	2
<b>Total</b>	<b>6</b>	<b>40</b>	<b>7</b>	<b>47</b>	<b>2</b>	<b>13</b>	<b>0</b>	<b>0</b>	<b>15</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Great Egret records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Snowy Egret/Garza Blanca

## *Egretta thula*



Photo by Pedro W. Santana

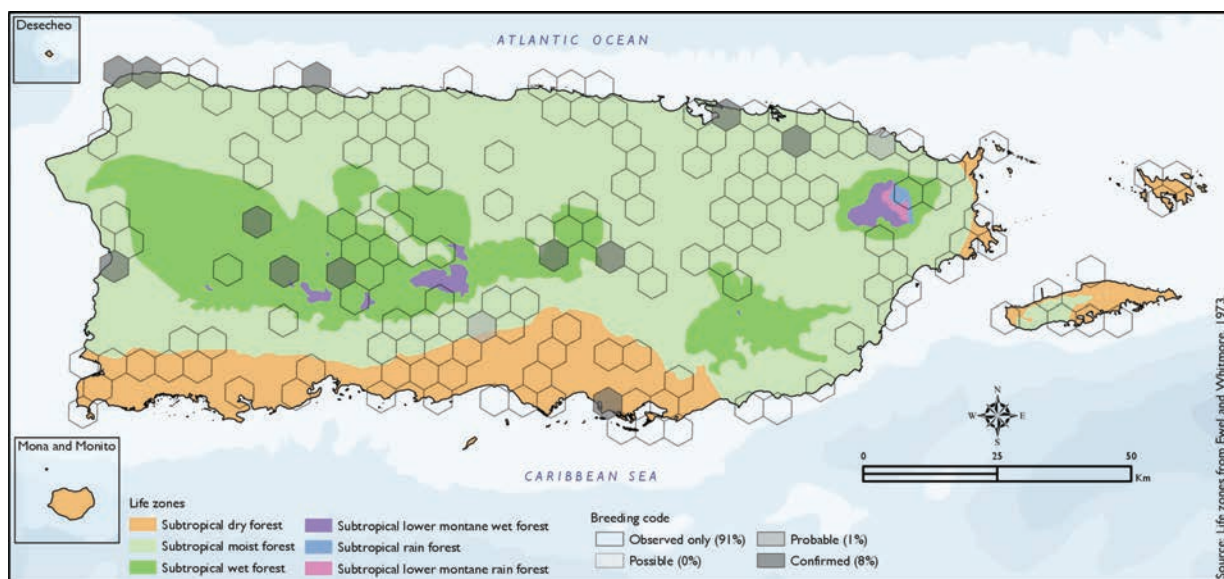
### Distribution and Habitat

The Snowy Egret occurs through most of the Western Hemisphere including the West Indies (Raffaele and others 1998). It is a common and permanent resident in Puerto Rico and can be seen regularly at the Boquerón Nature Reserve and the salt flats of Cabo Rojo (Oberle 2018). It is also present on Culebra and Vieques islands (Ventosa-Febles and others 2005), in the latter being common during winter and spring, uncommon in fall, and rare in summer (Gemmill 2015). Habitat includes mostly freshwater swamps, riverbanks (Raffaele and others 1998), lagoons, marshes, ponds,

mangroves, and salt flats (Oberle 2018). The atlas fieldwork yielded a total of 232 records within 158 hexagons or 33 percent of the 479 total hexagons (see map). Of the 158 where this species was found, breeding met the atlas definition of confirmed in 8 percent (12) of the hexagons and probable in 1 percent (2), while the species was observed in 91 percent (144) of the hexagons but without evidence of breeding (see map).

### Breeding Ecology

Previously published reports indicate that the Snowy Egret breeds from April to July and also in October (Raffaele and



Snowy Egret distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

others 1998). Nesting is often colonial with other heron species (Biaggi 1997, Oberle 2018, Raffaele and others 1998), and the nest is made of sticks and usually built in mangroves and swamps (Oberle 2018, Raffaele and others 1998). Atlas results show that this species breeds from February to July with the most breeding activity during March, April, and June (see chart). Overall, the breeding activity peaks during March and June, and mostly takes place within the subtropical moist forest life zone (see chart).

Results show that this species breeds mostly in lowlands within the subtropical moist forest life zone (64 percent of the hexagons) (see table), but it also breeds in subtropical wet and subtropical dry forest life zones as well (29 and 7 percent of the hexagons, respectively) (see table and map).

**Population Status and Conservation**

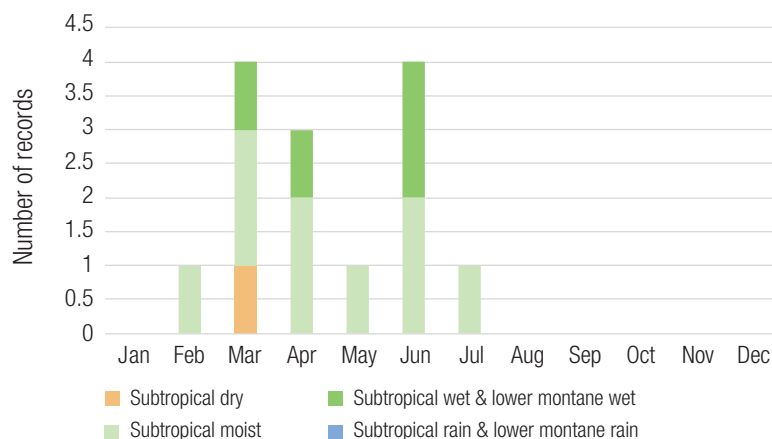
The current overall population trend of the Snowy Egret is described as ‘increasing.’ However, some populations

may be stable, and others have unknown trends (Wetlands International 2012). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Snowy Egret has a protected habitat in land of 4 percent or 15 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (335 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Snowy Egret breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	1	8	7	75	4	33	0	0	12
Probable	0	0	2	100	0	0	0	0	2
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>1</b>	<b>7</b>	<b>9</b>	<b>64</b>	<b>4</b>	<b>29</b>	<b>0</b>	<b>0</b>	<b>14</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Snowy Egret records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Little Blue Heron/Garza Azul

*Egretta caerulea*

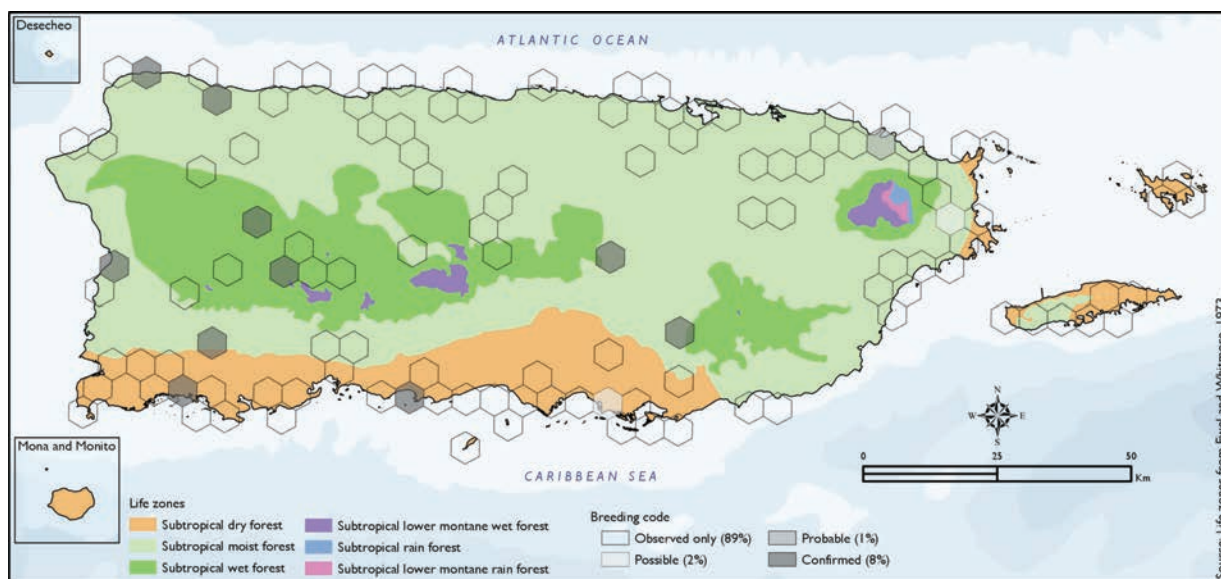


Photo by Pedro W. Santana

## Distribution and Habitat

The Little Blue Heron occurs from most of the United States through Central and South America including the West Indies (Biaggi 1997), where it is generally a common resident on most of the islands (Raffaele and others 1998). It is a common resident in Puerto Rico and can be seen regularly at the Parque Central's boardwalk along the Caño Martín Peña in the municipality of San Juan (Oberle 2018). It also occurs on satellite islands such as Vieques (Sorrié 1975) and Culebra (Kapan 2003), in the latter being common in fall, winter, and spring, and uncommon in summer (Gemmill

2015). Habitat includes mostly calm and shallow freshwater and saltwater areas (Raffaele and others 1998) including ponds, wetlands, canals, mangrove swamps, estuaries, and lagoons (Oberle 2018). The atlas fieldwork yielded a total of 199 records within 118 hexagons or 25 percent of the 479 total hexagons (see map). Of the 118 hexagons where this species was found, breeding met the atlas definition of confirmed in 8 percent (10) of the hexagons, probable in 1 percent (1), and possible in 2 percent (2), while the species was observed in 89 percent (105) of the hexagons but without evidence of breeding (see map).



Little Blue Heron distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

Previously published reports indicate that the Little Blue Heron breeds from April to July, and it is usually colonial with other heron species (Raffaele and others 1998). The nest consists of a platform made mostly of twigs, which is usually constructed high in trees (Raffaele and others 1998) or in bushes near water (Biaggi 1997). Atlas results indicate that this species breeds from March to June and sometimes in August, with the most breeding activity during March and June (see chart). Overall, the breeding activity

mostly takes place within the subtropical moist forest life zone (see chart). Results show that this species breeds mostly within subtropical moist (62 percent of the hexagons) and subtropical dry forest life zones (23 percent of hexagons) (see table). It also breeds within subtropical wet and lower montane wet forest life zones at higher elevations (15 percent of the hexagons) (see table and map).

**Population Status and Conservation**

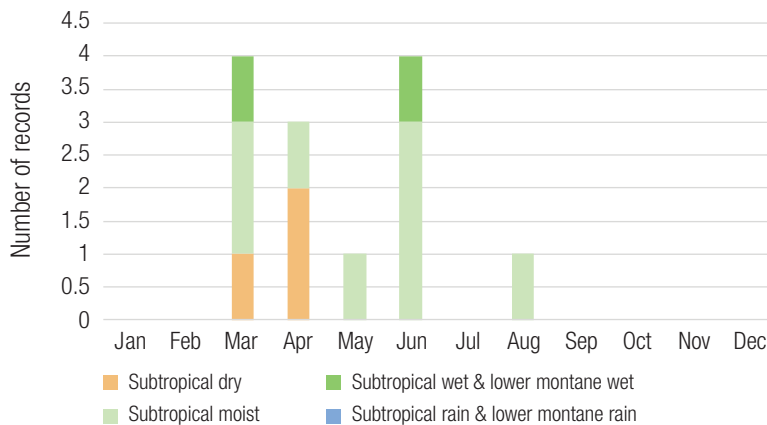
The current overall population trend of the Little Blue Heron is described as ‘decreasing,’

although some populations have unknown trends (Wetlands International 2012). However, this species is currently listed as a species of least concern by the IUCN (BirdLife International 2017). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Little Blue Heron has a protected habitat in land of 11 percent or 33 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (311 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Little Blue Heron breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	2	20	6	60	2	20	0	0	10
Probable	0	0	1	100	0	0	0	0	1
Possible	1	50	1	50	0	0	0	0	2
<b>Total</b>	<b>3</b>	<b>23</b>	<b>8</b>	<b>62</b>	<b>2</b>	<b>15</b>	<b>0</b>	<b>0</b>	<b>13</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Little Blue Heron records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Tricolored Heron/Garza Pechiblanca

## *Egretta tricolor*



Photo by Guillermo Plaza

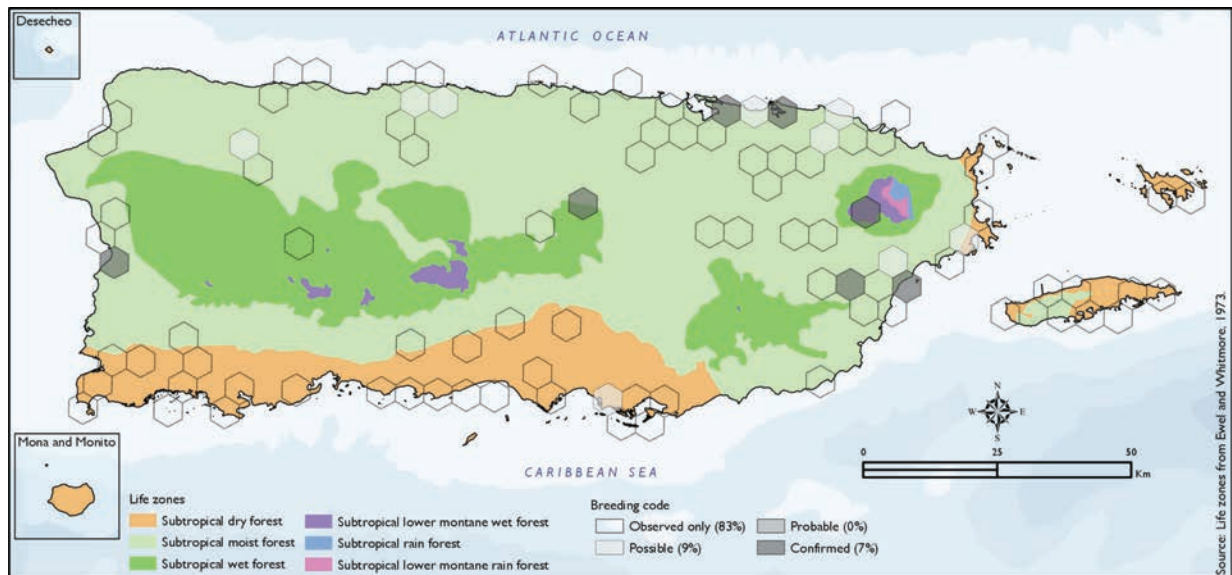
### Distribution and Habitat

The Tricolored Heron occurs from North America to northern South America including the West Indies (Raffaele and others 1998). It is a common permanent resident in Puerto Rico (Oberle 2018). It is also present on Vieques (Sorrié 1975), where it is a common resident in winter and spring, fairly common in fall, and uncommon in summer (Gemmill 2015). It usually inhabits saltwater lagoons, mangrove swamps, estuaries, shallow coastal waters (Oberle 2018), and freshwater wetlands (Raffaele and others 1998). The atlas fieldwork yielded a total of

143 records within 95 hexagons or 20 percent of the 479 total hexagons (see map). Of the 95 hexagons where this species was found, breeding met the atlas definition of confirmed in 7 percent (7) of the hexagons and possible in 9 percent (9), while the species was observed in 83 percent (79) of the hexagons but without evidence of breeding (see map).

### Breeding Ecology

Previously published reports indicate that the Tricolored Heron breeds from April to July (Raffaele and others 1998) and is often colonial with other



Tricolored Heron distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

heron species (Biaggi 1997, Raffaele and others 1998). The nest is usually constructed on a bush or tree limb at a moderate height and consists of a platform made mostly of sticks (Biaggi 1997, Raffaele and others 1998). Atlas results suggest that this species breeds mostly from March to September with the most breeding activity in March, April, and July, and to a lesser extent also during December and January (see chart). Results show that this species breeds mostly

within the subtropical moist forest life zone (88 percent of the hexagons), and it also breeds in the subtropical wet and lower montane wet forest life zones at higher elevations (6 percent of the hexagons) (see table and map).

**Population Status and Conservation**

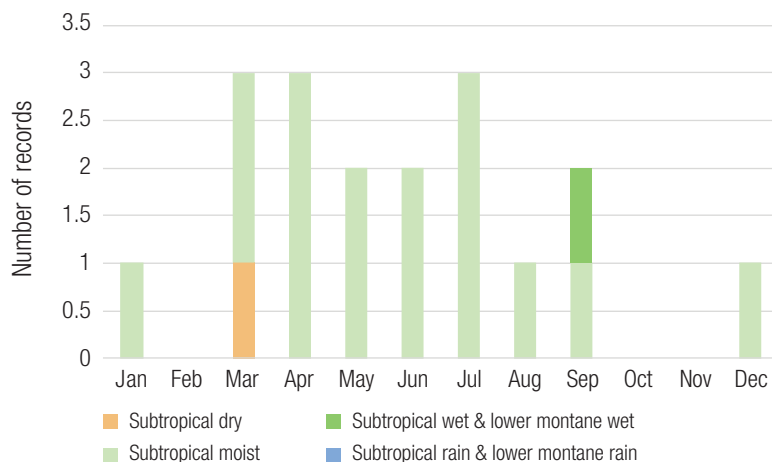
The overall population trend of the Tricolored Heron is described as ‘stable.’ However, some populations have unknown

trends (Wetlands International 2012). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Tricolored Heron has a protected habitat in land of 18 percent or 69 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (382 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Tricolored Heron breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	6	86	1	14	0	0	7
Probable	0	0	0	0	0	0	0	0	0
Possible	1	11	8	89	0	0	0	0	9
<b>Total</b>	<b>1</b>	<b>6</b>	<b>14</b>	<b>88</b>	<b>1</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>16</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Tricolored Heron records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Cattle Egret/Garza Ganadera

## *Bubulcus ibis*

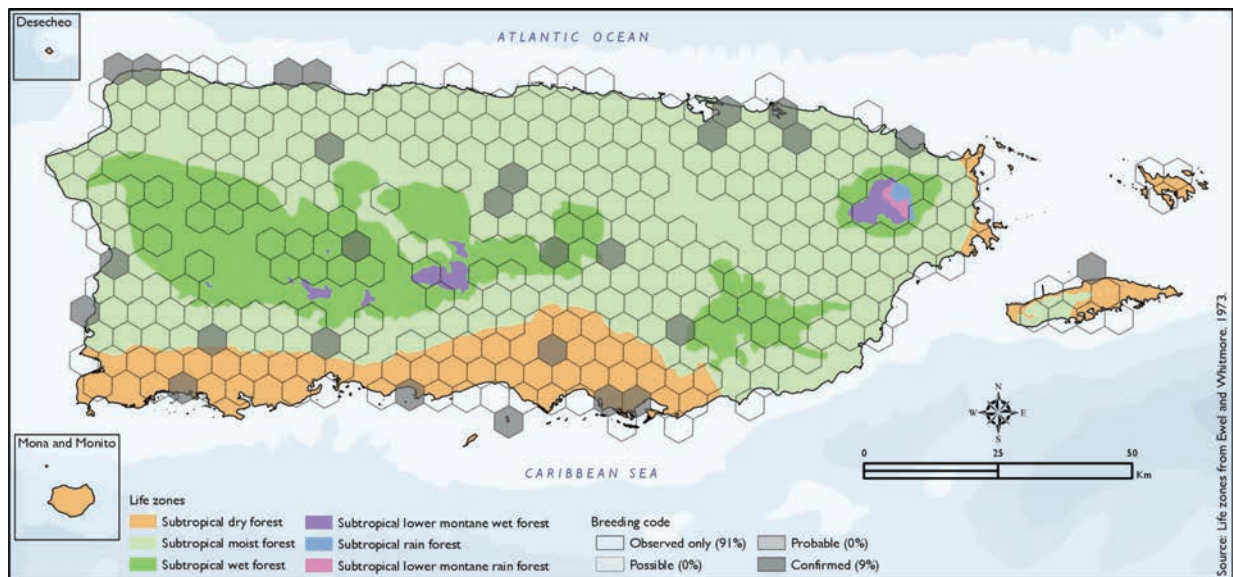


Photo by Michael Morel

### Distribution and Habitat

The Cattle Egret occurs throughout temperate and tropical regions of the world (Raffaele and others 1998). It is a common permanent resident species in Puerto Rico (Oberle 2018, Raffaele 1989a) and fairly common in Vieques (Gemmill 2015). It has also been reported in Mona and Desecheo (Ventosa-Febles and others 2005). The species is a relatively recent arrival from Africa from which it colonized South America and the Caribbean, and arrived in Puerto Rico in the late 1940s and early 1950s (Arendt 1988).

This species occurs in pastures where livestock are grazing or tractors are cutting grass or plowing (Raffaele and others 1998), grassy roadsides, and landfills (Oberle 2018). The atlas fieldwork yielded a total of 560 records within 305 hexagons or 64 percent of the 479 total hexagons (see map). Of the 305 hexagons where this species was found, breeding met the atlas definition of confirmed in 9 percent (27), while the species was observed in 91 percent (278) of the hexagons but without evidence of breeding (see map).



Cattle Egret distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

### Breeding Ecology

The Cattle Egret forms large colonies during the breeding season and constructs a bulky nest of twigs in a tree (Raffaele and others 1998). Nests can be found in different habitats or ecosystems including swamps, creeks, lagoons, and even offshore cays (J.A. Salguero-Fara, personal observation 2009). Breeding season may vary, ranging from January to July, according to previously published reports (Oberle 2018, Raffaele and others 1998). Atlas

results show that the Cattle Egret breeding season extends from January to July (see chart). Results show that the Cattle Egret breeds within the subtropical moist forest life zone (67 percent of the hexagons), the subtropical dry forest life zone (26 percent of the hexagons), and the subtropical wet forest life zone (7 percent of the hexagons) (see table and map).

it is listed as a species of least concern by the IUCN (BirdLife International 2019). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Cattle Egret has a protected habitat in land of 9 percent or 57 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (646 km<sup>2</sup>).

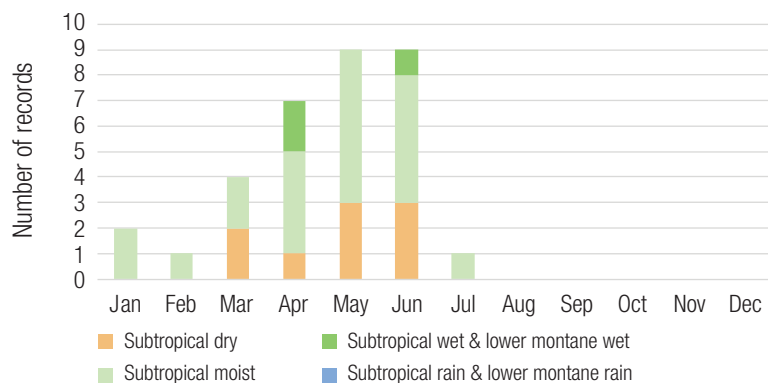
### Population Status and Conservation

The Cattle Egret’s overall population is increasing, and

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Cattle Egret breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	7	26	18	67	2	7	0	0	27
Probable	0	0	0	0	0	0	0	0	0
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>7</b>	<b>26</b>	<b>18</b>	<b>67</b>	<b>2</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>27</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Cattle Egret records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and broken down by the different ecological life zones.

# Green Heron/Martinete

## *Butorides virescens*



Photo by José Salguero

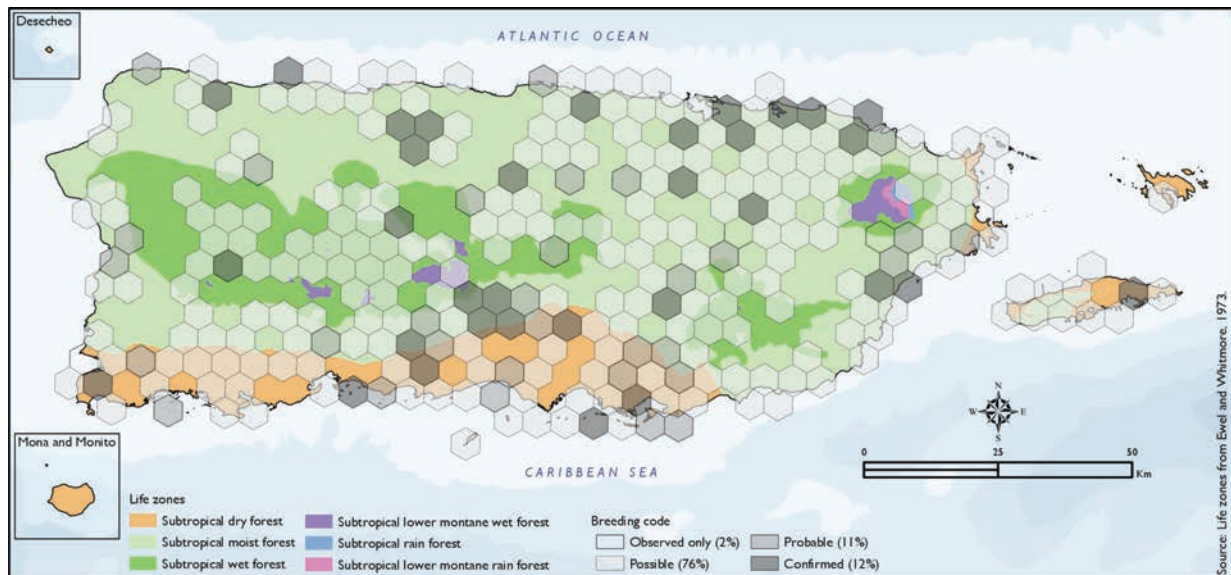
### Distribution and Habitat

The Green Heron occurs from temperate North America south to Colombia and Venezuela including the West Indies (Raffaele and others 1998), where it is a common resident species in Puerto Rico (Oberle 2018) and fairly common on Vieques (Gemmill 2015). The Green Heron inhabits freshwater and saltwater marshes, as well as ponds, canals, mangroves, stream borders, ocean shores, and even gardens (Oberle 2018). The atlas fieldwork yielded a total of 492 records within 284 hexagons or 59 percent of the 479 total hexagons (see map). Of the 284

hexagons where this species was found, breeding met the atlas definition of confirmed in 12 percent (33) of the hexagons, probable in 11 percent (31), and possible in 76 percent (215), while the species was observed in 2 percent (5) of the hexagons but without evidence of breeding (see map).

### Breeding Ecology

The Green Heron often nests alone but also in treetop colonies (Oberle 2018). This species constructs a platform nest of twigs in a tree or shrub (Raffaele and others 1998), usually near reservoirs, ponds, lagoons,



Green Heron distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

rivers, creeks, and streams from the coast to the highest peaks (J.A. Salguero-Farfa, personal observation 2009). Previously published reports indicate that it breeds mostly from April to August (Raffaele and others 1998). Atlas results indicate that this species breeds throughout the year, but most breeding activity occurs during April, May, and June (see chart). Atlas findings show that the Green Heron breeds within all

ecological life zones, but the most breeding occurs within the subtropical moist forest life zone (61 percent of the hexagons), followed by the subtropical dry (25 percent of the hexagons) and subtropical wet forest life zones (14 percent of the hexagons) (see table and map).

listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Green Heron has a protected habitat in land of 9 percent or 633 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (6671 km<sup>2</sup>).

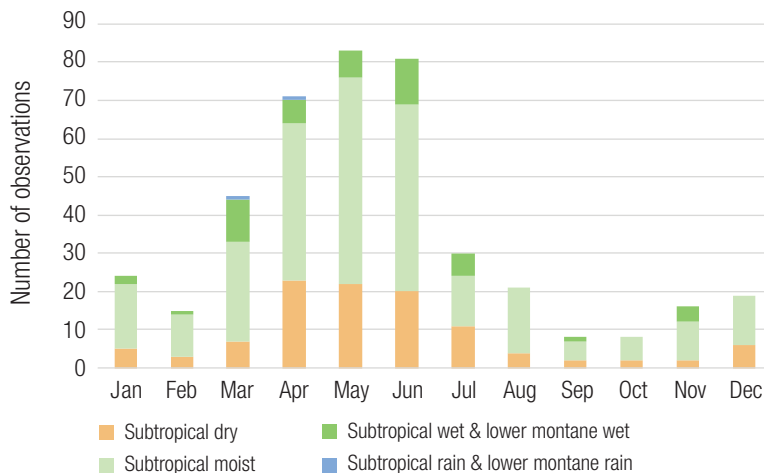
**Population Status and Conservation**

The Green Heron has not yet been assessed by the IUCN Red List. Locally, this species is not

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Green Heron breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	7	21	24	73	2	6	0	0	33
Probable	12	39	18	58	1	3	0	0	31
Possible	51	24	127	59	36	17	1	<1	215
<b>Total</b>	<b>70</b>	<b>25</b>	<b>169</b>	<b>61</b>	<b>39</b>	<b>14</b>	<b>1</b>	<b>&lt;1</b>	<b>279</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Green Heron records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Black-crowned Night-Heron/Yaboa Real

*Nycticorax nycticorax*



Photo by José Salguero

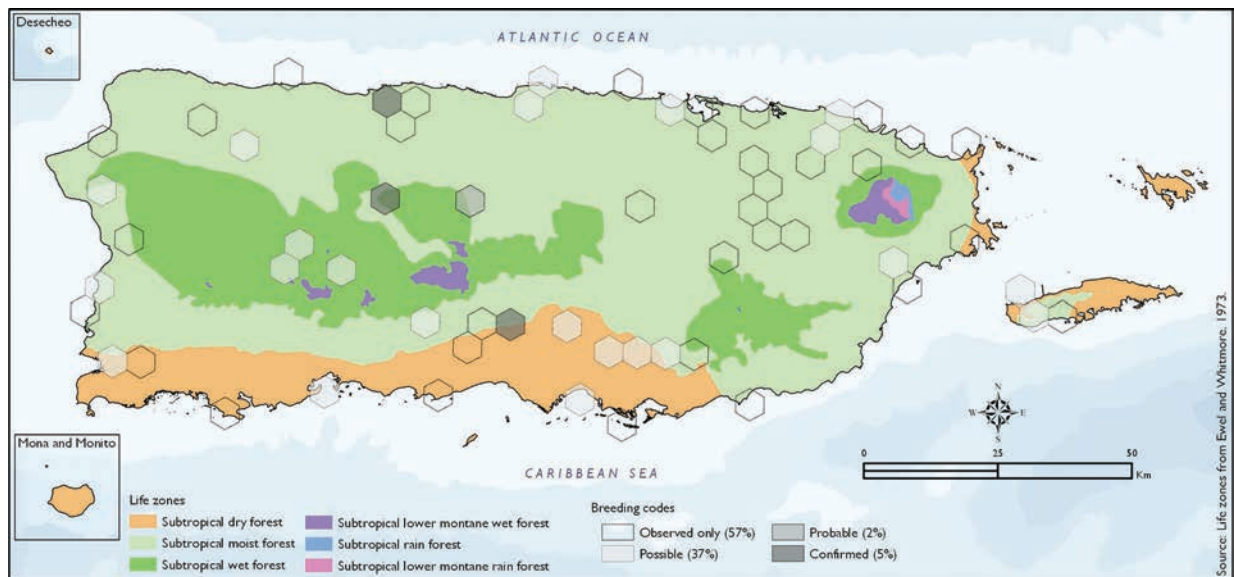
## Distribution and Habitat

The Black-crowned Night Heron occurs worldwide. It is an uncommon resident species in Puerto Rico (Oberle 2018, Raffaele 1989a) and considered a rare spring resident on Vieques where breeding is unconfirmed (Gemmill 2015). In addition, it also occurs in Mona (Ventosa-Febles and others 2005). This species inhabits freshwater swamps, but also uses brackish lagoons and salt ponds (Raffaele and others 1998). It is mostly nocturnal and usually seen at dawn or dusk (Oberle 2018, Raffaele 1989a). The atlas fieldwork yielded a total of

75 records within 60 hexagons or 13 percent of the 479 total hexagons (see map). Of the 60 hexagons where this species was found, breeding met the atlas definition of confirmed in 5 percent (3) of the hexagons, probable in 2 percent (1), and possible in 37 percent (22), while the species was observed in 57 percent (34) of the hexagons but without evidence of breeding (see map).

## Breeding Ecology

The Black-crowned Night Heron nests in colonies, and nests are built on trees mainly from January to late July, but breeding



Black-crowned Night Heron distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



season may vary, according to previously published reports (Raffaele and others 1998). Atlas results indicate that the peak of the breeding season for this species is from April to June (see chart). Results show that this species breeds in the subtropical moist forest life zone (58 percent of the hexagons), subtropical dry forest life zone (27 percent of the hexagons), and subtropical wet forest life zone (15 percent of the hexagons) (see table and map).

**Population Status and Conservation**

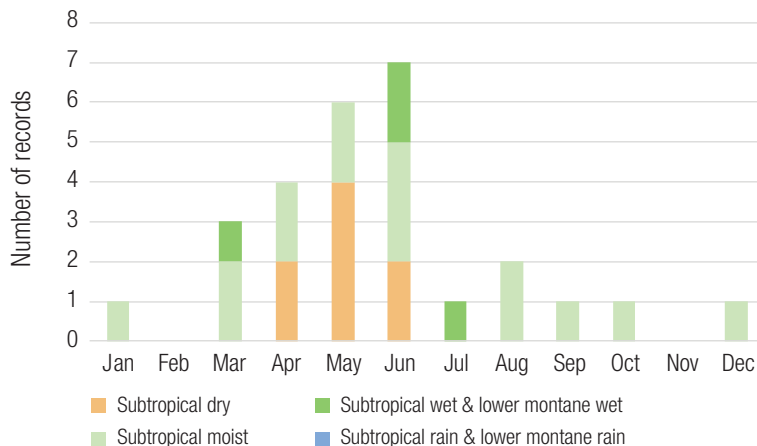
The Black-crowned Night Heron is listed as a species of least concern by the IUCN (BirdLife International 2019). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Black-crowned Night Heron has a protected habitat in land of

14 percent or 86 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (622 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Black-crowned Night-Heron breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	2	67	1	33	0	0	3
Probable	0	0	1	100	0	0	0	0	1
Possible	7	32	12	55	3	14	0	0	22
<b>Total</b>	<b>7</b>	<b>27</b>	<b>15</b>	<b>58</b>	<b>4</b>	<b>15</b>	<b>0</b>	<b>0</b>	<b>26</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Black-crowned Night-Heron records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Yellow-crowned Night-Heron/Yaboa Común

*Nyctanassa violacea*

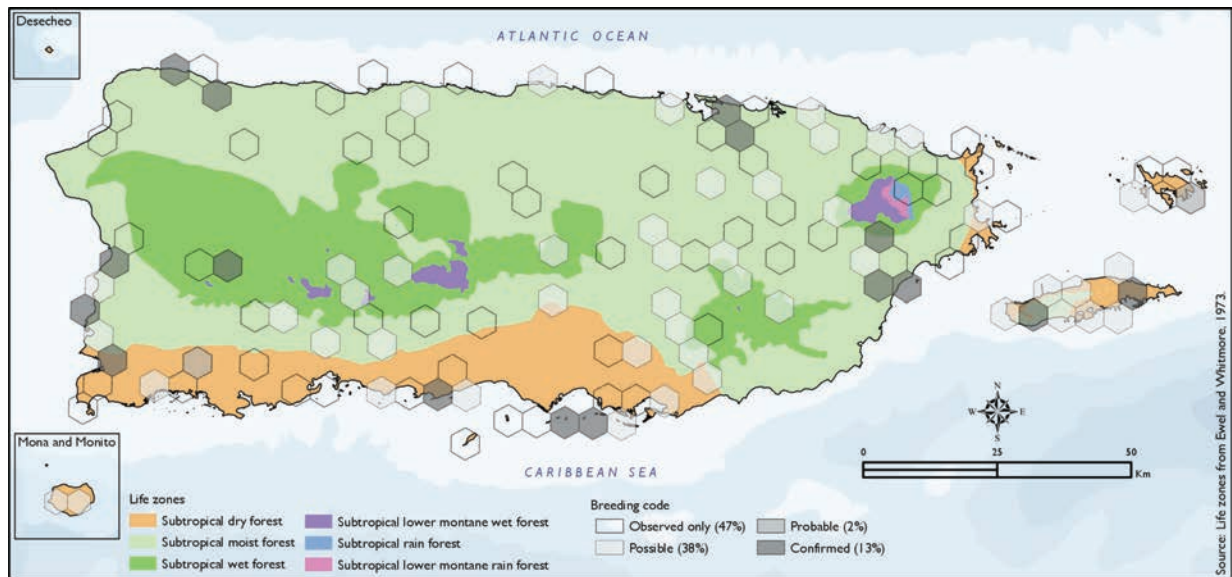


Photo by Pedro W. Santana

## Distribution and Habitat

The Yellow-crowned Night-Heron occurs from the Eastern and Central United States south into coastal areas of South America including the West Indies, where it is common in The Bahamas, Greater Antilles, northern Lesser Antilles, Virgin Islands, and Cayman Islands (Raffaele and others 1998). It occurs throughout Puerto Rico and satellite islands such as Desecheo, Culebra, and Vieques (Raffaele 1989a, Sorrié 1975), in the latter being an uncommon resident from spring to fall and a rare resident in winter (Gemmill 2015). This species' habitat includes mostly mangrove

swamps but also coastal mudflats and sometimes dry thickets far from water (Raffaele and others 1998), as well as shores, lagoons, and estuaries (Oberle 2018). The atlas fieldwork yielded a total of 176 records within 123 hexagons or 26 percent of the 479 total hexagons (see map). Of the 123 hexagons where this species was found, breeding met the atlas definition of confirmed in 13 percent (16) of the hexagons, probable in 2 percent (2), and possible in 38 percent (47), while the species was observed in 47 percent (58) of the hexagons but without evidence of breeding (see map).



Yellow-crowned Night-Heron distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

The Yellow-crowned Night-Heron feeds heavily on crabs and builds a bulky platform nest made of twigs, usually near water in a tree but sometimes far from water (Raffaele and others 1998). Previously published reports indicate that breeding occurs from March to July (Raffaele and others 1998). Nevertheless, atlas results show that this species' breeding season extends throughout the year, with the most breeding activity in May and June (see chart). The overall breeding activity mostly takes place in

the subtropical moist forest life zone. Atlas results show that this species breeds mostly within the subtropical moist (52 percent of the hexagons) and subtropical dry forest life zones (35 percent of the hexagons) (see table and map). However, results also indicate that at higher elevations it breeds in subtropical wet forest life zones as well (12 percent of the hexagons) (see table and map).

**Population Status and Conservation**

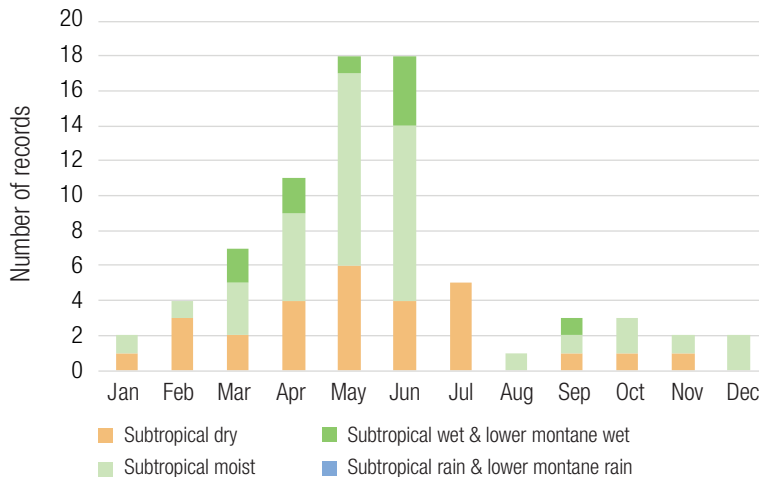
The current global population trend for the Yellow-crowned Night-Heron is described as

'stable' (Wetlands International 2012). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Yellow-crowned Night-Heron has a protected habitat in land of 11 percent or 177 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1553 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Yellow-crowned Night-Heron breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	5	31	10	63	1	6	0	0	16
Probable	2	100	0	0	0	0	0	0	2
Possible	16	34	24	51	7	15	0	0	47
<b>Total</b>	<b>23</b>	<b>35</b>	<b>34</b>	<b>52</b>	<b>8</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>65</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Yellow-crowned Night-Heron records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# White Ibis/Ibis Blanco

## *Eudocimus albus*



Photo by Alcides Morales

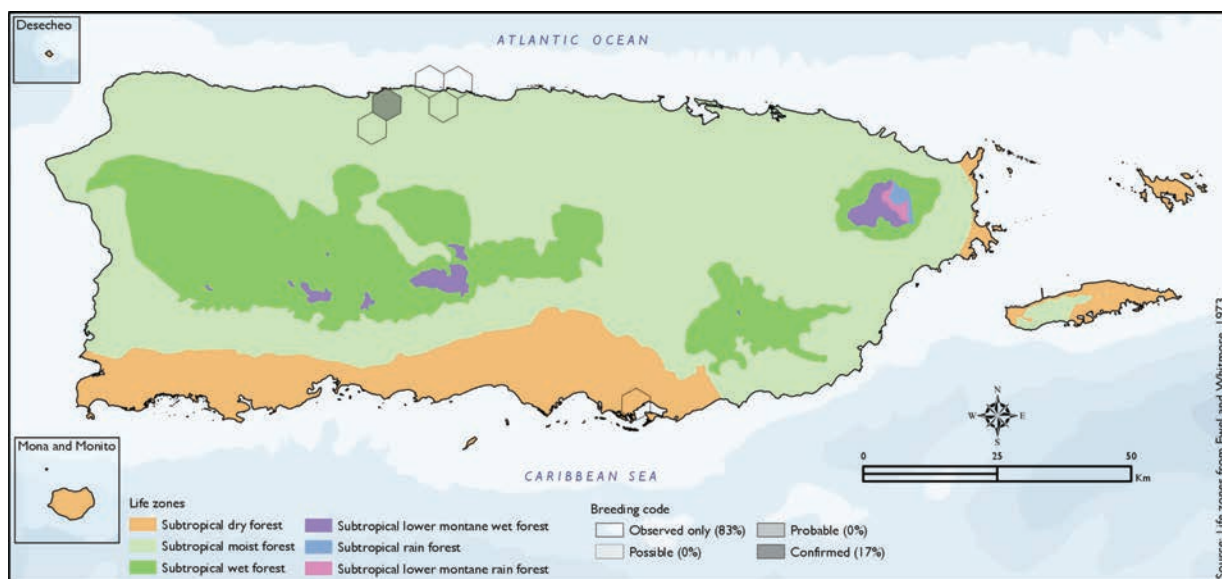
### Distribution and Habitat

The White Ibis occurs from the Southeastern United States through northern South America including the West Indies (Raffaele and others 1998). It is described as a 'rare visitor and breeder' in Puerto Rico (Oberle 2018). No records for this species are recorded for Vieques (Gemmill 2015). Before the early 2000s, it was a rare visitor but has since become established locally in the north coast near Arecibo and has expanded east and west along coastal wetlands. Habitat includes freshwater swamps, saltwater lagoons, and rice fields (Raffaele and others 1998). The atlas fieldwork

yielded a total of six records within six hexagons or 1.2 percent of the 479 total hexagons (see map). Of the six hexagons where this species was found, breeding met the atlas definition of confirmed in 17 percent (one) of the hexagons, while the species was observed in 83 percent (five) of the hexagons but without evidence of breeding (see map).

### Breeding Ecology

Previously published reports indicate that the White Ibis breeds from April to September, and the nesting is colonial (Raffaele and others 1998). The nest is made of twigs and grasses



White Ibis distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

and is usually constructed high in mangroves above water (Raffaele and others 1998). Atlas results show that this species breeds in June and within the subtropical moist forest life zone (see chart). Atlas results show that this species breeds in the subtropical moist forest life zone (100 percent of the hexagons) (see table and map).

**Population Status and Conservation**

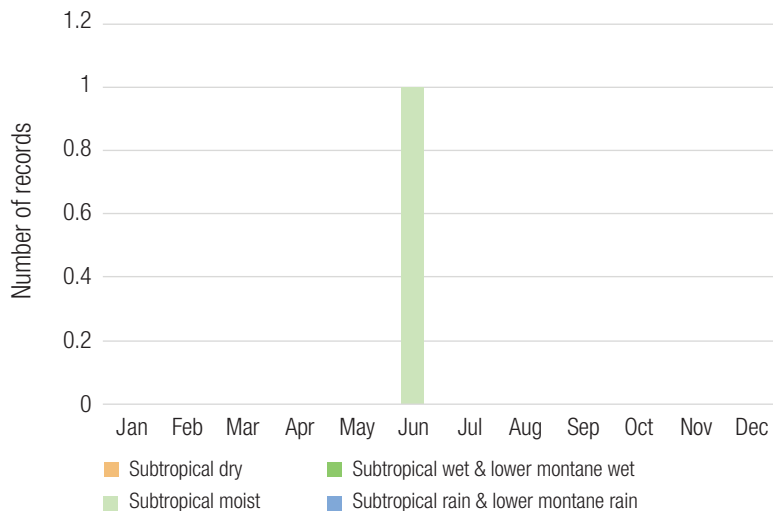
The current global population trend of the White Ibis is described as ‘stable,’ although some populations have unknown trends (Wetlands International 2012). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the

threatened categories of PRDNER and USFWS. In Puerto Rico, the White Ibis has a protected habitat in land of 25 percent or 6 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (24 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where White Ibis breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	1	100	0	0	0	0	1
Probable	0	0	0	0	0	0	0	0	0
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of White Ibis records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Glossy Ibis/Ibis Lustroso

## *Plegadis falcinellus*



Photo by Pedro W. Santana

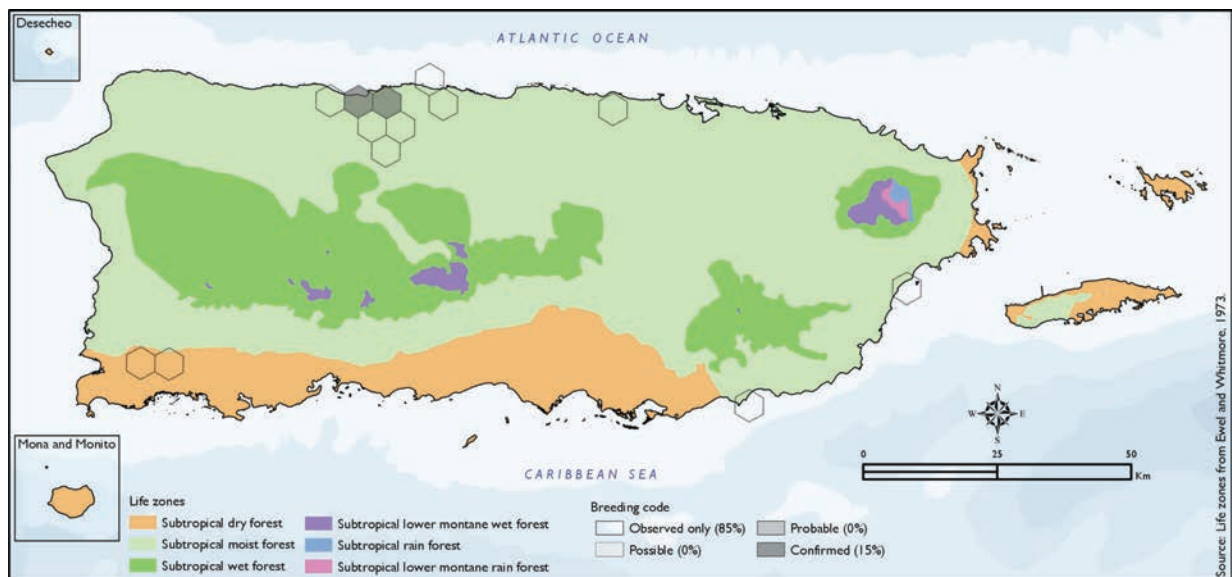
### Distribution and Habitat

The Glossy Ibis occurs worldwide including the West Indies, where it is irregular and very local in Puerto Rico (Raffaele and others 1998). Before the early 2000s, this species was considered a rare visitor until it was confirmed to be nesting in the municipality of Arecibo (J.A. Salguero-Faría, personal observation 2009). It has expanded throughout coastal wetlands and now can be seen in flocks that number hundreds of birds (J.A. Salguero-Faría, personal observation 2009). This species occurs in lowland habitats (Oberle 2018) including mud flats and marshy savannas

(Raffaele and others 1998). The atlas fieldwork yielded a total of 27 records within 13 hexagons or 3 percent of the 479 total hexagons (see map). Of the 13 hexagons where this species was found, breeding met the atlas definition of confirmed in 15 percent (2) of the hexagons, while the species was observed in 85 percent (11) of the hexagons but without evidence of breeding (see map).

### Breeding Ecology

The Glossy Ibis nests in colonies and constructs the nest near water, principally from June to August, according to previously published reports (Raffaele and



Glossy Ibis distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

others 1998). The two instances of reported Glossy Ibis breeding in Puerto Rico occurred in the month of June (see chart). Results show that the Glossy Ibis breeds within the subtropical moist forest life zone (100 percent of the hexagons) (see table and map).

**Population Status and Conservation**

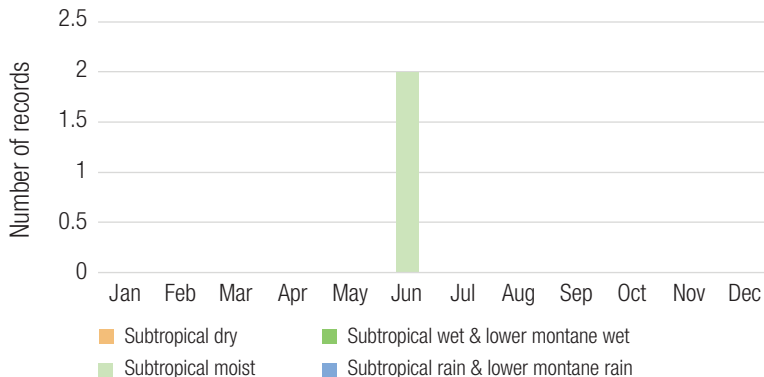
The population trend for the Glossy Ibis across its distribution range is described as decreasing,

mainly due to wetland habitat degradation and loss, but it is listed as a species of least concern by the IUCN (BirdLife International 2019). Locally, this species is listed as Data Deficient (PRDNER 2015). In Puerto Rico, the Glossy Ibis has a protected habitat in land of 15 percent or 7 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (~48 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Glossy Ibis breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	2	100	0	0	0	0	2
Probable	0	0	0	0	0	0	0	0	0
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Glossy Ibis records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Turkey Vulture/Aura Tiñosa

## *Cathartes aura*



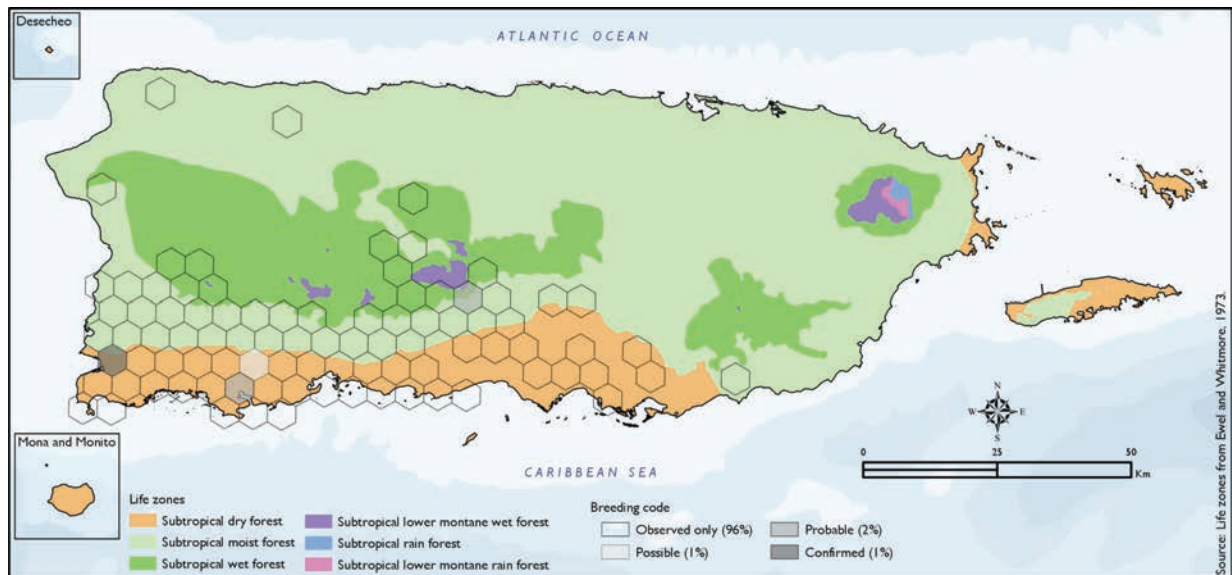
Photo by José Salguero

### Distribution and Habitat

The Turkey Vulture occurs throughout most of the Western Hemisphere including the West Indies, where it is common on Cuba, Jamaica, the northern Bahamas, northeastern Hispaniola, and Puerto Rico (Raffaele and others 1998). It was reportedly introduced from

Cuba to Puerto Rico in the late 19<sup>th</sup> century (Santiago-Valentin 1997), and it is now commonly seen in the open country of the southcentral and southwestern regions (Biaggi 1997), especially from Ponce to Cabo Rojo (Oberle 2018). However, it has also been seen in the northwestern region between the municipalities of Moca and Isabela (Lizardi 2003). Census results indicate that its abundance decreases from west to east along the southern coastal plain of the island (Santana and others 1986). This species' habitat includes open areas such as grasslands, coasts, pastures, dry forests, farming areas (Oberle 2018), scrublands, towns, and even garbage dumps (Raffaele

and others 1998), but it only comes down to rest on trees or cliffsides. In Puerto Rico, Turkey Vultures are most abundant in the subtropical dry forest life zone of the southern region (Santana and others 1986). The atlas fieldwork yielded a total of 190 records within 89 hexagons or 19 percent of the 479 total hexagons (see map). Of the 89 hexagons where this species was found, breeding met the atlas definition of confirmed in 1 percent (1) of the hexagons, probable in 2 percent (2), and possible in 1 percent (1), while the species was observed in 96 percent (85) of the hexagons but without evidence of breeding (see map).



Turkey Vulture distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

Previously published reports indicate that the Turkey Vulture breeds primarily from February to April, but it may breed throughout the year (Raffaele and others 1998). The nest can be an unmodified rocky ledge, tree stump, cave (Oberle 2018), or a shallow depression on the ground under vegetation (Raffaele and others 1998). Atlas results show that this species breeds during April and May, and that the breeding activity takes place within subtropical dry and

subtropical wet forest life zones (see chart). Results show that this species breeds mostly within the subtropical dry forest life zone (75 percent of the hexagons) (see table), but it may also breed at higher elevations within subtropical wet forest life zones (25 percent of the hexagons) (see table and map).

concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Turkey Vulture has a protected habitat in land of 5 percent or 5 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (96 km<sup>2</sup>).

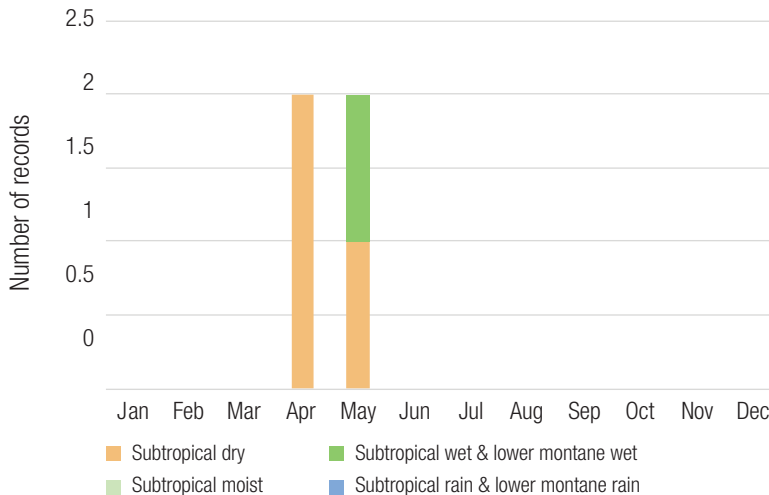
**Population Status and Conservation**

The current population trend of the Turkey Vulture is described as ‘stable,’ and it is currently listed as a species of least

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Turkey Vulture breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	1	100	0	0	0	0	0	0	1
Probable	1	50	0	0	1	50	0	0	2
Possible	1	100	0	0	0	0	0	0	1
<b>Total</b>	<b>3</b>	<b>75</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>25</b>	<b>0</b>	<b>0</b>	<b>4</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Turkey Vulture records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by Rafael Rodriguez

# Sharp-shinned Hawk/ Halcón o Gavilán de Sierra

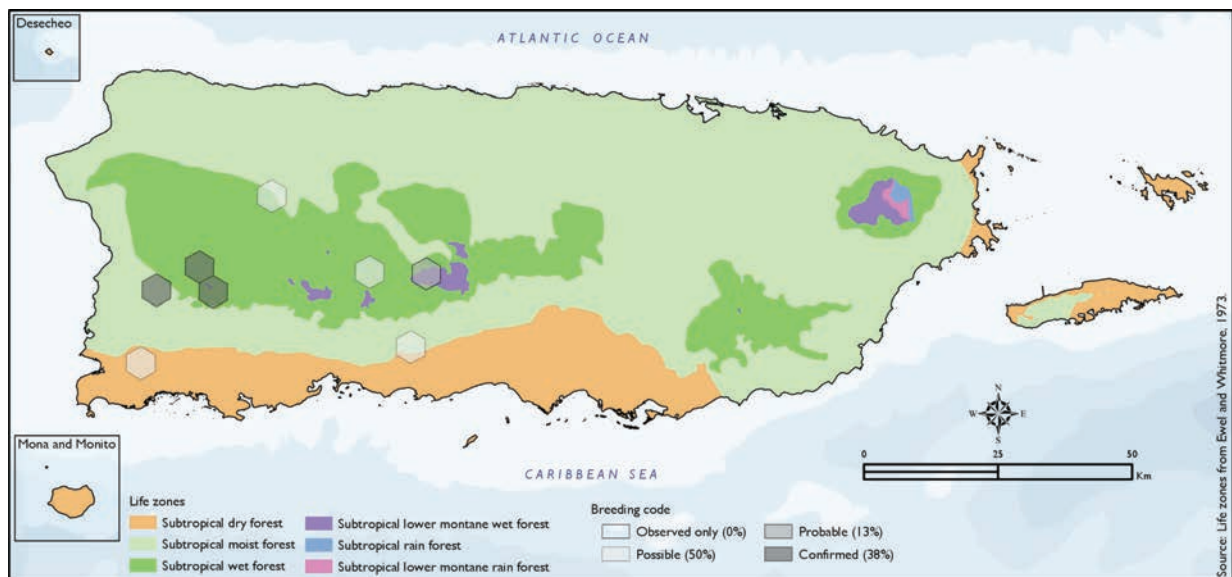
*Accipiter striatus*

## Distribution and Habitat

The Sharp-shinned Hawk occurs through North, Central, and South America (Biaggi 1997, Raffaele and others 1998) including the West Indies, where it is a common year-round resident on Cuba and

Hispaniola, and rare on Puerto Rico (Raffaele and others 1998). The Puerto Rican Sharp-shinned Hawk (*A. s. venator*) is an endangered breeding resident subspecies found in the montane forests and shade coffee plantations of Puerto Rico (Delannoy 1992). Historically, the species bred in the Sierra de Cayey, Sierra de Luquillo, and the central west portion of the Cordillera Central (e.g., Maricao forest) mostly above 400 m elevation (Delannoy and Cruz 1999, Oberle 2018). However, recent surveys indicate that the species has declined in population (especially in Maricao) and distribution, and is

now believed to be isolated in a few montane forests (Delannoy 1992, Gallardo and Vilella 2014). A single individual was observed on Mona in 1972 and considered vagrant (Terborgh and Faaborg 1973). The atlas fieldwork yielded a total of 20 records within eight hexagons or 2 percent of the 479 total hexagons (see map). Of the eight hexagons where this species was found, breeding met the atlas definition of confirmed in 38 percent (three) of the hexagons, probable in 13 percent (one), and possible in 50 percent (four) (see map).



Sharp-shinned Hawk distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the Sharp-shinned Hawk breeds from March to June (Delannoy and Cruz 1988, Raffaele and others 1998). The nest is a platform made of twigs built high in a tree or palm (Delannoy and Cruz 1988, Raffaele and others 1998). Atlas results show that this species breeds mostly from November to June and also during August, with the most breeding activity during February to April (see chart). Overall, the breeding activity peaks in March and mostly takes place within subtropical wet forest life zones (see chart). Results show that this species breeds mostly within

subtropical wet and lower montane wet forest life zones (63 percent of the hexagons), but it also breeds in the subtropical moist forest life zone (25 percent of the hexagons) and may also breed within the subtropical dry forest life zone (13 percent of the hexagons) (see table and map).

**Population Status and Conservation**

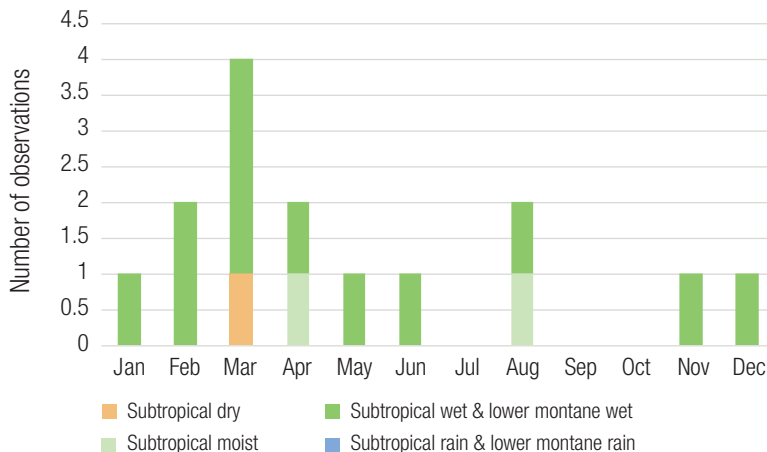
The current population trend of the Sharp-shinned Hawk is described as ‘increasing’ in North America (Butcher and Niven 2007), and it is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Nonetheless, the Puerto Rican subspecies (*A. s. venator*) is critically endangered (PRDNER

2016) and is included on the Federal Endangered Species List (USFWS 1973) as it has declined dramatically in the Sierra de Luquillo and Carite forests, mostly due to hurricanes, introduced predators, egg/chick predation by the Pearly-eyed Thrasher (*Margarops fuscatus*), and nest failures due to fledglings infested with botfly larvae (*Philornis* spp.) (Delannoy 1992; Gallardo and Vilella 2014, 2017; Oberle 2018). In Puerto Rico, the Sharp-shinned Hawk has a protected habitat in land of 26 percent or 49 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (191 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Sharp-shinned Hawk breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	0	0	1	33	2	67	0	0	3
Probable	0	0	0	0	1	100	0	0	1
Possible	1	25	1	25	2	50	0	0	4
<b>Total</b>	<b>1</b>	<b>13</b>	<b>2</b>	<b>25</b>	<b>5</b>	<b>63</b>	<b>0</b>	<b>0</b>	<b>8</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Sharp-shinned Hawk records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Broad-winged Hawk/Guaraguao de Bosque

*Buteo platypterus brunnescens*

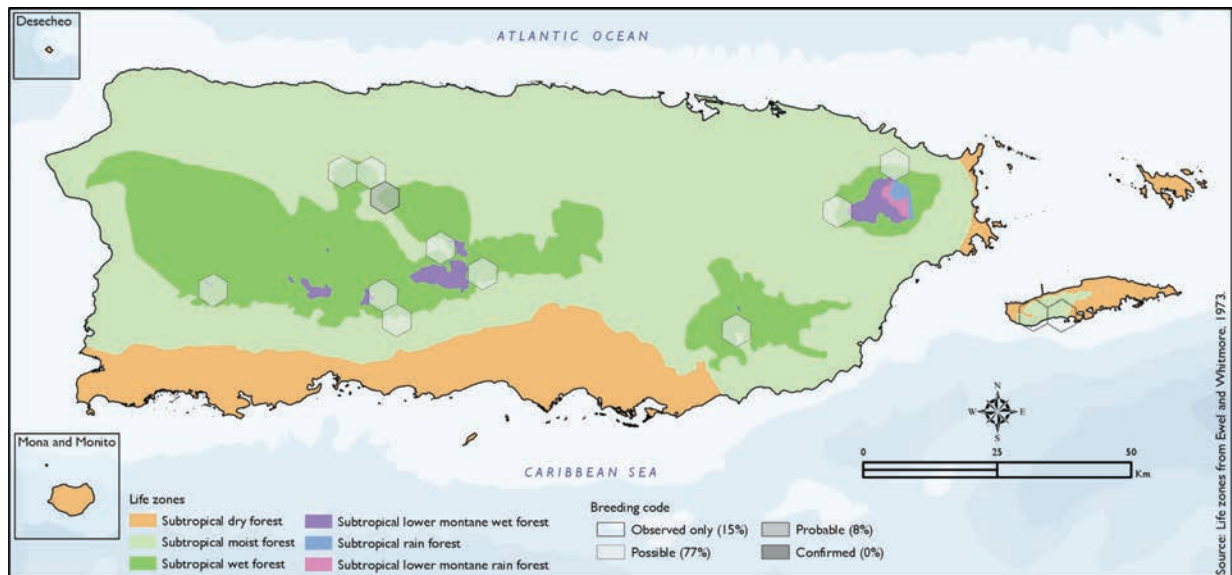


Photo by Jesus M. Rios Cruz

## Distribution and Habitat

The Broad-winged Hawk is a rare and endemic non-migratory subspecies in Puerto Rico (Raffaele and others 1998), mostly restricted to El Yunque National Forest, and in Carite and Río Abajo Commonwealth Forests, where it is most abundant (Oberle 2018). However, it has also been reported for the Toro Negro, Maricao, and Guajataca Commonwealth Forests (J.A. Salguero-Farías, personal observation 2009). It is an extremely rare visitor in Vieques

(Gemmill 2015). Currently, this species is restricted to dense broadleaf forests in the mountains (Oberle 2018, Raffaele and others 1998). The atlas fieldwork yielded a total of 15 records within 13 hexagons or 3 percent of the 479 total hexagons (see map). Of the 13 hexagons where this species was found, breeding met the atlas definition of probable in 8 percent (1) and possible in 77 percent (10), while the species was observed in 15 percent (2) of the hexagons but without evidence of breeding (see map).



Broad-winged Hawk distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the Broad-winged Hawk builds a large bulky stick nest in a tree or on a cliff from January to July (Raffaele and others 1998), but most of the nesting activity occurs in February and March (Oberle 2018). Atlas results indicate that breeding activity for this species peaks in April, suggesting this species may also breed outside of the period described in the literature. Results show that the

Broad-winged Hawk mostly breeds within the subtropical wet and subtropical moist forest life zones (73 and 27 percent of the hexagons, respectively) (see table and map).

**Population Status and Conservation**

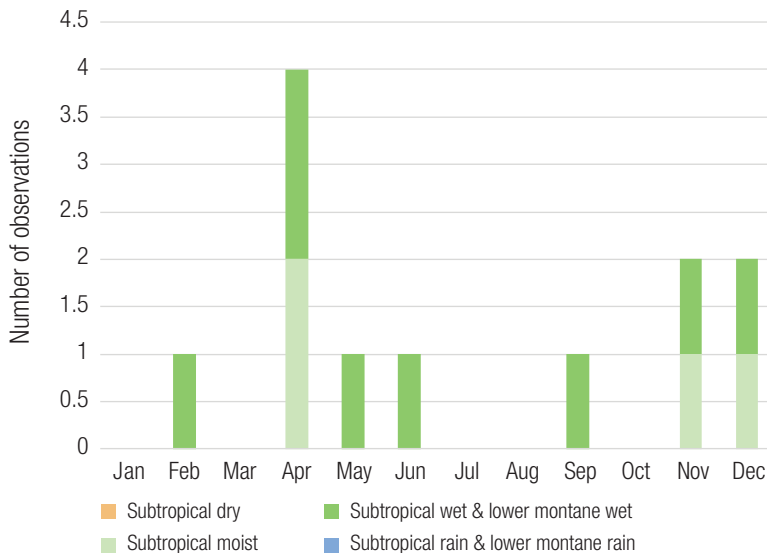
Overall, the Broad-winged Hawk (*B. platypterus*) is listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, however, the subspecies (*B. p. brunnescens*) is listed as critically endangered by

local laws (PRDNER 2015) and as endangered by Federal laws (USFWS 1973). In Puerto Rico, the Broad-winged Hawk has a protected habitat in land of 34 percent or 106 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (311 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Broad-winged Hawk breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	0	0	0	0	0	0	0	0	0
Probable	0	0	0	0	1	100	0	0	1
Possible	0	0	3	30	7	70	0	0	10
<b>Total</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>27</b>	<b>8</b>	<b>73</b>	<b>0</b>	<b>0</b>	<b>11</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Broad-winged Hawk records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Red-tailed Hawk/Guaraguao Colirrojo

## *Buteo jamaicensis*

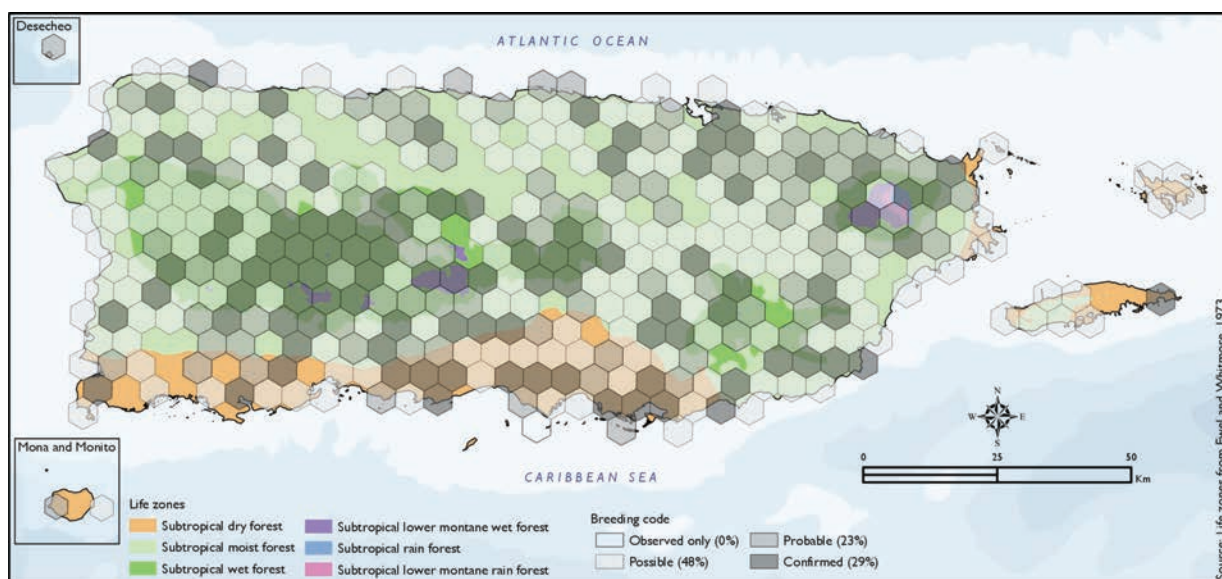


Photo by Noelia Nieves

### Distribution and Habitat

The Red-tailed Hawk occurs from North America through Central America including the Caribbean (Raffaele and others 1998, Root 1988). It is widespread and fairly abundant throughout Puerto Rico's mainland, but it is most numerous in the mountains (Biaggi 1997, Bond 1961, Rivera-Milán 1995b, Santana and Temple 1988). It is also known to inhabit satellite islands such as Desecheo (Meier and others 1989), Culebra (Wetmore 1917), and Vieques (Sorrié 1975, Wetmore 1916), in the latter being a fairly common resident (Gemmill 2015). This species generally occurs on

all habitats at all elevations including towns and urban areas (Oberle 2018, Raffaele and others 1998, Rivera-Milán 1995b, Santana and Temple 1988). The atlas fieldwork yielded a total of 646 records within 355 hexagons or 74 percent of the 479 total hexagons (see map). Of the 355 hexagons where this species was found, breeding met the atlas definition of confirmed in 29 percent (102) of the hexagons, probable in 23 percent (83), and possible in 48 percent (169), while it was observed in an additional hexagon (<1 percent) but without evidence of breeding (see map).



Red-tailed Hawk distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

The Red-tailed Hawk builds a large and bulky nest made of sticks, which is usually placed high in a tree or on the side of a cliff (Santana and Temple 1988, Santana and others 1986). Previously published reports indicate that it breeds from January to July (Raffaele and others 1998), but Santana and Temple (1988) describe a November-to-August breeding period. Overall, the breeding activity peaks in June, and it mostly takes place in the subtropical moist forest life zone, which is consistent with survey results of Rivera-Milán (1995b). Atlas results show that

this species' breeding season extends throughout the year with the most breeding activity from March to June (see chart). Results show that this species breeds throughout the island but mostly within the subtropical moist forest life zone (58 percent of the hexagons) (see table and map). It also breeds in the subtropical wet and lower montane wet forest life zones, and subtropical rain forest life zones at higher elevations (23 percent and 1 percent of the hexagons, respectively), and in the subtropical dry forest life zone as well (18 percent of the hexagons) (see table and map).

**Population Status and Conservation**

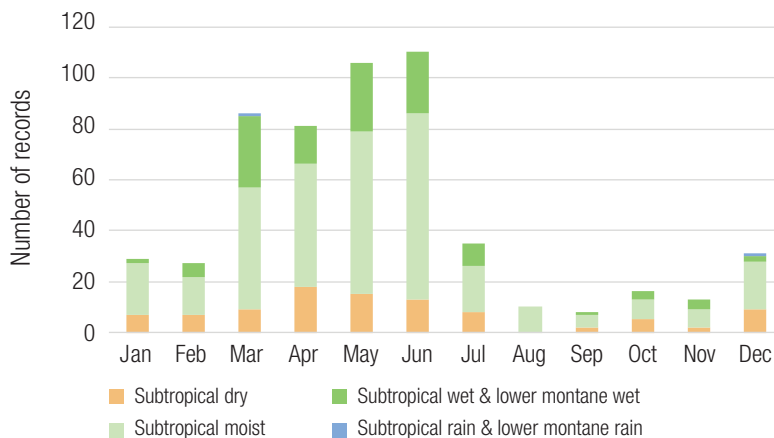
The current population trend of the Red-tailed Hawk is described as 'increasing' (Butcher and Niven 2007). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Red-tailed Hawk has a protected habitat in land of 12 percent or 992 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (8466 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Red-tailed Hawk breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total	%
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%		
Confirmed	16	16	48	47	37	36	1	1	102	<b>100</b>
Probable	13	16	50	60	20	24	0	0	83	<b>100</b>
Possible	36	21	108	64	24	14	0	0	168 <sup>b</sup>	<b>100</b>
<b>Total</b>	<b>65</b>	<b>18</b>	<b>206</b>	<b>58</b>	<b>81</b>	<b>23</b>	<b>1</b>	<b>1</b>	<b>353</b>	<b>100</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.

<sup>b</sup> A different number of total hexagons for each breeding code in this table may not reflect the actual number of hexagons where the species was found breeding, as some of the hexagons in the coastal zone or on the water may not have ecological life zone data.



Number of Red-tailed Hawk records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Puerto Rican Owl/Mucarito de Puerto Rico

## *Gymnasio nudipes*

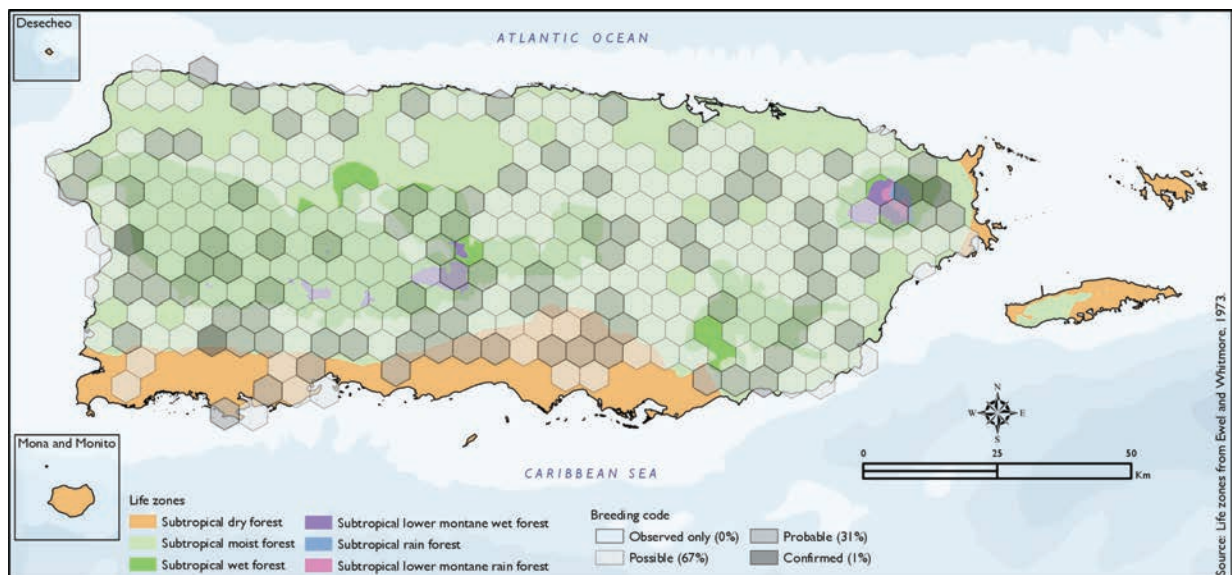


Photo by Michael Morel

### Distribution and Habitat

The Puerto Rican Owl is endemic to Puerto Rico and the Virgin Islands (Oberle 2018), but recent playback surveys using acoustic recorders in the Virgin Islands and in Vieques elicited no response (Gemmill 2015), suggesting that this species has been extirpated or is extremely rare on those islands. The species occurs in all forest types at all elevations from wet forests in the mountains to dry forests in coastal areas (Raffaele and others 1998), woodlots, forest edges, and tree-filled gardens (Oberle

2018). The owl occurs in both small and large forest fragments (Pardieck and others 1996). The atlas fieldwork yielded a total of 364 records within 284 hexagons or 59 percent of the 479 total hexagons (see map). Of the 284 hexagons where this species was found, breeding met the atlas definition of confirmed in 1 percent (4) of the hexagons, probable in 31 percent (89), and possible in 67 percent (190), while this species was observed in an additional hexagon but without evidence of breeding (see map).



Puerto Rican Owl distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

The Puerto Rican Owl nests in cavities in large hardwood trees and palms from April to June, according to previously published reports (Raffaele and others 1998). Atlas findings indicate breeding activity for this species occurs throughout the year, but increases from December to July and peaks in June (see chart). Results confirm that this species breeds in all ecological life zones, but

it is mostly associated with the subtropical moist and subtropical wet forest life zones (63 and 28 percent of the hexagons, respectively) (see table and map).

**Population Status and Conservation**

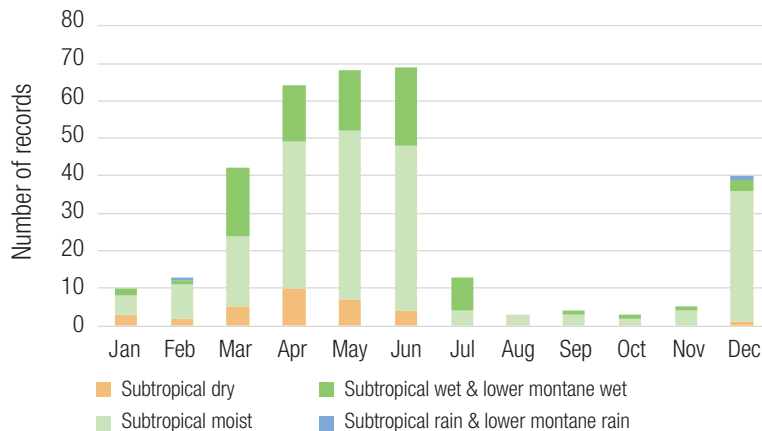
Population trends for the Puerto Rican Owl are stable in Puerto Rico, but the subspecies (*M. n. newtoni*) is apparently extinct in the Virgin Islands and Vieques (Thorstrom and

Gallardo 2017). Globally, it is listed as a species of least concern by the IUCN (BirdLife International 2016), and locally, this species is not listed in any of the threatened categories of PRDNER or USFWS. In Puerto Rico, the Puerto Rican Owl has a protected habitat in land of 11 percent or 729 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (6770 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Puerto Rican Owl breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	0	0	2	50	1	25	1	25	4
Probable	12	13	56	63	21	24	0	0	89
Possible	12	6	120	63	58	31	0	0	190
<b>Total</b>	<b>24</b>	<b>8</b>	<b>178</b>	<b>63</b>	<b>80</b>	<b>28</b>	<b>1</b>	<b>&lt;1</b>	<b>283</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Puerto Rican Owl records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Short-eared Owl/Múcaro Real

## *Asio flammeus*

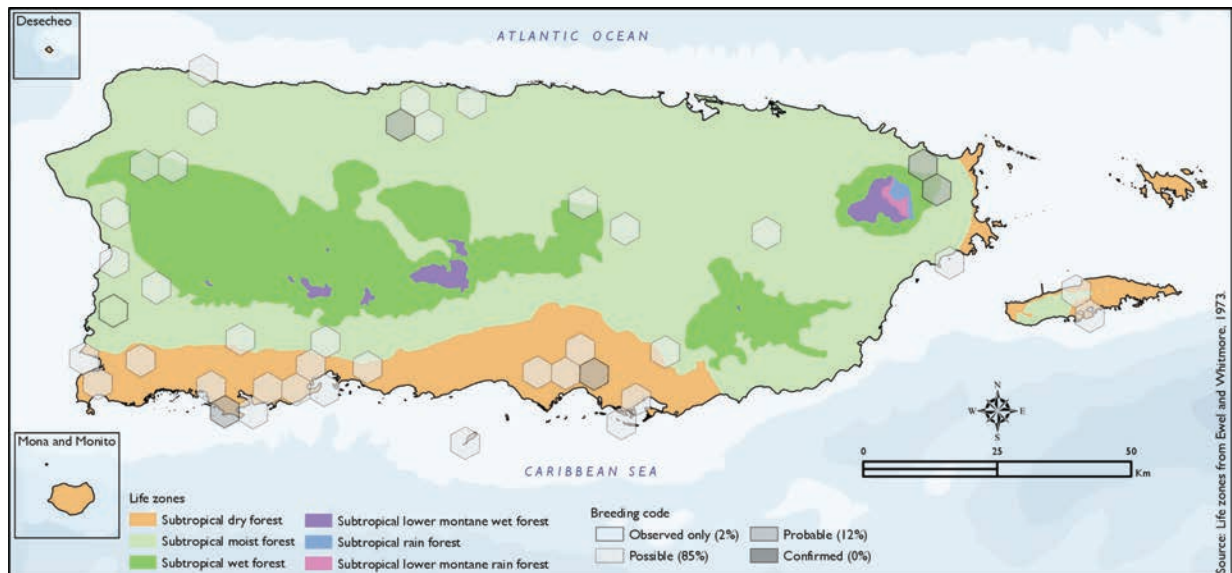


Photo by José Salguero

### Distribution and Habitat

The Short-eared Owl has a worldwide distribution. In the Caribbean, it is a common resident on Cuba and Hispaniola, and uncommon on Puerto Rico (Raffaele and others 1998). It occurs in Puerto Rico's mainland (Biaggi 1997, Oberle 2018, Raffaele 1989a) and Vieques, in the latter being an extremely rare resident (Gemmill 2015). In Puerto Rico, it can be regularly seen in the municipality of Salinas and the Caño Tiburones Natural Reserve (Oberle 2018). Nonetheless, it has also been observed in Cerro de las Mesas in Mayagüez (Biaggi 1997).

The owl is a species of open habitats including open fields, pastures, short-grass marshes (Oberle 2018), rice fields, and citrus plantations (Oberle 2018, Raffaele and others 1998). The atlas fieldwork yielded a total of 51 records within 41 hexagons or 9 percent of the 479 total hexagons (see map). Of the 41 hexagons where this species was found, breeding met the atlas definition of probable in 12 percent (5) and possible in 85 percent (35), while the species was observed in 2 percent (1) of the hexagons but without evidence of breeding (see map).



Short-eared Owl distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

## Breeding Ecology

The Short-eared Owl makes a scrape nest on the ground under a bush or a thick clump of grass (Raffaele and others 1998).

Previously published reports indicate that breeding occurs mostly from April to June, but some nesting activity has been noted as early as December (Raffaele and others 1998).

Nevertheless, atlas results suggest that this species' breeding season extends mostly from February to June and to a lesser extent from August to October and December, and peaks in March

(see chart). Results suggest that this species breeds mostly within the subtropical dry forest life zone (50 percent of the hexagons) (see table and map). However, results indicate that it may also breed within the subtropical moist forest life zone (43 percent of the hexagons) and rarely in the subtropical wet forest life zone at higher elevations (8 percent of the hexagons) (see table).

## Population Status and Conservation

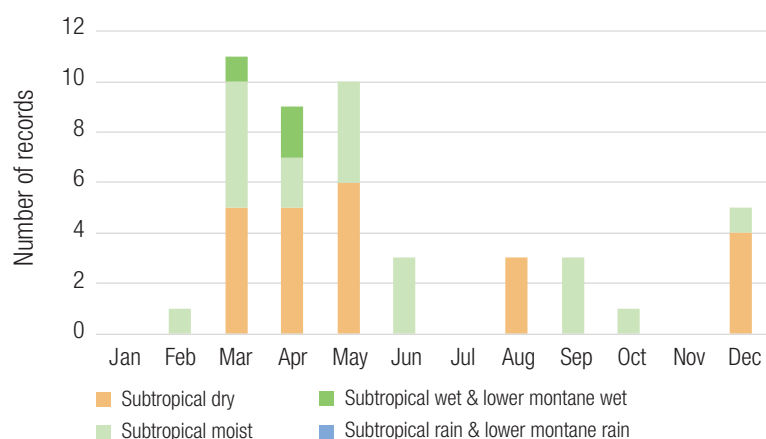
The current population trend of the Short-eared Owl is described

as 'decreasing' in North America (Butcher and Niven 2007), and it is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Short-eared Owl has a protected habitat of 15 percent or 148 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (958 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Short-eared Owl breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	0	0	0	0	0	0	0
Probable	2	40	2	40	1	20	0	0	5
Possible	18	51	15	43	2	6	0	0	35
<b>Total</b>	<b>20</b>	<b>50</b>	<b>17</b>	<b>43</b>	<b>3</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>40</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Short-eared Owl records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Puerto Rican Tody/San Pedrito

## *Todus mexicanus*



Photo by Marconi Campos Cerqueira

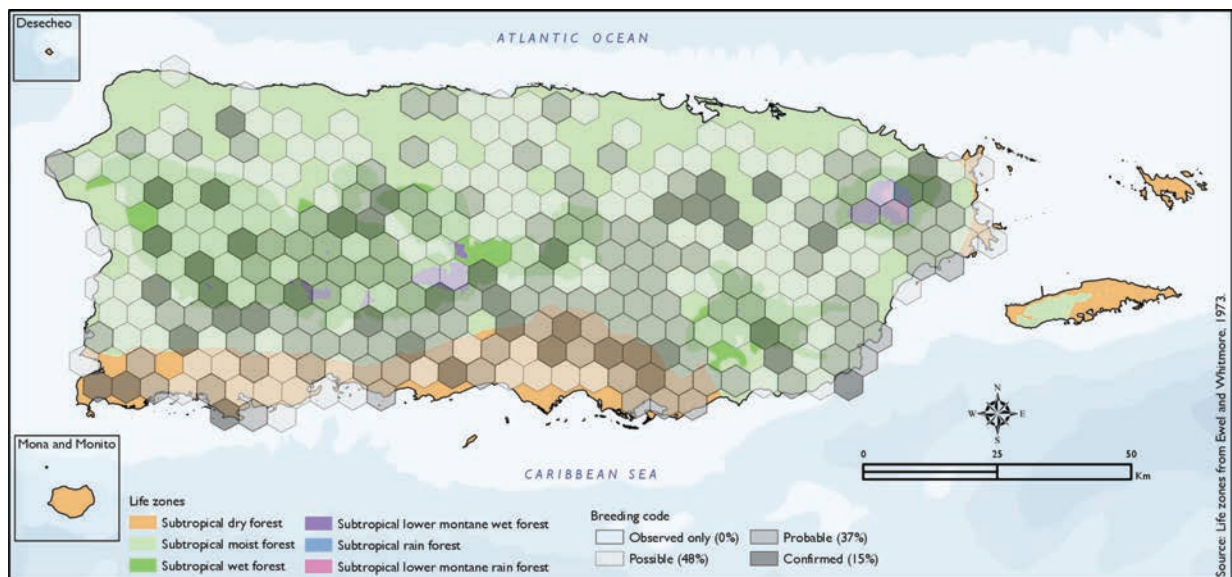
### Distribution and Habitat

The Puerto Rican Tody is a fairly common species endemic to Puerto Rico (Oberle 2018, Raffaele and others 1998) but unconfirmed in Vieques (Gemmill 2015). It occurs in most forest habitats at all elevations, except in mangroves (Kepler 1977, Oberle 2018, Raffaele 1989a). The atlas fieldwork yielded a total of 581 records within 307 hexagons or 64 percent of the 479 total hexagons (see map). Of the 307 hexagons where this species was found, breeding met the atlas definition of confirmed in 15 percent (45)

of the hexagons, probable in 37 percent (115), and possible in 48 percent (147) (see map).

### Breeding Ecology

The Puerto Rican Tody digs a burrow in an earth bank typically between February and May, according to previously published reports (Oberle 2018). As observed for other species (e.g., Bananaquit [*Coereba flaveola*]), nests are not always used for laying eggs, and many of them can be abandoned (Raffaele and others 1998). Atlas results indicate that this species breeds throughout the year, but



Puerto Rican Tody distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

most of the breeding activity takes place from March to June (see chart). Results show that the Puerto Rican Tody breeds in all ecological life zones, but most breeding activity was reported for the subtropical moist and subtropical wet forest life zones (56 and 27 percent of the hexagons, respectively) (see table and map).

**Population Status and Conservation**

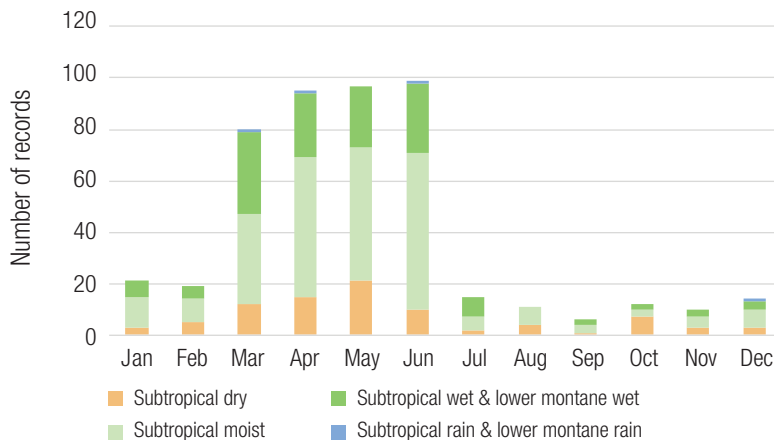
The Puerto Rican Tody is a common species on the island

and is classified as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Puerto Rican Tody has a protected habitat in land of 13 percent or 942 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (7344 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Puerto Rican Tody breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	9	20	20	44	15	33	1	2	45
Probable	21	18	65	57	29	25	0	0	115
Possible	22	15	87	59	38	26	0	0	147
<b>Total</b>	<b>52</b>	<b>17</b>	<b>172</b>	<b>56</b>	<b>82</b>	<b>27</b>	<b>1</b>	<b>&lt;1</b>	<b>307</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Puerto Rican Tody records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Puerto Rican Woodpecker/ Carpintero de Puerto Rico

## *Melanerpes portoricensis*



Photo by Marconi Campos Cerqueira

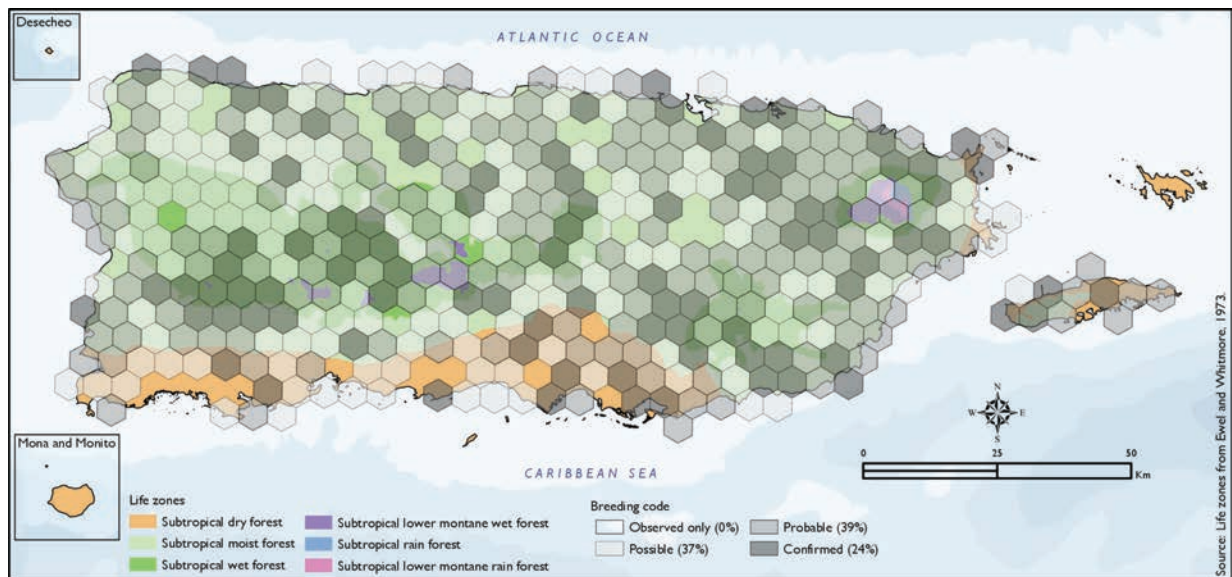
### Distribution and Habitat

The Puerto Rican Woodpecker is a common endemic species in Puerto Rico known to occur throughout the main island (Raffaele 1989a), and it is fairly common in Vieques (Gemmill 2015). This species is more common in hills and lowlands associated with forests, mangroves, and shade coffee plantations, but it also occurs in palm groves, parks, gardens, and woodlots, from the coast to the mountains (Oberle 2018, Raffaele 1989a). The atlas fieldwork yielded a total of 814 records within 388 hexagons or 81 percent of the 479 total hexagons

(see map). Of the 388 hexagons where this species was found, breeding met the atlas definition of confirmed in 24 percent (93) of the hexagons, probable in 39 percent (153), and possible in 37 percent (142) (see map and table).

### Breeding Ecology

Previously published reports indicate that the Puerto Rican Woodpecker excavates cavities in high trees or palms in January or February and lays eggs later, followed by fledglings reported from late March to June (Toms 2010). Old or abandoned nests are sometimes used by other



Puerto Rican Woodpecker distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

cavity-nesting species such as the American Kestrel (*Falco sparverius*), the Caribbean Martin (*Progne dominicensis*), and the Puerto Rican Flycatcher (*Myiarchus antillarum*) (J.A. Salguero-Farías, personal observation 2009). Atlas results indicate that the woodpecker breeding season extends throughout the year but is more active from March to June, with a peak in May (see chart). This seasonal pattern of woodpecker breeding appears to coincide in each of the life zones with no evidence to suggest breeding

times differ among the life zones. Results show that the Puerto Rican Woodpecker mostly breeds within the subtropical moist forest life zone (61 percent of the hexagons). Breeding for this species was also reported for the subtropical wet and lower montane wet forest life zones (22 percent of the hexagons), the subtropical dry forest life zone (17 percent of the hexagons), and for only one hexagon (1 percent of the hexagons) in the subtropical rain and lower montane rain forest life zones (see table and map).

### Population Status and Conservation

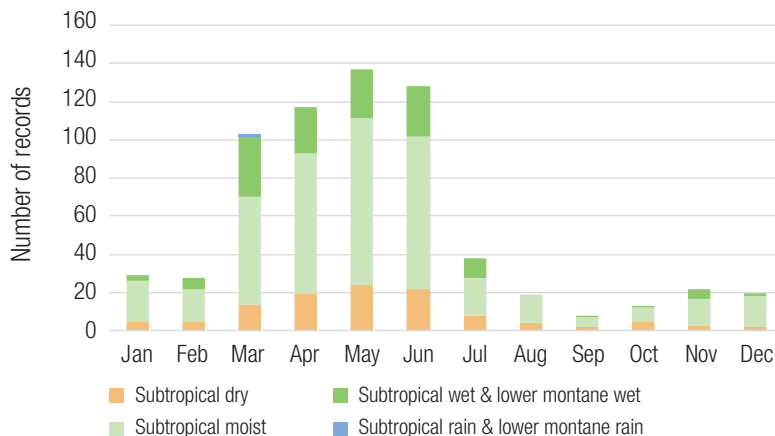
The Puerto Rican Woodpecker exhibits a stable population within its distribution range, and it is listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Puerto Rican Woodpecker has a protected habitat in land of 13 percent or 1167 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (9255 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Puerto Rican Woodpecker breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	14	15	59	63	20	22	0	0	93
Probable	24	16	96	63	32	21	1	1	153
Possible	28	20	81	57	32	23	0	0	141 <sup>b</sup>
<b>Total</b>	<b>66</b>	<b>17</b>	<b>236</b>	<b>61</b>	<b>84</b>	<b>22</b>	<b>1</b>	<b>&lt;1</b>	<b>387</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.

<sup>b</sup> A different number of total hexagons for each breeding code in this table may not reflect the actual number of hexagons where the species was found breeding, as some of the hexagons in the coastal zone or on the water may not have ecological life zone data.



Number of Puerto Rican Woodpecker records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# American Kestrel/Falcón Común

## *Falco sparverius*

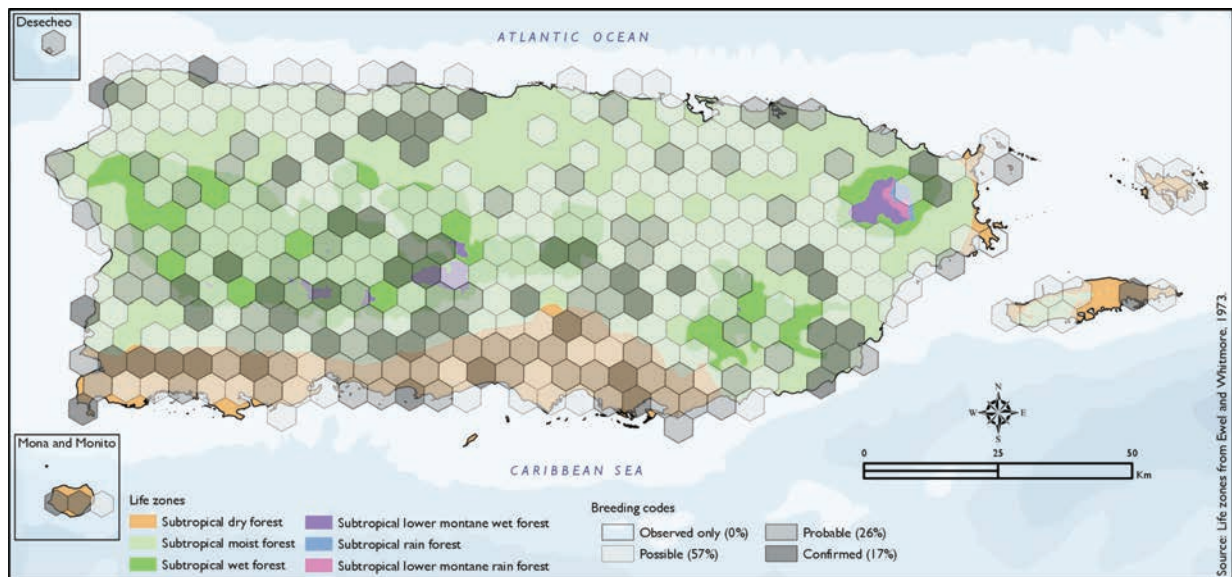


Photo by Michael Morel

### Distribution and Habitat

The American Kestrel occurs throughout the Western Hemisphere including the West Indies, where it is generally a common resident in The Bahamas, Greater Antilles, Virgin Islands, and the Lesser Antilles (Raffaele and others 1998). It is a common nesting species in Puerto Rico (Oberle 2018) and a common resident on Vieques (Gemmill 2015). It also occurs in Mona and Culebra (Biaggi 1997, Ventosa-Febles and others 2005). This species occurs throughout Puerto Rico but is observed most commonly in the dry regions of the southern side of the island

(Biaggi 1997) and inhabits farms, pastures, open country (Oberle 2018), forest edges, and urban areas like towns and even cities (Raffaele and others 1998). The atlas fieldwork yielded a total of 537 records within 327 hexagons or 68 percent of the 479 total hexagons (see map). Of the 327 hexagons where this species was found, breeding met the atlas definition of confirmed in 17 percent (56) of the hexagons, probable in 26 percent (84), and possible in 57 percent (186), while the species was observed in an additional hexagon (<1 percent) but without evidence of breeding (see map).



American Kestrel distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

The American Kestrel is a secondary cavity nester—a species that does not make its own cavities but uses the cavities excavated by other species (i.e., woodpecker cavities in trees) or natural cavities in cliff faces (Raffaele and others 1998). Therefore, the species and its distribution may be limited by absence of suitable cavities for nesting. Atlas results indicate that the breeding season for this species extends throughout the year, but breeding is most active from March to June, with a peak in June (see chart). This

seasonal pattern of breeding appears to coincide in each of the ecological life zones with no evidence to suggest that breeding times differ among the life zones. Atlas results show that the American Kestrel mostly breeds within the subtropical moist forest life zone (58 percent of the hexagons), followed by the subtropical dry forest life zone (23 percent of the hexagons) and the subtropical wet and lower montane wet forest life zones (19 percent of the hexagons), and rarely breeding in the subtropical rain forest life zone (see table and map).

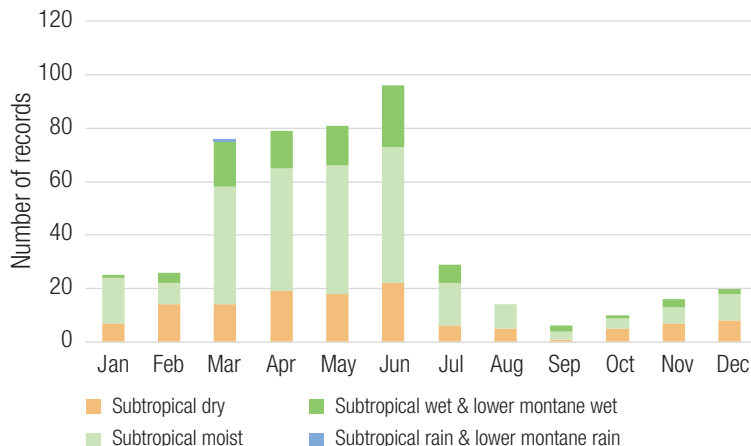
**Population Status and Conservation**

The American Kestrel is listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the American Kestrel has a protected habitat in land of 11.5 percent or 902 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (7799 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where American Kestrel breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	14	25	31	55	11	20	0	0	56
Probable	32	38	40	48	12	14	0	0	84
Possible	28	15	117	63	40	22	1	1	186
<b>Total</b>	<b>74</b>	<b>23</b>	<b>188</b>	<b>58</b>	<b>63</b>	<b>19</b>	<b>1</b>	<b>&lt;1</b>	<b>326</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of American Kestrel records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# White Cockatoo/Cacatúa Blanca

## *Cacatua alba*



Photo by Adele Mouakad

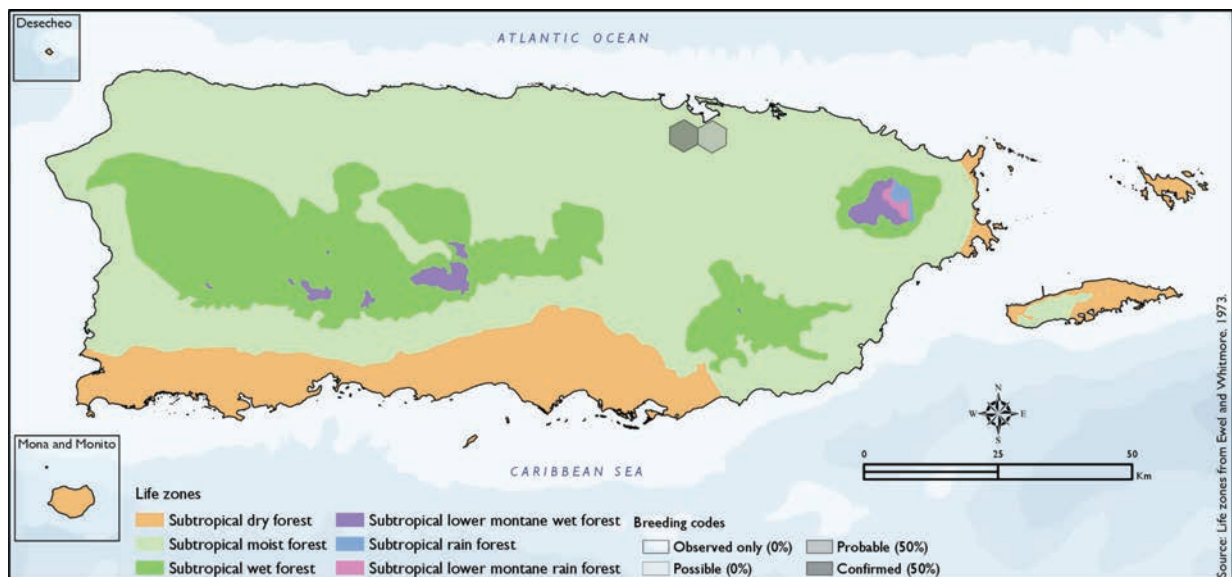
### Distribution and Habitat

The White Cockatoo is endemic to several Indonesia islands (Juniper and Parr 1998). It is also a common species in captivity (Juniper and Parr 1998) and has been introduced to Puerto Rico where it has a stable population trend, although with low numbers, around the municipalities of Bayamón and Guaynabo in the metropolitan area (Falcón and Tremblay 2018). In its native habitat, it can usually be found in lowland and hill forests, as well as in second-growth forests around clearings, rivers, forests edges, and agricultural lands (Juniper and Parr 1998). The atlas fieldwork

yielded a total of five records within two hexagons or 0.4 percent of the 479 total hexagons (see map). Of the two hexagons where this species was found, breeding met the atlas definition of confirmed in 50 percent (one) of the hexagons and probable in 50 percent (one) as well (see map).

### Breeding Ecology

Previously published reports indicate that, in its native habitat, the White Cockatoo is suspected to nest in April, and the nesting usually occurs in tree cavities (Juniper and Parr 1998). Atlas results show that this species



White Cockatoo distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

breeds during February, April, and December (see chart). The breeding activity peaks in April and takes place within the subtropical moist forest life zone (see chart). Results show that this species breeds in the subtropical moist forest life zone (100 percent of the hexagons) (see table and map).

**Population Status and Conservation**

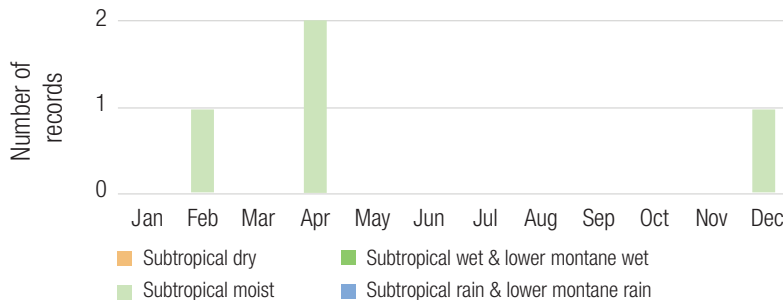
The current population trend of the White Cockatoo in Indonesia is suspected to be rapidly declining with ongoing

habitat destruction, deforestation, and the international cage-bird trade (BirdLife International 2018). This species is currently listed as Endangered by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the White Cockatoo has a protected habitat of 5 percent or 2 km<sup>2</sup> of the total area covered by the hexagons where this species is known to breed (48 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where White Cockatoo breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	1	100	0	0	0	0	1
Probable	0	0	1	100	0	0	0	0	1
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of White Cockatoo records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Monk Parakeet/Perico Monje

*Myiopsitta monachus*

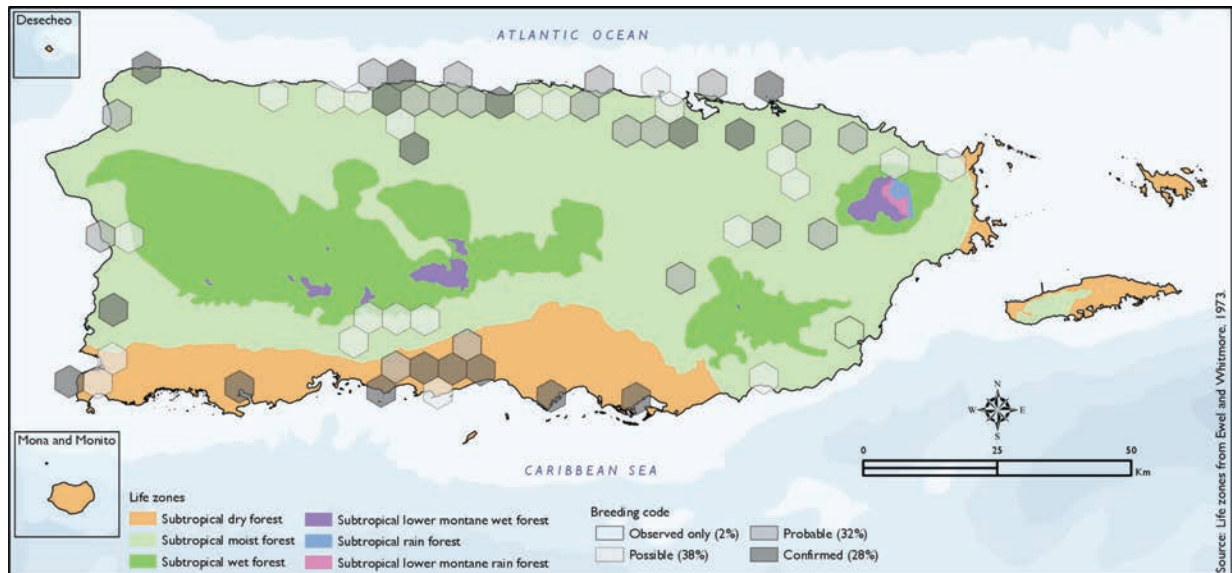
## Distribution and Habitat

The Monk Parakeet is native to south-central South America, and in the West Indies it has been introduced to Puerto Rico, the Cayman Islands, Guadeloupe, and The Bahamas (Raffaele and others 1998), as well in major cities of North America and Europe (del Hoyo and others 2013). In Puerto Rico, it is a common resident along the coastal plain and urban areas (Falcón and Tremblay 2018) and can be found in coastal habitats and palm groves (Raffaele and others 1998), farms, gardens, and

city parks (Oberle 2018). The atlas fieldwork yielded a total of 76 records within 60 hexagons or 13 percent of the 479 total hexagons (see map). Of the 60 hexagons where this species was found, breeding met the atlas definition of confirmed in 28 percent (17) of the hexagons, probable in 32 percent (19), and possible in 37 percent (22), while the species was observed in 3 percent (2) of the hexagons but without evidence of breeding (see map).



Photo by José Salguero



Monk Parakeet distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

### Breeding Ecology

The Monk Parakeet builds a large communal nest made of sticks, often placed at the base of palm fronds (Oberle 2018, Raffaele and others 1998). Atlas results show that this species breeds throughout the year with the most breeding activity from March to May (see chart). Overall, the breeding activity peaks during April and May, and it mostly takes place within the subtropical moist forest life zone (see chart). Results (see table and map) show that this species breeds mostly within the subtropical moist forest life zone

(78 percent of the hexagons) and also within the subtropical dry forest life zone (22 percent of the hexagons).

### Population Status and Conservation

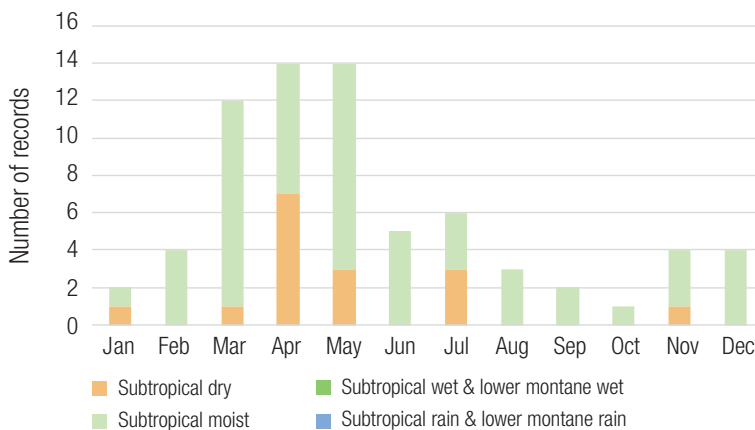
The current global population trend of the Monk Parakeet has not been quantified or assessed, but the species is described as ‘common’ and ‘common to abundant’ (del Hoyo and others 2013, Stotz and others 1996), and the population is suspected to be increasing due to the creation of new suitable habitat (del Hoyo and others 2013). This species is currently listed

as a species of least concern by the IUCN (BirdLife International 2018). The parakeet has been increasing in numbers in Puerto Rico and has expanded its range from the urban locations where originally introduced (Falcón and Tremblay 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Monk Parakeet has a protected habitat in land of 10 percent or 141 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1387 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Monk Parakeet breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	8	47	9	53	0	0	0	0	17
Probable	2	11	17	89	0	0	0	0	19
Possible	3	14	19	86	0	0	0	0	22
<b>Total</b>	<b>13</b>	<b>22</b>	<b>45</b>	<b>78</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>58</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Monk Parakeet records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Orange-fronted Parakeet/ Periquito Frentianaranjado

*Eupsittula canicularis*

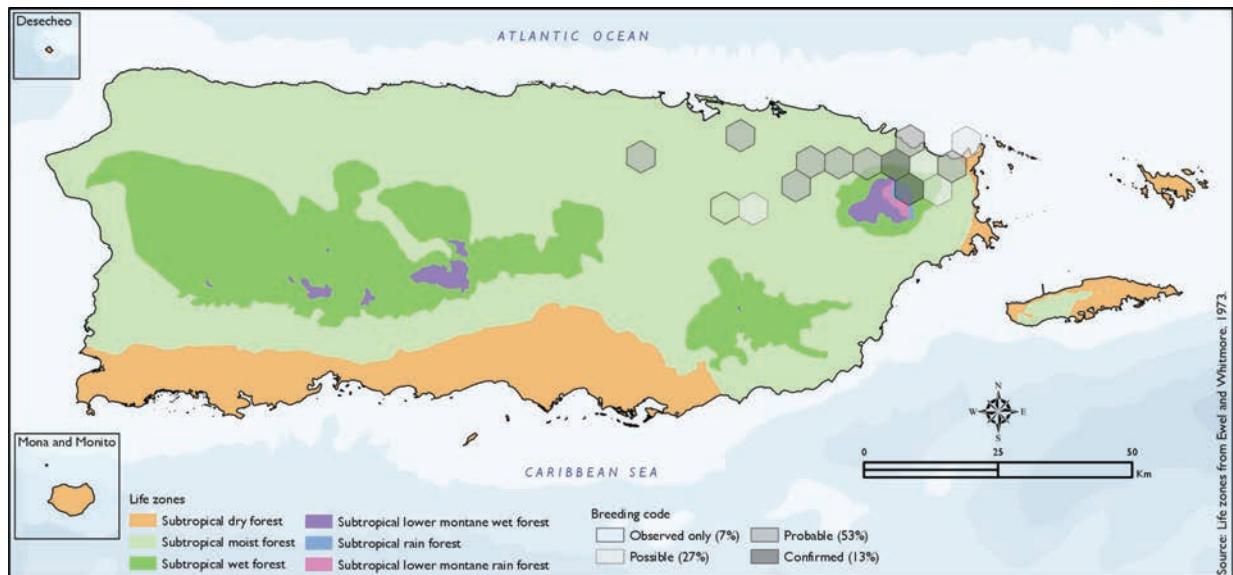


Photo by Pedro W. Santana

## Distribution and Habitat

The Orange-fronted Parakeet is native to Mexico and Central America (Raffaele and others 1998). It was introduced to Puerto Rico, where it is locally uncommon from Cabezas de San Juan near Fajardo (Raffaele and others 1998) and scattered throughout the Fajardo Christmas Bird Count circle (Wunderle, Jr. 2017) and nearby (Falcón and Tremblay 2018). In Puerto Rico, the species usually inhabits wooded pastures and urban areas with ornamental trees (Raffaele and others 1998). However, in its native habitat it occurs mostly in tropical deciduous and semideciduous

forests, lower cloud forests, agricultural areas, disturbed areas, mango plantations, coconut palms, and flat coastal plains (Hardy 1965, Navarro 1994). The atlas fieldwork yielded a total of 22 records within 15 hexagons or 3 percent of the 479 total hexagons (see map). Of the 15 hexagons where the Orange-fronted Parakeet was found, breeding met the atlas definition of confirmed in 13 percent (two) of the hexagons, probable in 53 percent (eight), and possible in 27 percent (four), while the species was observed in 7 percent (one) of the hexagons but without evidence of breeding (see map).



Orange-fronted Parakeet distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

### Breeding Ecology

The Orange-fronted Parakeet's nest has not yet been found on Puerto Rico (Raffaele and others 1998). However, it may excavate nest holes in arboreal termitaria (Sazima 1989). Atlas results suggest that this species breeds from February to July and to a lesser extent during December (see chart). Overall, the breeding activity peaks in March, and it mostly takes place within the subtropical moist forest life zone (see chart). Atlas results

show that this species breeds mostly within the subtropical moist forest life zone (79 percent of the hexagons) (see table and map). It also breeds in subtropical rain forest life zones at higher elevations (7 percent of the hexagons).

### Population Status and Conservation

The Orange-fronted Parakeet is currently listed as a species of least concern by the IUCN (BirdLife International 2018), while in Puerto Rico

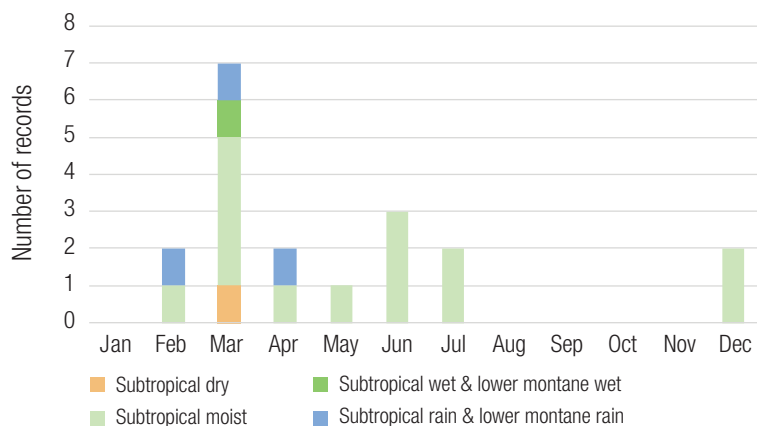
this parakeet has increased in population size and has expanded in range (Falcón and Tremblay 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS.

In Puerto Rico, the Orange-fronted Parakeet has a protected habitat in land of 14 percent or 46 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (334 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Orange-fronted Parakeet breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	1	50	0	0	1	50	2
Probable	0	0	8	100	0	0	0	0	8
Possible	1	25	2	50	1	25	0	0	4
<b>Total</b>	<b>1</b>	<b>7</b>	<b>11</b>	<b>79</b>	<b>1</b>	<b>7</b>	<b>1</b>	<b>7</b>	<b>14</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Orange-fronted Parakeet records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Blue-and-yellow Macaw/ Guacamayo Azuliamarillo

*Ara ararauna*

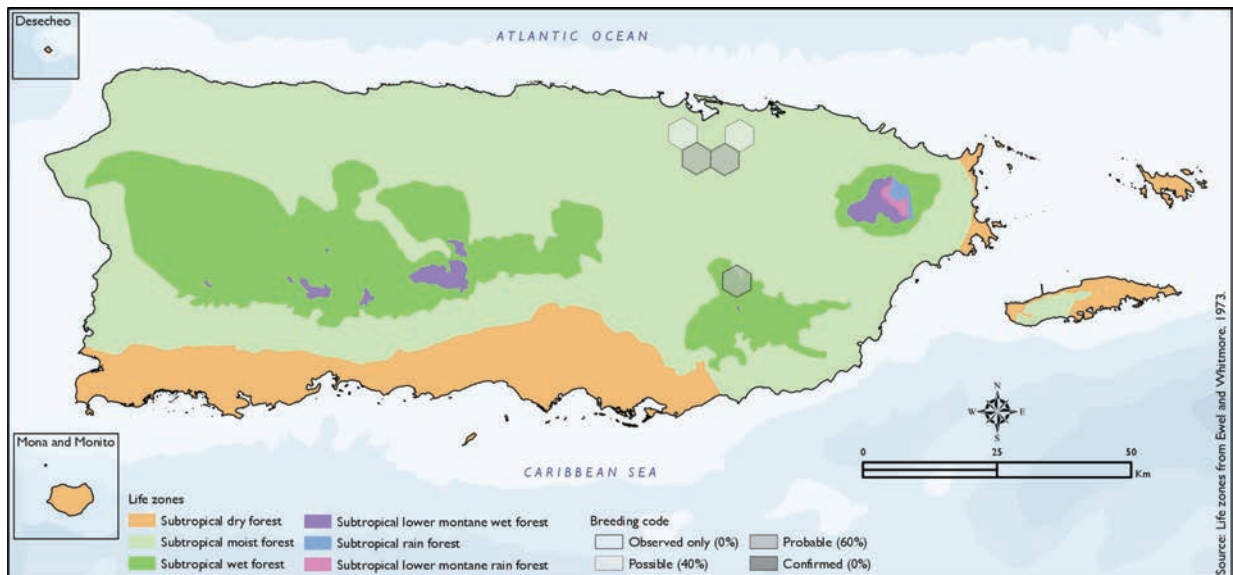


Photo by José Salguero

## Distribution and Habitat

The Blue-and-yellow Macaw is native to eastern Panama, Paraguay, southern Brazil, and northern Argentina (Dickinson 2003). It is introduced and established on Puerto Rico, where there is one population in the metropolitan area of San Juan, which has experienced declines and increases during the last decades (Falcón and Tremblay 2018). It is associated with *Roystonea* palms for food, roosting, and nesting (J.A. Salguero-Faría, personal observation 2009). In its native

habitat, it occurs mostly in seasonally flooded forests, gallery forests along waterways, lightly timbered savannas, and in some regions also in deciduous forests far from water (Forshaw 2006). The atlas fieldwork yielded a total of six records within five hexagons or 1 percent of the 479 total hexagons (see map). Of the five hexagons where this species was found, breeding met the atlas definition of probable in 60 percent (three) of the hexagons and possible in 40 percent (two) (see map).



Blue-and-yellow Macaw distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

This species nests high in a hole of a dead palm, and breeding occurs generally from November to May in its native range, according to previously published reports (Juniper and Parr 1998). Atlas results suggest that this species breeds during the months of April, May, July, and October (see chart). Overall, the breeding activity peaks in May and July, and mostly takes place within the subtropical moist forest life

zone (see chart). Results suggest that this species breeds mostly within the subtropical moist forest life zone (80 percent of the hexagons) (see table and map). It may also breed within subtropical wet forest life zones at higher elevations (20 percent of the hexagons).

**Population Status and Conservation**

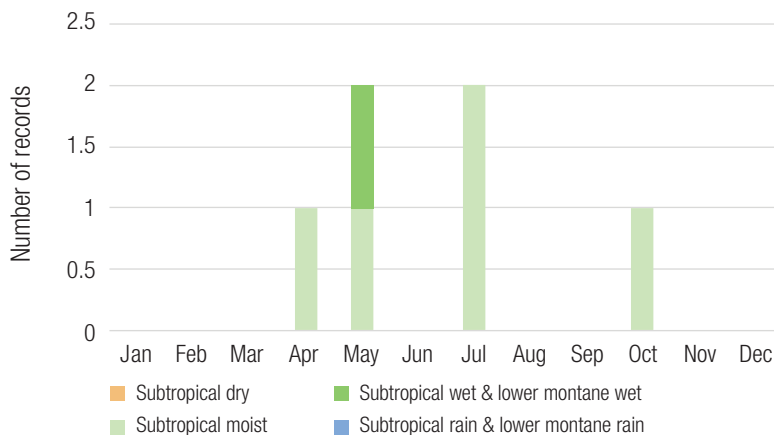
The current global population trend of the Blue-and-yellow Macaw has not been quantified or assessed, but the species is

described as ‘uncommon’ (Stotz and others 1996). However, it is currently listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Blue-and-yellow Macaw has a protected habitat in land of 4 percent or 4.8 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (119 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Blue-and-yellow Macaw breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	0	0	0	0	0	0	0
Probable	0	0	2	67	1	33	0	0	3
Possible	0	0	2	100	0	0	0	0	2
<b>Total</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>80</b>	<b>1</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>5</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Blue-and-yellow Macaw records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Red-masked Parakeet/ Perico Frentirrojo

## *Psittacara erythrogenys*



Photo by Daniel Jauvin

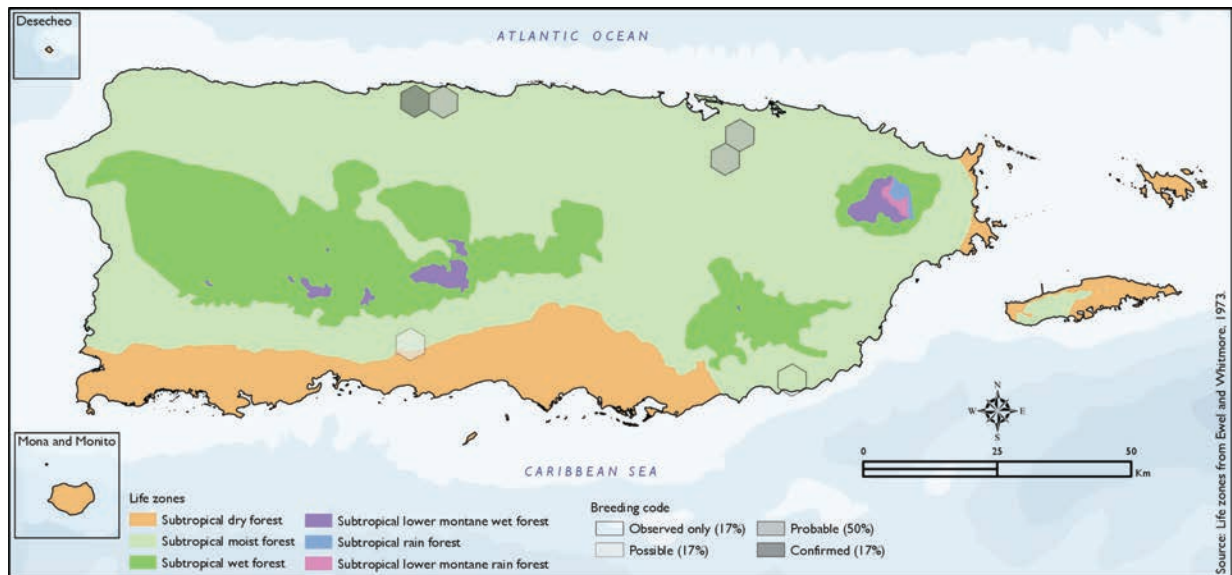
### Distribution and Habitat

The Red-masked Parakeet is native to Ecuador and Peru (Best and others 1995, Clements and others 2001, Juniper and Parr 1998), and has been introduced to Puerto Rico where it mostly occurs in urban areas and forested areas nearby (Falcón and Tremblay 2018). Populations are concentrated in the San Juan metro area and around Arecibo-Barceloneta on the north coast and has shown a population increase on the island (Falcón and Tremblay 2018). The atlas fieldwork yielded a total of seven records within six hexagons or 1 percent of the 479 total hexagons

(see map). Of the six hexagons where this species was found, breeding met the atlas definition of confirmed in 17 percent (one) of the hexagons, probable in 50 percent (three), and possible in 17 percent (one), while the species was also observed in an additional hexagon (17 percent) but without evidence of breeding (see map).

### Breeding Ecology

The Red-masked Parakeet nests in tree cavities/holes (Juniper and Parr 1998), termite nests, or cliffs (Juniper and Parr 1998). Atlas results show that this species breeds during April,



Red-masked Parakeet distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

July, and December, peaking in December (see chart), in the subtropical moist forest life zone (100 percent of the hexagons) (see table and map).

**Population Status and Conservation**

The current overall population trend of the Red-masked Parakeet has not been quantified or assessed, but the species is suspected to be undergoing a

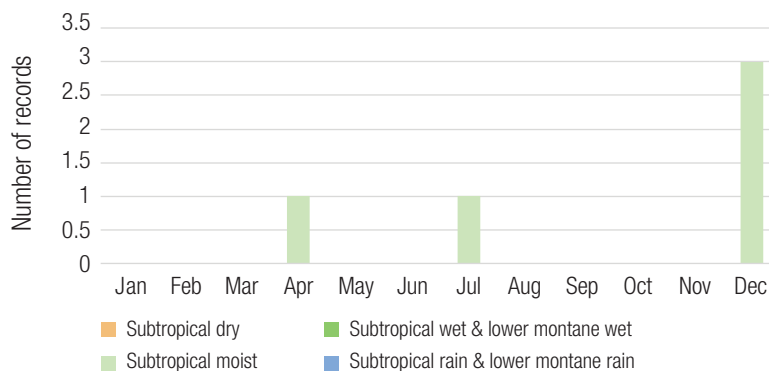
moderately rapid decline due to trapping for the pet trade as well as habitat loss and fragmentation (BirdLife International 2018). However, the population trend for this species in Puerto Rico is described as ‘increasing’ (Falcón and Tremblay 2018). This species is currently listed as a Near Threatened species by the IUCN (BirdLife International 2018). Locally, this species is not

listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Red-masked Parakeet has a protected habitat in land of 13 percent or 15 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (119 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Red-masked Parakeet breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	1	100	0	0	0	0	1
Probable	0	0	3	100	0	0	0	0	3
Possible	0	0	1	100	0	0	0	0	1
<b>Total</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>5</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Red-masked Parakeet records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# White-winged Parakeet/Periquito Aliblanco

## *Brotogeris versicolurus*

### Distribution and Habitat

The White-winged Parakeet is native to northern and central South America (Raffaele and others 1998). It is introduced and established on Puerto Rico, where it is locally common in the lowlands (Camacho Rodríguez and others 1999, Oberle 2018, Raffaele and others 1998) and has greatly expanded its range in recent years including near college campuses and urban areas where large trees abound (Falcón and Tremblay 2018). Habitat also includes coastal woodlands, low hills, and foothills of higher mountains, as well as towns and urban areas (Raffaele and others 1998) including farms, gardens, and

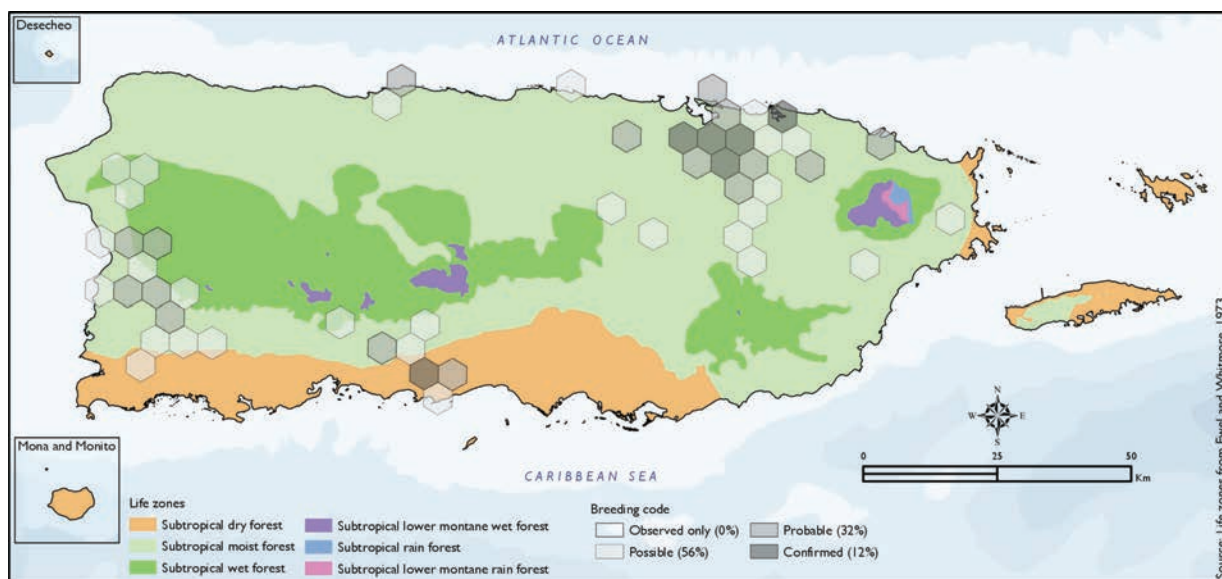
city parks (Oberle 2018). The atlas fieldwork yielded a total of 79 records within 50 hexagons or 10 percent of the 479 total hexagons (see map). Of the 50 hexagons where this species was found, breeding met the atlas definition of confirmed in 12 percent (6) of the hexagons, probable in 32 percent (16), and possible in 56 percent (28) (see map).

### Breeding Ecology

The White-winged Parakeet nests inside termite nests located in palms or trees (Oberle 2018, Raffaele and others 1998). Atlas results suggest that this species breeds throughout the year with



Photo by José Salguero



White-winged Parakeet distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

the most breeding activity during March, May, and June (see chart). Overall, the breeding activity peaks in May, and it mostly takes place within the subtropical moist forest life zone (see chart). Atlas findings show that this species breeds mostly within the subtropical moist forest life zone (80 percent of the hexagons) (see table and map). Results indicate that it also breeds within the subtropical dry forest life zone (8 percent of the hexagons). It might also breed at higher elevations within subtropical

wet forest life zones (12 percent of the hexagons) (see table and map).

**Population Status and Conservation**

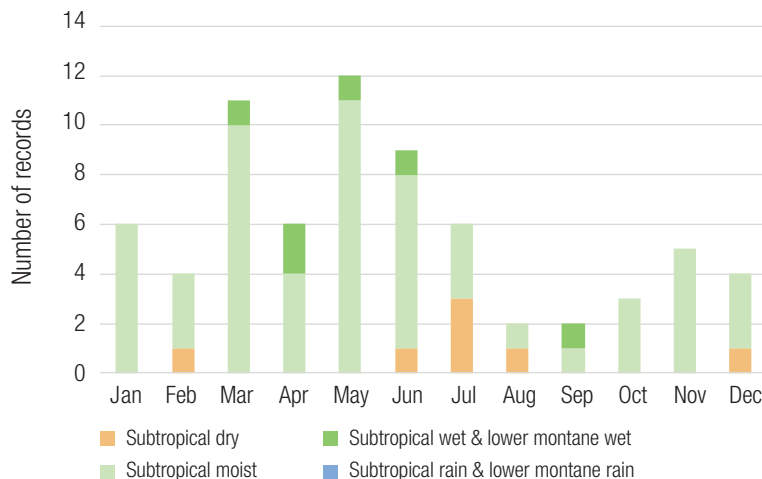
The current global population trend of the White-winged Parakeet has not been quantified or assessed, but the species is described as ‘common’ (Stotz and others 1996), and due to the lack of evidence for any threats or declines, the overall population is suspected to be ‘stable.’ The population trend in Puerto Rico has been described as increasing

(Falcón and Tremblay 2018). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the White-winged Parakeet has a protected habitat of about 6 percent or 66 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1196 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where White-winged Parakeet breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	1	17	5	83	0	0	0	0	6
Probable	1	6	14	88	1	6	0	0	16
Possible	2	7	21	75	5	18	0	0	28
<b>Total</b>	<b>4</b>	<b>8</b>	<b>40</b>	<b>80</b>	<b>6</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>50</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of White-winged Parakeet records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# White-fronted Parrot/ Cotorra Cabeciblanca

*Amazona albifrons*



Photo by José Salguero

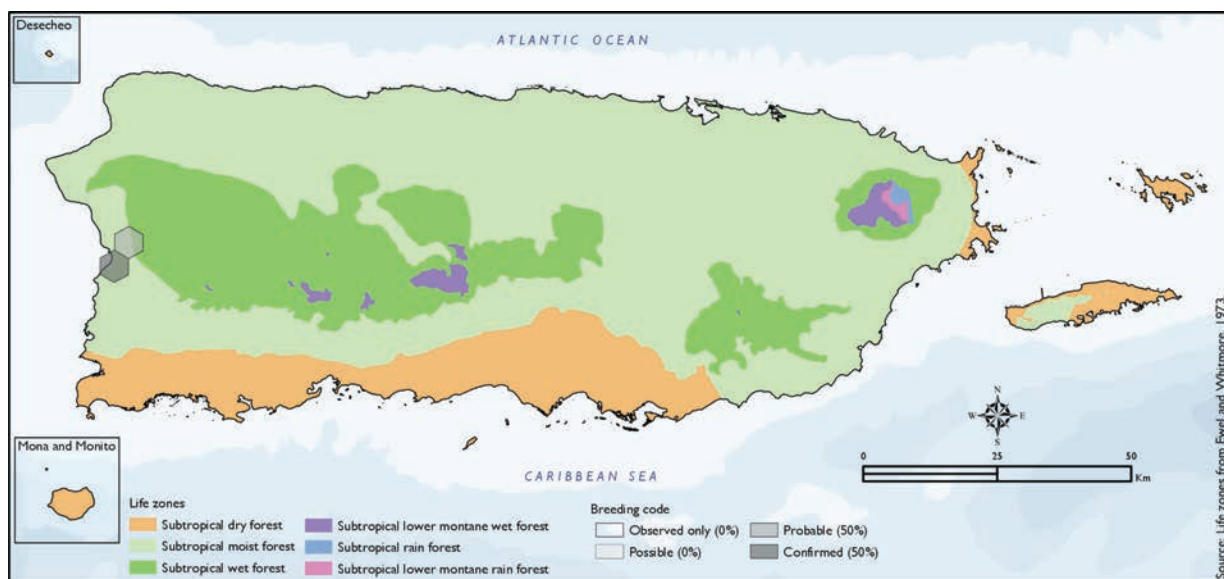
## Distribution and Habitat

The White-fronted Parrot is native to Central America and has been introduced to Puerto Rico, where it is restricted to the municipality of Mayagüez, although it has been observed less frequently there in recent years (Falcón and Tremblay 2018). In its native habitat, it can be usually found in agricultural areas with patches of forest, deciduous forests, and mangroves (Gómez de Silva and others 2005). In Puerto Rico, it is found in parks and secondary forests where it feeds on nonnative fruits and seeds. The atlas fieldwork yielded a total of

two records within two hexagons or 0.4 percent of the 479 total hexagons (see map). Of the two hexagons where this species was found, breeding met the atlas definition of confirmed in 50 percent (one) of the hexagons and probable in 50 percent (one) as well (see map).

## Breeding Ecology

In the White-fronted Parrot's native habitat, breeding occurs from January to May, according to previously published reports (del Hoyo and others 2013). Atlas results show that this species breeds during March and April (see table and chart, respectively)



White-fronted Parrot distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

in the subtropical moist forest life zone (100 percent of the hexagons) (see table and map).

**Population Status and Conservation**

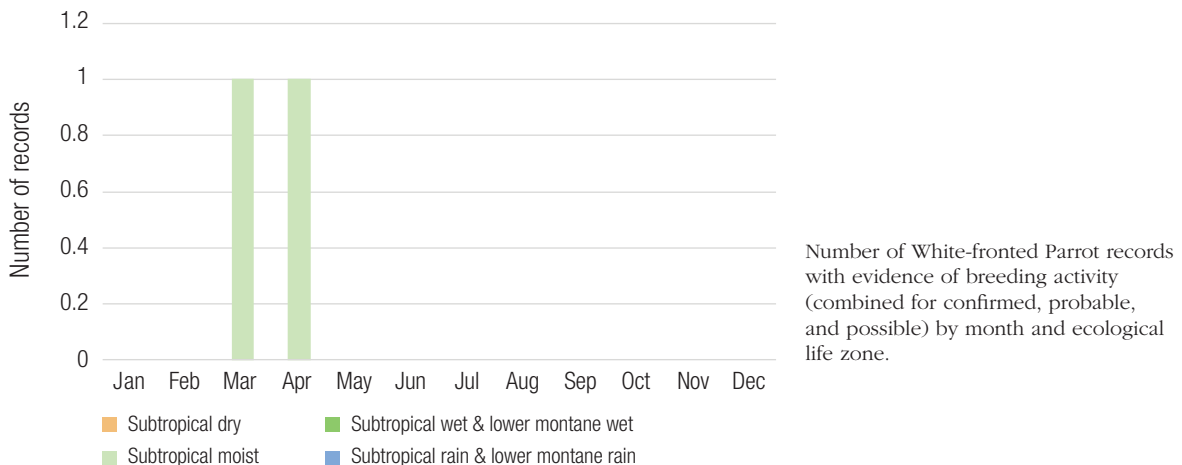
The current population trend of the White-fronted Parrot in its native range is suspected to be increasing as this species takes advantage of perturbed sites that create new suitable habitat (BirdLife International 2018). The White-fronted Parrot is currently listed as a species of least concern by the IUCN

(BirdLife International 2018). However, on Puerto Rico where the introduced population is restricted to Mayagüez, sightings have declined from 11 individuals in 2011 to one to two individuals in recent years (Falcón and Trembly 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, none of the hexagons where this species is known to breed overlay a protected area.

Number of hexagons by ecological life zone and percentage of the total number of hexagons where White-fronted Parrot breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	1	100	0	0	0	0	1
Probable	0	0	1	100	0	0	0	0	1
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



# Orange-winged Parrot/ Cotorra Alianaranjada

*Amazona amazonica*

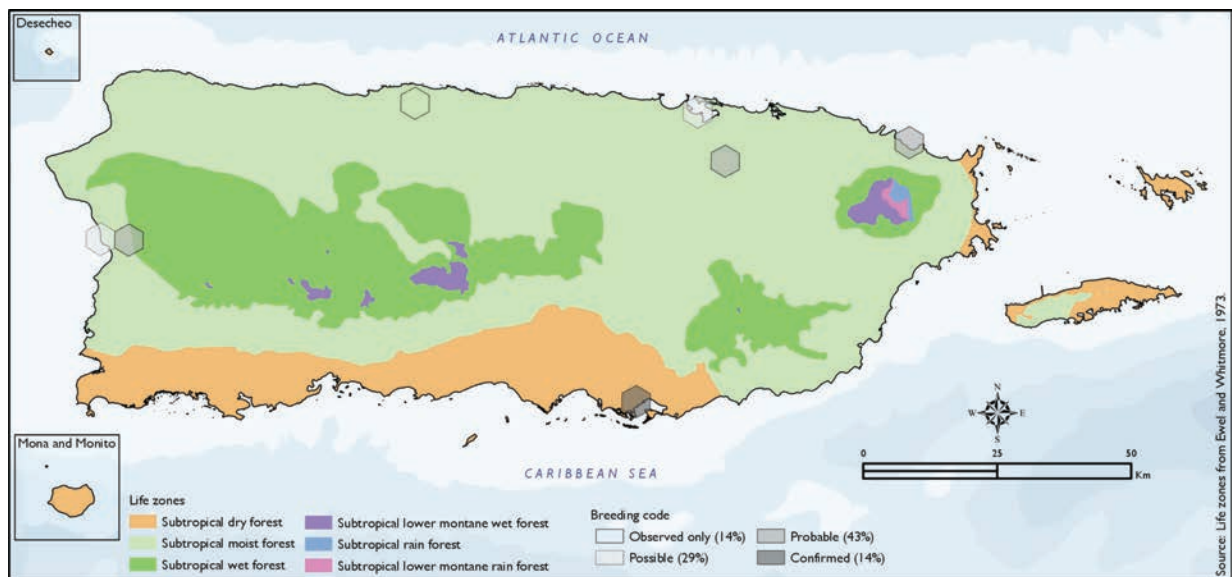


Photo by José Salguero

## Distribution and Habitat

The Orange-winged Parrot is native to central and northern South America, and to Trinidad and Tobago (Raffaele and others 1998). It is introduced on Martinique and Puerto Rico, in the latter being uncommon in the metropolitan area of San Juan where it occurs in small numbers (Raffaele and others 1998). More recently, it has been described as a self-sustaining population which has expanded its range from sites of original introduction (Falcón and Tremblay 2018). It usually inhabits lowland

second-growth forests (Raffaele and others 1998). The atlas fieldwork yielded a total of nine records within seven hexagons or 1.5 percent of the 479 total hexagons (see map). Of the seven hexagons where this species was found, breeding met the atlas definition of confirmed in 14 percent (one) of the hexagons, probable in 43 percent (three), and possible in 29 percent (two), while the species was observed in an additional hexagon (14 percent) but without evidence of breeding (see map).



Orange-winged Parrot distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

The Orange-winged Parrot’s nest has not yet been found on Puerto Rico (Raffaele and others 1998). Atlas results suggest that this species breeds from December to March and also during June, July, and October (see chart). Results (see table and map) show that this species breeds primarily in the lowlands mostly within the subtropical moist forest life zone (83 percent of the hexagons) but also in the subtropical dry forest life zone (17 percent of the hexagons).

**Population Status and Conservation**

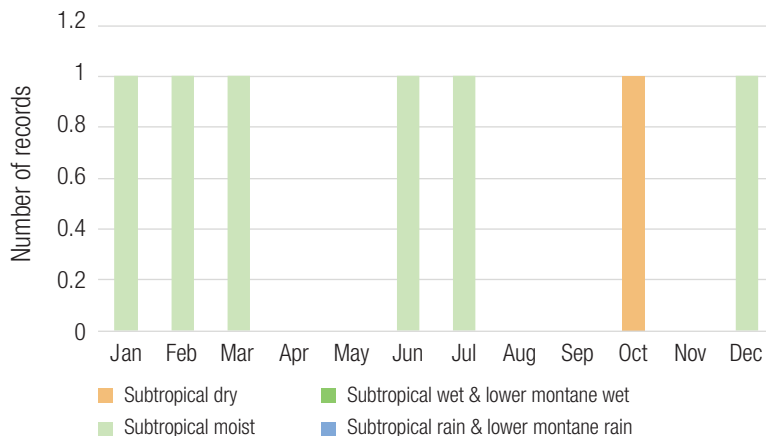
The current global population trend of the Orange-winged Parrot has not been quantified or assessed, but the species is described as ‘fairly common’ (Stotz and others 1996). Nevertheless, the population is suspected to be in decline due to ongoing habitat destruction and hunting. It is currently listed as a species of least concern by the IUCN (BirdLife International 2018). Sighting trends in Puerto Rico indicate that the introduced population is stable (Falcón

and Tremblay 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Orange-winged Parrot has a protected habitat in land of about 4 percent or 6 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (143 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Orange-winged Parrot breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	1	100	0	0	0	0	0	0	1
Probable	0	0	3	100	0	0	0	0	3
Possible	0	0	2	100	0	0	0	0	2
<b>Total</b>	<b>1</b>	<b>17</b>	<b>5</b>	<b>83</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Orange-winged Parrot records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Red-crowned Parrot/ Cotorra Coronirroja

*Amazona viridigenalis*



Photo by Gloria Archilla

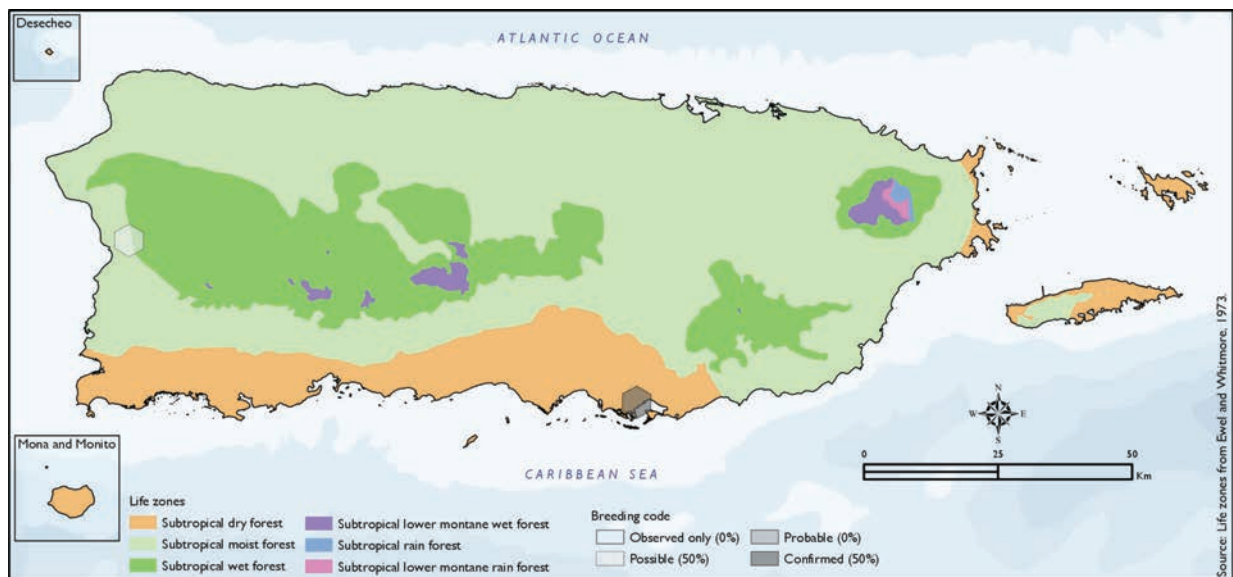
## Distribution and Habitat

The Red-crowned Parrot is native to Mexico and northern South America and has been introduced to Puerto Rico (in association with the pet trade), where it occurs in small numbers around the coast (Raffaele and others 1998). A flock of as many as 40 individuals was reported near the municipality of Salinas (Raffaele and others 1998). Habitat includes mostly scrub and lowland moist forests (Raffaele and others 1998). The atlas fieldwork yielded a total of three records within two hexagons of the 479 total

hexagons (see map). Of the two hexagons where this parrot was found, breeding met the atlas definition of confirmed in 50 percent (one) of the hexagons and possible in 50 percent (one) of the hexagons as well (see map).

## Breeding Ecology

Previously published reports indicate that the Red-crowned Parrot breeds from March to June (Raffaele and others 1998). The nests are located in tree cavities (Raffaele and others 1998), especially in large mahogany (*Swietenia mahogany*) and black



Red-crowned Parrot distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

olive (*Bucida buceras*) trees (J.A. Salguero-Farfa, personal observation 2009). Atlas results suggest that this species breeds during March, September, and October, and that the breeding activity mostly takes place within the subtropical dry forest life zone (see chart). Atlas results indicate that this species breeds within the subtropical dry forest life zone (50 percent of the hexagons) (see table and map).

It may also breed within the subtropical moist forest life zone (50 percent of the hexagons) (see table and map).

**Population Status and Conservation**

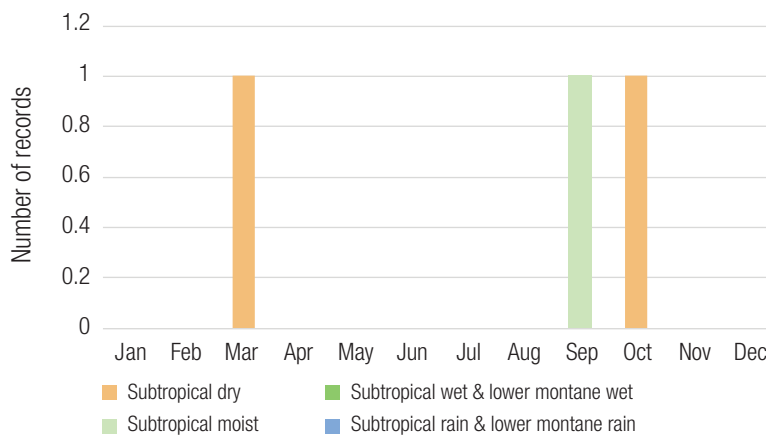
The current population trend of the Red-crowned Parrot is described as ‘decreasing’ in its native distributional range (Castro 1976, Enkerlin-Hoeflich 1995). This species is currently

listed as Endangered by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Red-crowned Parrot has a protected habitat in land of 50 percent or 24 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (48 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Red-crowned Parrot breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	1	100	0	0	0	0	0	0	1
Probable	0	0	0	0	0	0	0	0	0
Possible	0	0	1	100	0	0	0	0	1
<b>Total</b>	<b>1</b>	<b>50</b>	<b>1</b>	<b>50</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Red-crowned Parrot records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Hispaniolan Parrot/ Cotorra de la Española

*Amazona ventralis*



Photo by Yolanda Leon

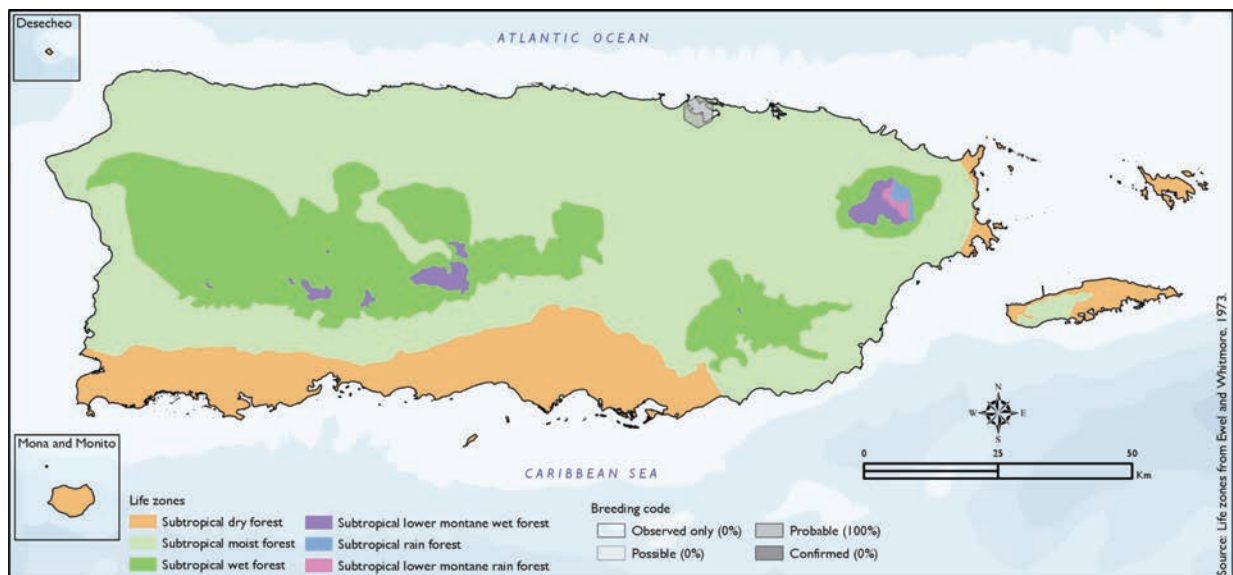
## Distribution and Habitat

The Hispaniolan Parrot is endemic to Hispaniola and satellite islands (Juniper and Parr 1998, Raffaele and others 1998). It was introduced on Puerto Rico, where it was found mostly in the metropolitan area in the west and north-central regions of the island (Raffaele and others 1998). It has been observed in shade coffee plantations and pine forests in the Cordillera Central of the Dominican Republic (Latta and Wunderle, Jr. 1998, Wunderle, Jr. 1999). The species usually inhabits woodlands, scrub, and forests

at all elevations on Hispaniola, whereas in Puerto Rico it occurs in forests and foothill woodlands (Raffaele and others 1998). The atlas fieldwork yielded a total of one record within one hexagon or 0.2 percent of the 479 total hexagons (see map). Breeding is probable in the only hexagon where the species occurs (100 percent) (see map).

## Breeding Ecology

The Hispaniolan Parrot nests in tree cavities and occasionally in cliff potholes, and breeds from February to June, according to previously published reports



Hispaniolan Parrot distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

(Raffaele and others 1998). Atlas results suggest that this species breeds in February and that the breeding activity could occur within the subtropical moist forest life zone (100 percent of the hexagons) (see table and map), although it doesn't seem to be reproducing at all on the island.

**Population Status and Conservation**

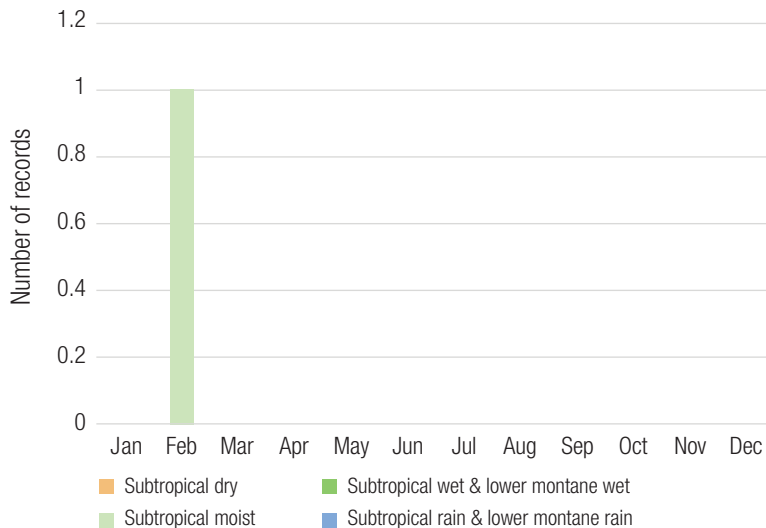
This species is currently listed as Vulnerable by the IUCN (BirdLife International 2016). Based on the atlas surveys, it appears that the introduced Hispaniolan Parrot on Puerto Rico has decreased in abundance and distribution relative to the earlier description by Raffaele (1998). Locally, this

species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Hispaniolan Parrot has a protected habitat in land of 10 percent or 2.5 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (24 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Hispaniolan Parrot breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	0	0	0	0	0	0	0
Probable	0	0	1	100	0	0	0	0	1
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Hispaniolan Parrot records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Caribbean Elaenia/Juí Blanco

## *Elaenia martinica*



Photo by José A. Colon

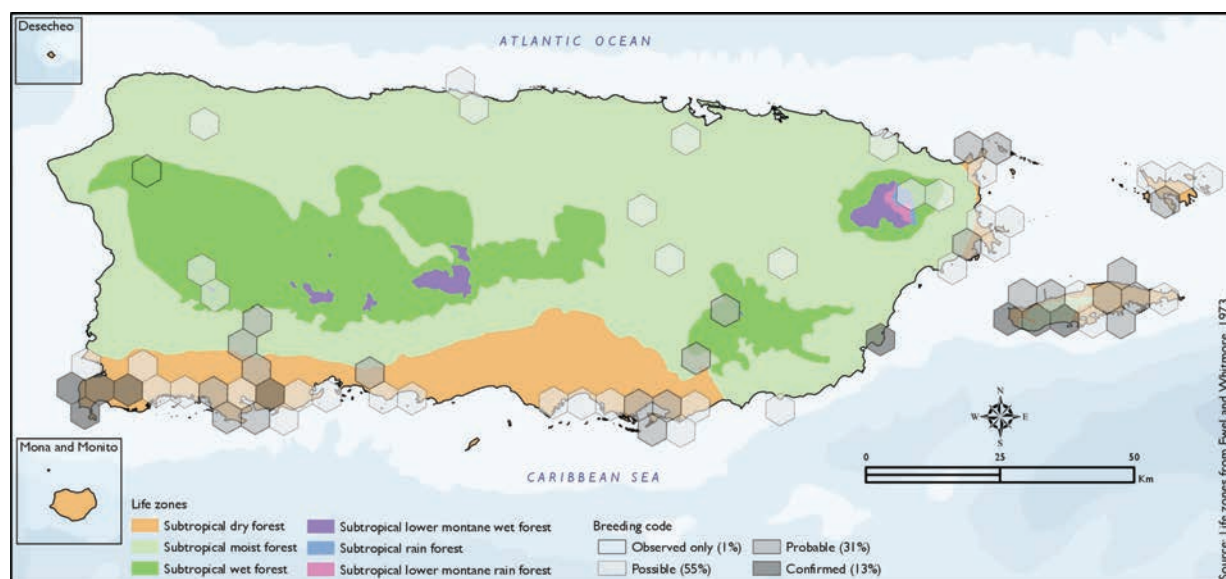
### Distribution and Habitat

The Caribbean Elaenia occurs from Puerto Rico through the islands of the eastern Caribbean, as well as in the Cayman Islands, some of The Bahamas, and islands off the Yucatán Peninsula (Oberle 2018). It is a common resident in Puerto Rico, regularly seen in the Boquerón Nature Reserve and Guánica State Forest (Oberle 2018), and in Vieques (Gemmill 2015). The species is believed to be a new arrival on Puerto Rico, at least on the south coast (Faaborg and others 1984), likely colonizing from the Lesser Antilles where it is common. This species is common along the lowland dry scrub forests

especially along the south coast (Oberle 2018). The atlas fieldwork yielded a total of 145 records within 71 hexagons or 15 percent of the 479 total hexagons (see map). Of the 71 hexagons where this species was found, breeding met the atlas definition of confirmed in 13 percent (9) of the hexagons, probable in 31 percent (22), and possible in 55 percent (39), while the species was observed in 1 percent (1) of the hexagons but without evidence of breeding (see map).

### Breeding Ecology

The Caribbean Elaenia constructs a shallow cup of twigs nest in a shrub or tree (Raffaele



Caribbean Elaenia distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

and others 1998). Atlas results indicate that the breeding activity extends throughout the year but overall increases from January to July (see chart). Results show that even though this species breeds in all ecological life zones, it is most often reported from the subtropical dry and subtropical moist forest life zones (67 and 26 percent of the hexagons, respectively) (see table and map).

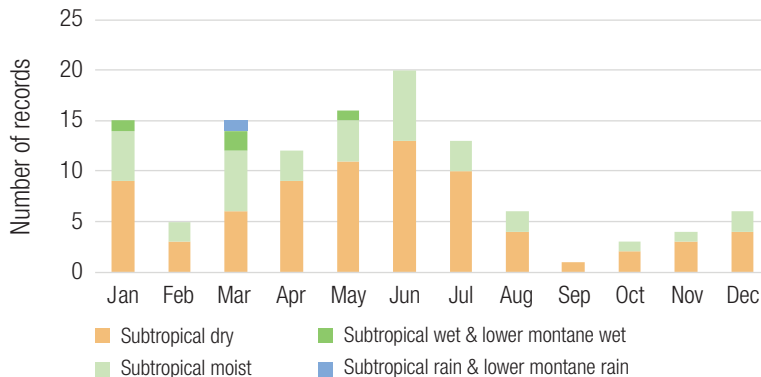
**Population Status and Conservation**

The Caribbean Elaenia is classified as a species of least concern by the IUCN (BirdLife International 2017). Locally, this species is not listed in any of the threatened categories of PRDNER or USFWS. In Puerto Rico, the Caribbean Elaenia has a protected habitat in land of about 18 percent or 298 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1673 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Caribbean Elaenia breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	6	67	3	33	0	0	0	0	9
Probable	16	73	5	23	1	5	0	0	22
Possible	25	64	10	26	3	8	1	3	39
<b>Total</b>	<b>47</b>	<b>67</b>	<b>18</b>	<b>26</b>	<b>4</b>	<b>6</b>	<b>1</b>	<b>1</b>	<b>70</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Caribbean Elaenia records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Puerto Rican Flycatcher/ Juí de Puerto Rico

## *Myiarchus antillarum*



Photo by Noelia Nieves

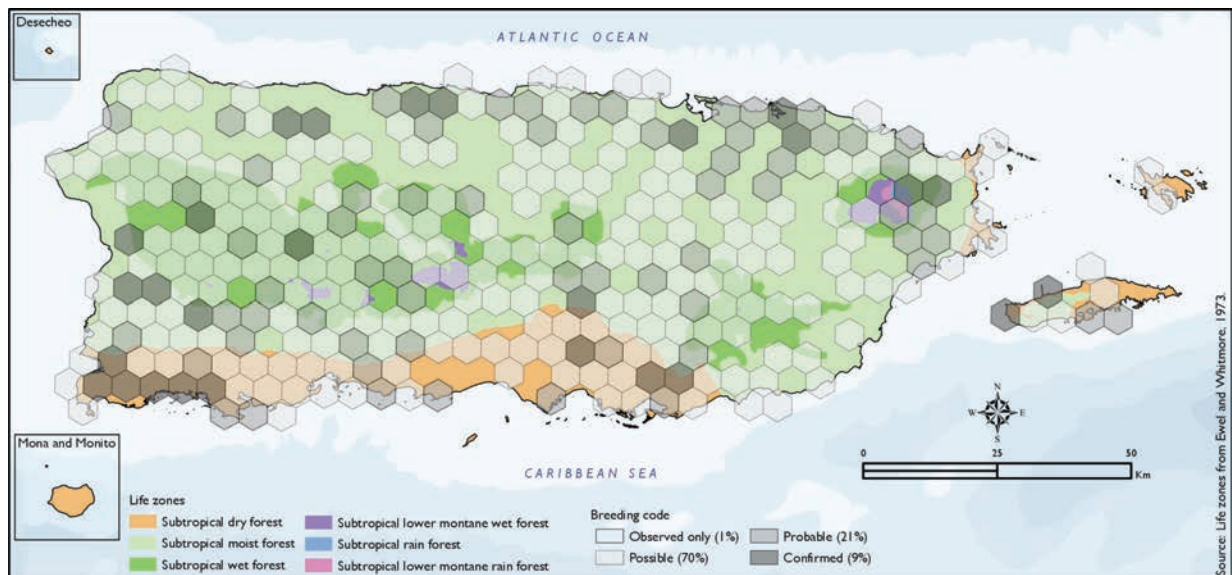
### Distribution and Habitat

The Puerto Rican Flycatcher is a common endemic species in Puerto Rico and the Virgin Islands (Oberle 2018, Raffaele 1989a), a fairly common resident in Vieques (Gemmill 2015), and rare in Culebra (Raffaele 1989a). It is common in wooded habitats from mangrove edges, arid scrub, coffee plantations, mogotes, and montane forests except at the higher elevations (Oberle 2018, Raffaele 1989a). The atlas fieldwork yielded a total of 518 records within 302 hexagons or 63 percent of the 479 total hexagons (see map). Of the 302 hexagons where this species

was found, breeding met the atlas definition of confirmed in 9 percent (27) of the hexagons, probable in 21 percent (63), and possible in 70 percent (210), while it was observed in 1 percent (2) of the hexagons but without evidence of breeding (see map and table).

### Breeding Ecology

Previously published reports indicate that the Puerto Rican Flycatcher nests from February to July in tree cavities (Oberle 2018). Atlas results indicate that the breeding season for this species extends throughout the year, but breeding activity



Puerto Rican Flycatcher distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



increases from March to June, with a peak in May (see chart). This seasonal pattern of breeding appears to coincide in each of the life zones with no evidence to suggest breeding times differ among the life zones. Results show that the Puerto Rican Flycatcher breeds in all ecological life zones, but most breeding activity was reported within the subtropical moist, subtropical wet, and subtropical dry forest life zones (55 percent, 23, and 21 percent of the hexagons, respectively) (see table and map). Breeding was confirmed in several hexagons

located in the interior mountains in the west and the southwest coast of the island (see map).

**Population Status and Conservation**

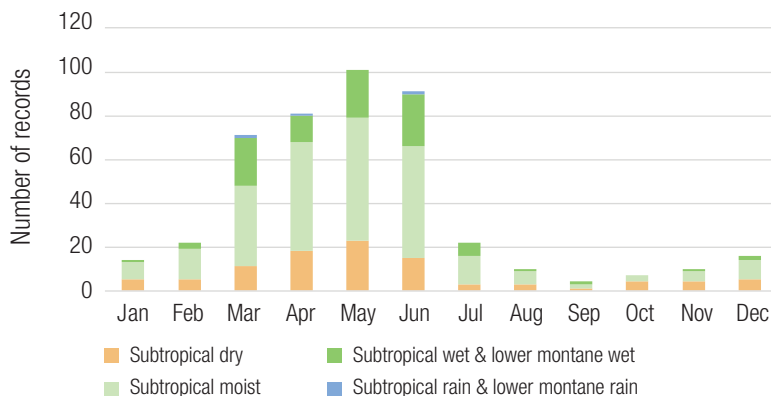
Although the Puerto Rican Flycatcher’s overall population is believed to be declining owing to a combination of natural and anthropogenic habitat loss within its distribution range (BirdLife International 2016), this species is listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER

and USFWS. It is unknown if Puerto Rican Flycatcher populations are limited by cavity availability as the flycatcher does not make its own cavities for nesting and hence is dependent on abandoned woodpecker cavities or cavities resulting from natural decay of tree trunks and branches. In Puerto Rico, the Puerto Rican Flycatcher has a protected habitat in land of about 13 percent (910 km<sup>2</sup>) of the total area covered by the hexagons where evidence of breeding was found for this species (7223 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Puerto Rican Flycatcher breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	10	37	13	48	3	11	1	4	27
Probable	11	17	39	62	13	21	0	0	63
Possible	43	20	114	54	53	25	0	0	210
<b>Total</b>	<b>64</b>	<b>21</b>	<b>166</b>	<b>55</b>	<b>69</b>	<b>23</b>	<b>1</b>	<b>&lt;1</b>	<b>300</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Puerto Rican Flycatcher records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Gray Kingbird/Pitirre

## *Tyrannus dominicensis*



Photo by Tomás Carlo

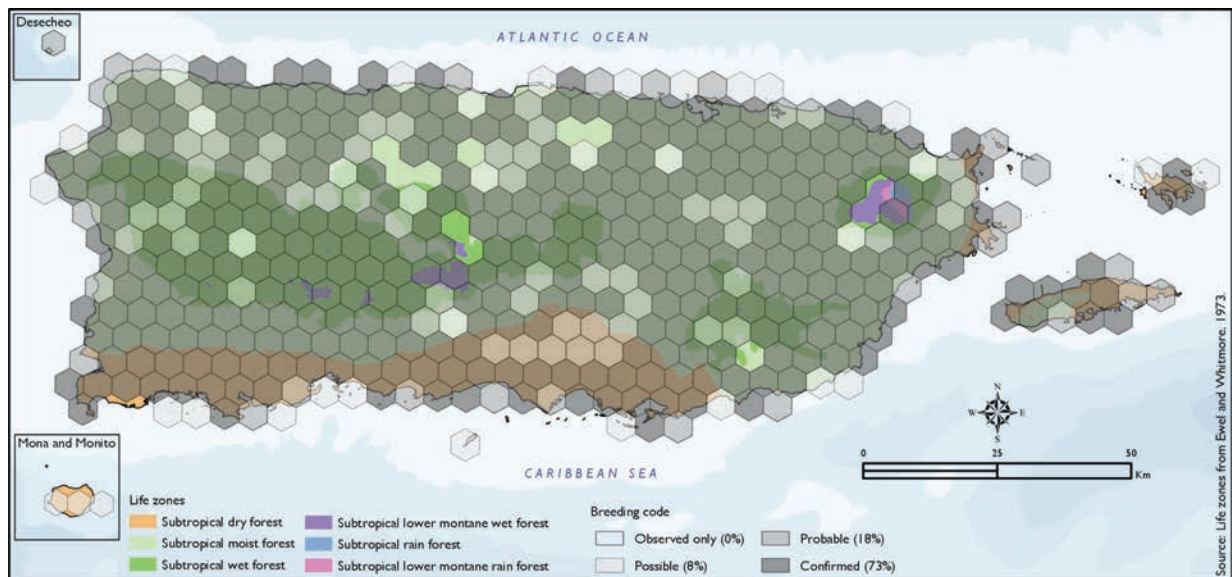
### Distribution and Habitat

The Gray Kingbird is one of the most conspicuous and common resident bird species throughout the West Indies (Raffaele and others 1998), including Puerto Rico (Oberle 2018), Culebra, and Vieques (Gemmill 2015). It occurs on all the islands of the Puerto Rican archipelago (Ventosa-Febles and others 2005) in open country, parks, forest edges, and urban areas (Oberle 2018). The atlas fieldwork yielded a total of 1,304 records within 436 hexagons or 91 percent of the 479 total hexagons (see map). Of the 436 hexagons

where this species was found, breeding met the atlas definition of confirmed in 73 percent (320) of the hexagons, probable in 18 percent (80), and possible in 8 percent (36) (see map).

### Breeding Ecology

The Gray Kingbird builds an open nest made of twigs in trees, shrubs, or human-made structures from April to June, according to previously published reports (Raffaele and others 1998). Atlas results indicate that the Gray Kingbird's breeding occurs throughout the year, but the most activity takes



Gray Kingbird distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

place during May and June (see chart). Atlas findings show that the Gray Kingbird mostly breeds within the subtropical moist forest life zone (59 percent of the hexagons) but also within the subtropical dry and subtropical wet forest life zones (22 and 19 percent of the hexagons, respectively), while breeding activity has also been reported for one hexagon within the subtropical rain forest life zone (see table and map).

**Population Status and Conservation**

The Gray Kingbird population is stable across its distribution range, and it is listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Gray Kingbird has a protected habitat in land of 12 percent or 1253 km<sup>2</sup> of the total area

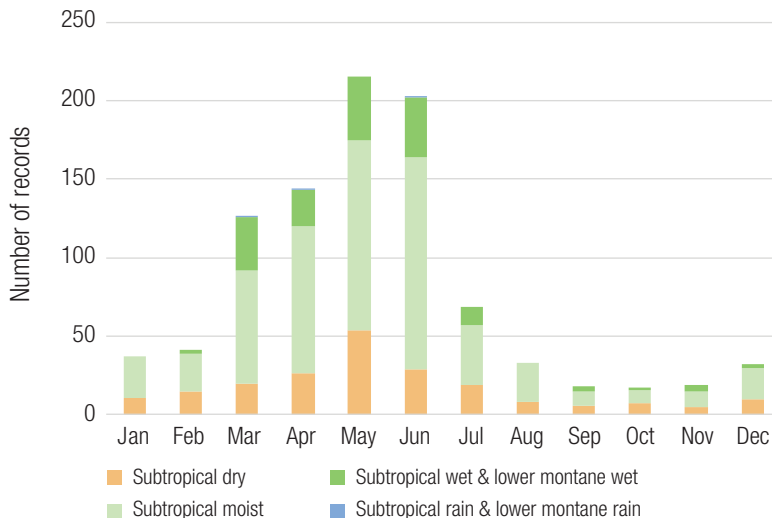
covered by the hexagons where evidence of breeding was found for this species (10 403 km<sup>2</sup>). (Note: the total area is larger than the islands’ area as hexagons in the coastline and cays are not cropped for this analysis).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Gray Kingbird breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	59	18	192	60	68	21	1	<1	320
Probable	22	28	47	59	11	14	0	0	80
Possible	13	37	19	54	3	9	0	0	35 <sup>b</sup>
<b>Total</b>	<b>94</b>	<b>22</b>	<b>258</b>	<b>59</b>	<b>82</b>	<b>19</b>	<b>1</b>	<b>&lt;1</b>	<b>435</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.

<sup>b</sup> A different number of total hexagons for each breeding code in this table may not reflect the actual number of hexagons where the species was found breeding, as some of the hexagons in the coastal zone or on the water may not have ecological life zone data.



Number of Gray Kingbird records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by José A. Colón

# Loggerhead Kingbird/Clérigo

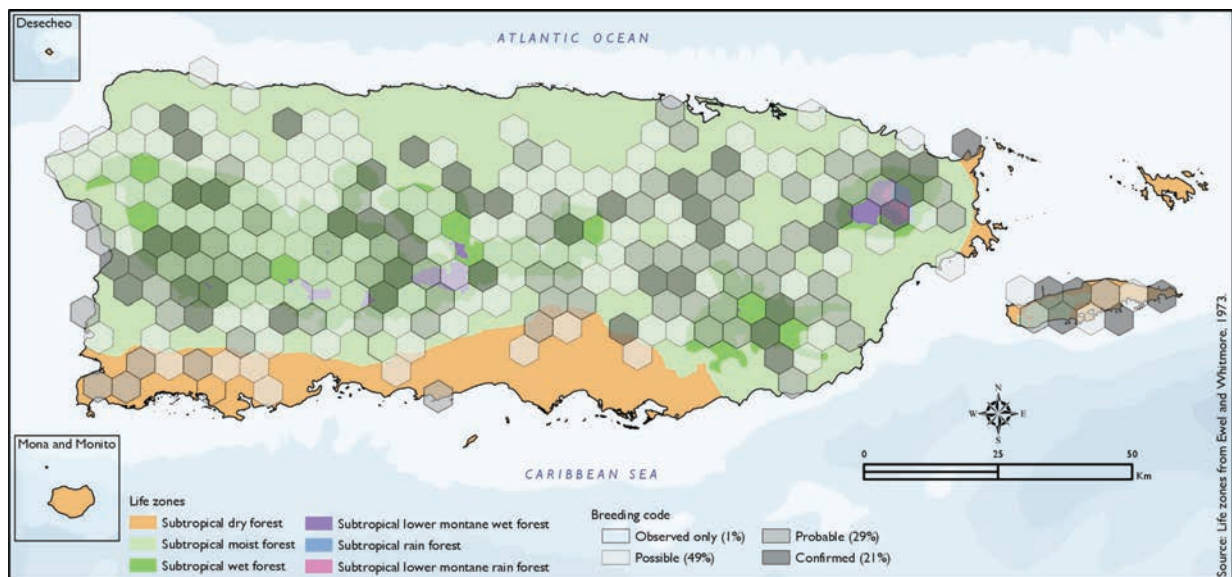
## *Tyrannus caudifasciatus*

### Distribution and Habitat

The Loggerhead Kingbird is common in the northern Bahamas, the Cayman Islands, and Greater Antilles (Raffaele and others 1998) including Puerto Rico (Oberle 2018) and Vieques (Gemmill 2015). The form on Puerto Rico and Vieques is sufficiently distinct from other

island populations; Garrido and others (2009) recommend that it be recognized as a separate endemic species, which they designate as *T. taylori*. However, this taxonomic recommendation has not been accepted by the American Ornithologists' Union checklist committee at this time (Chesser and others 2018). This species' habitat includes mostly forest clearings and edges, shade coffee plantations (Oberle 2018), pine and broadleaf forests, dry and wet woodlands, and mangrove swamps (Raffaele and others 1998). In Puerto Rico, the Loggerhead Kingbird occurs commonly in forest clearings at the Maricao State Forest (Oberle 2018), as well as in the haystack hills of the north coast and in lower forested areas of

the Sierra de Luquillo (Raffaele 1989a, Recher and Recher 1966). Nonetheless, it is rare in the metropolitan area of San Juan, but it is sporadically reported in the karst hills between the towns of Guaynabo and Bayamón (Salguero and Colón 2005). The atlas fieldwork yielded a total of 404 records within 243 hexagons or 51 percent of the 479 total hexagons (see map). Of the 243 hexagons where this species was found, breeding met the atlas definition of confirmed in 21 percent (50) of the hexagons, probable in 29 percent (70), and possible in 49 percent (120), while the species was observed in 1 percent (3) of the hexagons but without evidence of breeding (see map).



Puerto Rican Kingbird distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

The Puerto Rican Kingbird builds a cup-shaped nest made of twigs, stems, and grasses, usually in a tree or shrub (Raffaele and others 1998). Previously published reports indicate that breeding occurs mostly from February to July, but some nesting activity has been noted from November to January (Raffaele and others 1998). Nevertheless, atlas results show that this species' breeding season extends throughout the year, with the most breeding activity from March to June (see chart). The breeding activity peaks in

May, and it mostly takes place in the subtropical moist forest life zone. Atlas results (see table) show that this species breeds mostly within the subtropical moist forest life zone (59 percent of the hexagons) but also in the subtropical wet forest life zones at higher elevations (32 percent of the hexagons) and rarely in the subtropical dry forest life zone (9 percent of the hexagons) (see table and map).

**Population Status and Conservation**

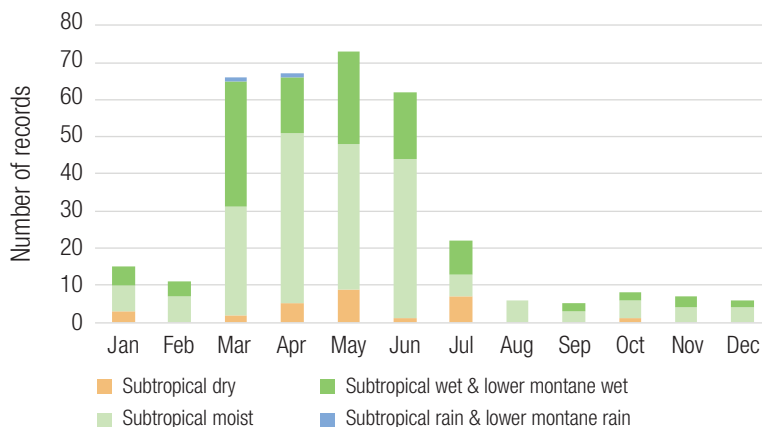
The population of the Loggerhead Kingbird has not been evaluated, but the species

is described as 'fairly common' (Stotz and others 1996). It is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Loggerhead Kingbird has a protected habitat in land of 15 percent or 834 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (5740 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Loggerhead Kingbird breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	4	8	28	56	17	34	1	2	50
Probable	7	10	42	60	21	30	0	0	70
Possible	11	9	71	59	38	32	0	0	120
<b>Total</b>	<b>22</b>	<b>9</b>	<b>141</b>	<b>59</b>	<b>76</b>	<b>32</b>	<b>1</b>	<b>&lt;1</b>	<b>240</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Loggerhead Kingbird records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Lesser Antillean Pewee/Bobito

*Contopus latirostris*



Photo by José Salguero

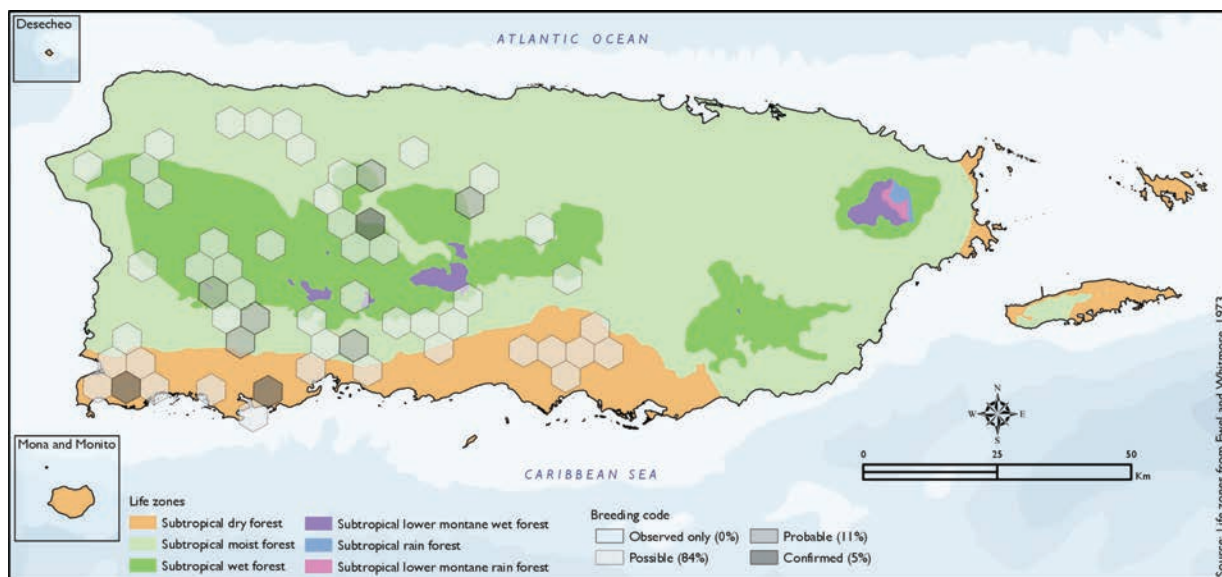
## Distribution and Habitat

The Lesser Antillean Pewee occurs in Puerto Rico (Oberle 2018) and in the northern Lesser Antilles such as St. Lucia, Martinique, Dominica, and Guadeloupe (Raffaele and others 1998). In Puerto Rico, it occurs almost exclusively in the western two-thirds of the island (Raffaele and others 1998), and it can be seen regularly at the Boquerón Nature Reserve and the Maricao State Forest (Oberle 2018). This species generally inhabits montane forests, coffee plantations, coastal scrub forests (Oberle 2018), and mangroves (Raffaele and others 1998). The

atlas fieldwork yielded a total of 99 records within 56 hexagons or 12 percent of the 479 total hexagons (see map). Of the 56 hexagons where this species was found, breeding met the atlas definition of confirmed in 5 percent (3) of the hexagons, probable in 11 percent (6), and possible in 84 percent (47) (see map).

## Breeding Ecology

The Lesser Antillean Pewee's nest consists of a cup-shaped structure made of moss, lichens, small roots, pieces of thin tree bark, and other fine materials, and is usually placed on a



Lesser Antillean Pewee distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

tree limb (Biaggi 1997, Oberle 2018). Previously published reports indicate that breeding occurs in the spring (Biaggi 1997). Atlas results show that this species' breeding season extends throughout the year with the most breeding activity from March to June (see chart). The breeding peaks in May, and in this month mostly occurs in the subtropical dry and wet forest life zones (see chart). Overall, atlas results (see table and map) show that the pewee breeds mostly within the subtropical

moist forest life zone (39 percent of the hexagons) but also in subtropical wet forest life zones at higher elevations (30 percent of the hexagons) and in the subtropical dry forest life zone (30 percent of the hexagons).

**Population Status and Conservation**

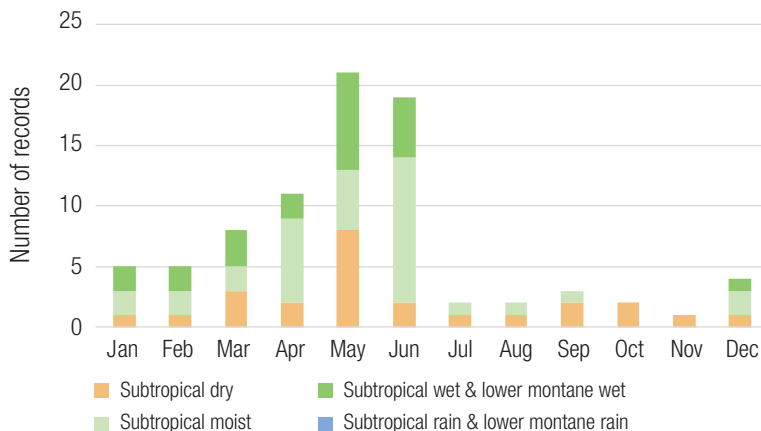
The global population trend of the Lesser Antillean Pewee has not been quantified or assessed, but the species is described as 'uncommon' (Stotz and others 1996). It is suspected to be in decline in the Lesser Antilles,

mostly due to habitat loss (del Hoyo and others 2004). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2017). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Lesser Antillean Pewee has a protected habitat in land of about 22 percent or 295 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1342 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Lesser Antillean Pewee breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	2	67	0	0	1	33	0	0	3
Probable	0	0	4	67	2	33	0	0	6
Possible	15	32	18	38	14	30	0	0	47
<b>Total</b>	<b>17</b>	<b>30</b>	<b>22</b>	<b>39</b>	<b>17</b>	<b>30</b>	<b>0</b>	<b>0</b>	<b>56</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Lesser Antillean Pewee records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Puerto Rican Vireo/Bienteveo

## *Vireo latimeri*



Photo by José A. Colon

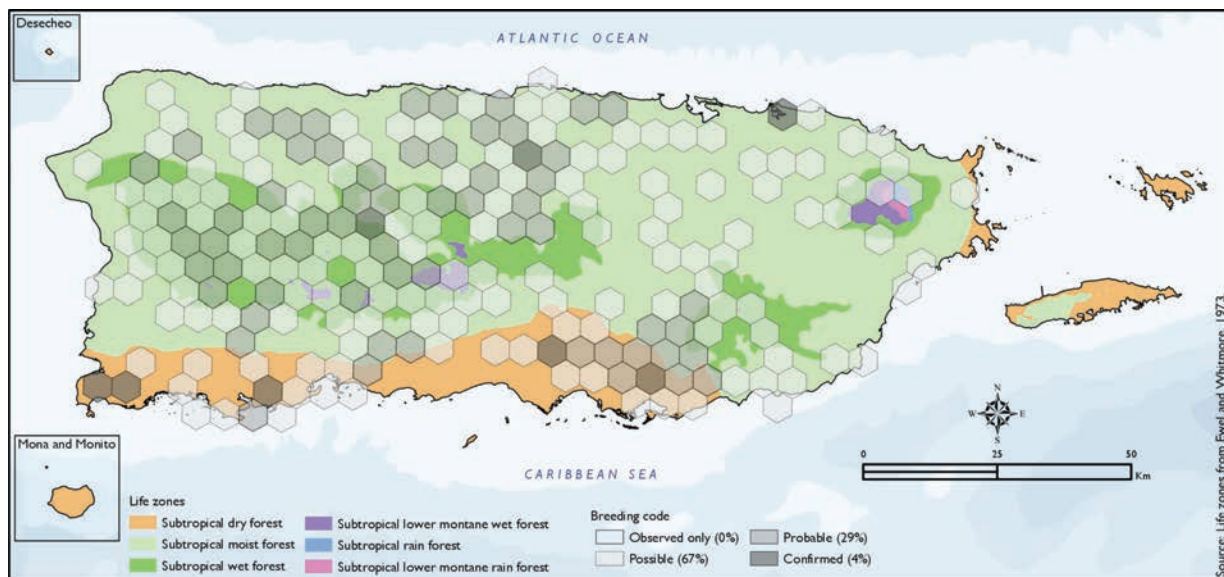
### Distribution and Habitat

The Puerto Rican Vireo is endemic in Puerto Rico and widespread and common throughout forest habitats at all elevations, except in the east where it is uncommon or rare (Oberle 2018, Raffaele 1989a). The species is usually associated with montane forests, coffee plantations, coastal karst limestone, and thorn forests with vine tangles (Oberle 2018). It has also been reported in the haystack hills of the north coast and among the hills of the south coast (Faaborg and others 1997, Raffaele 1989a). Only an unconfirmed record of the vireo exists for Vieques (Gemmill 2015). The atlas fieldwork yielded a total of 362 records within 210 hexagons or 44

percent of the 479 total hexagons (see map). Of the 210 hexagons where this species was found, breeding met the atlas definition of confirmed in 4 percent (8) of the hexagons, probable in 29 percent (61), and possible in 67 percent (141) (see map).

### Breeding Ecology

The Puerto Rican Vireo makes a deep cup-shaped nest made of grass, twigs, moss, and other vegetation, usually in the fork of branches. Previously published reports indicate that construction of the nest begins in March and peaks in May, with the juveniles fledging in June (Raffaele and others 1998). Atlas results show that this species' breeding season extends throughout the year with the most breeding



Puerto Rican Vireo distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



activity from March to June (see chart). Results show that this species breeds mostly within the subtropical moist forest life zone (53 percent of the hexagons), and in the subtropical wet and lower montane wet forest life zones at higher elevations (30 percent of the hexagons) (see table and map). However, results show that it also breeds in the coastal plains of the southern region within the subtropical dry forest life zone (17 percent of the hexagons) (see table and map).

**Population Status and Conservation**

The population trend for the Puerto Rican Vireo has not

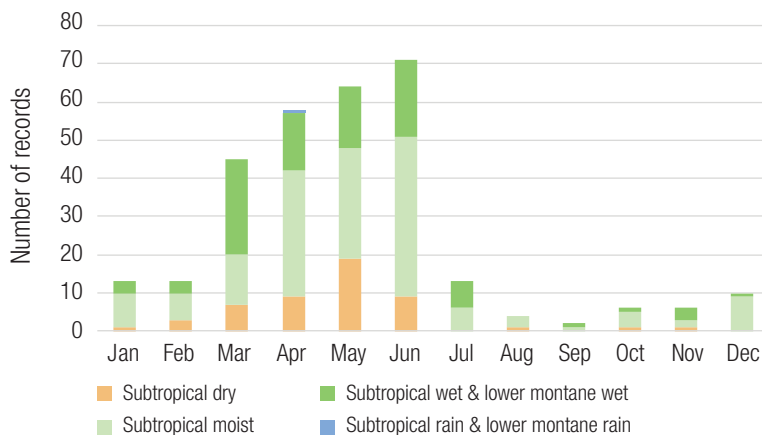
been quantified or assessed, but it is described as ‘fairly common’ (Stotz and others 1996). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). However, a current major threat is nest parasitism by the Shiny Cowbird (*Molothrus bonariensis*), which has been shown to reduce breeding success especially in the subtropical dry forest in Guánica (Faaborg and others 1997, Woodworth 1997) and perhaps elsewhere in the lowlands. However, cowbird parasitism is less of a threat to the Puerto Rican Vireos

breeding in the montane forests of Maricao (Tossas 2008), which may serve as a source population to maintain the heavily parasitized populations (sink populations) in the lowlands (Tossas 2002). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Puerto Rican Vireo has a protected habitat in land of 16 percent or 810 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (5025 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Puerto Rican Vireo breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	5	63	2	25	1	13	0	0	8
Probable	8	13	31	51	22	36	0	0	61
Possible	22	16	79	56	39	28	1	1	141
<b>Total</b>	<b>35</b>	<b>17</b>	<b>112</b>	<b>53</b>	<b>62</b>	<b>30</b>	<b>1</b>	<b>&lt;1</b>	<b>210</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Puerto Rican Vireo records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Black-whiskered Vireo/Julián Chiví

## *Vireo altiloquus*

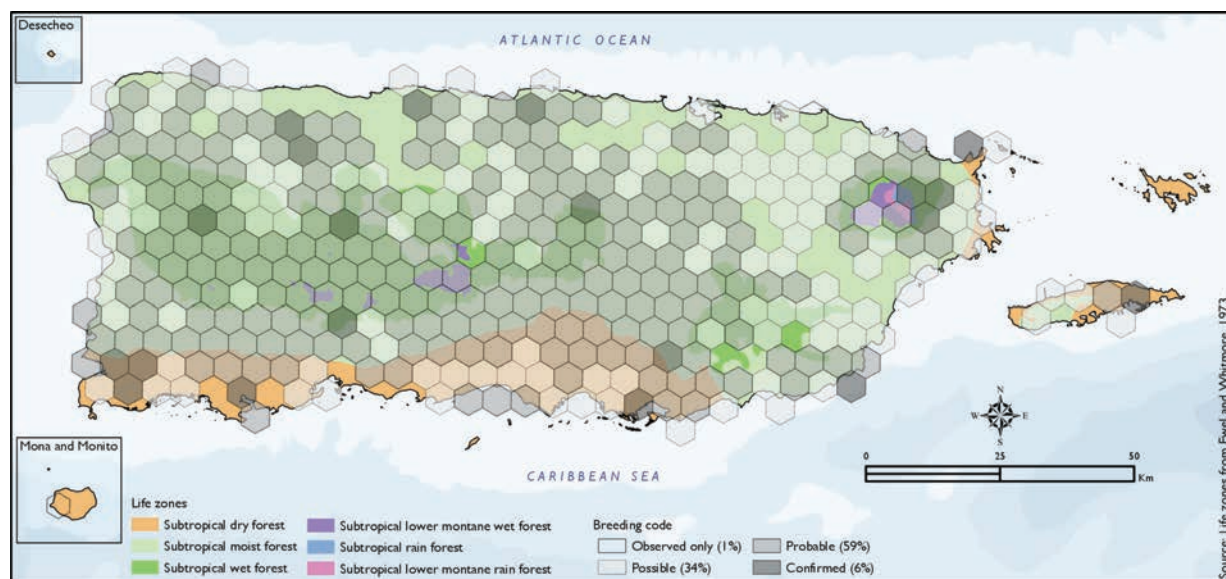


Photo by Guillermo Plaza

### Distribution and Habitat

The Black-whiskered Vireo occurs in the Southeastern United States, northern South America, and throughout the West Indies (Raffaele and others 1998). It is a common spring and summer resident in Puerto Rico, very abundant (March–August) in forested or wooded areas on the island (Oberle 2018, Raffaele 1989a), but uncommon in Vieques (Gemmill 2015). It has also been reported from Mona and Desecheo (Ventosa-Febles and others 2005). Most individuals migrate to South America for the winter, although some individuals remain on the island

during the non-breeding season. This species inhabits forests of all types and elevations, woodlands, tall undergrowth, mangroves, and gardens (Raffaele and others 1998). The atlas fieldwork yielded a total of 713 records within 355 hexagons or 74 percent of the 479 total hexagons (see map). Of the 355 hexagons where this species was found, breeding met the atlas definition of confirmed in 6 percent (20) of the hexagons, probable in 59 percent (211), and possible in 34 percent (122), while the species was observed in 1 percent (2) of the hexagons but without evidence of breeding (see map).



Black-whiskered Vireo distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

The Black-whiskered Vireo constructs a cup-shaped nest made of various plant fibers and grasses hanging from the fork of a small branch in the canopy of a tree from May to June, according to previously published reports (Raffaele and others 1998). Atlas results show that this species may breed primarily from March to June, with fewer records later in the year when most vireos have migrated south (see chart). Results suggest that the Black-whiskered Vireo inhabits

all forest types as it breeds within the subtropical moist forest life zone (59 percent of the hexagons), subtropical wet forest life zone (23 percent of the hexagons), subtropical dry forest life zone (17 percent of the hexagons), and in one hexagon within the subtropical rain forest life zone (see table and map).

**Population Status and Conservation**

The Black-whiskered Vireo population trend is unknown, and due to its large distribution range, it is listed as a species

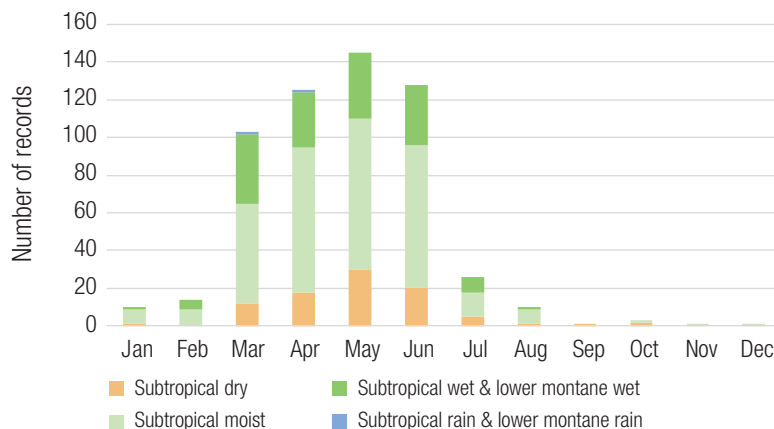
of least concern by the IUCN (BirdLife International 2017). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Black-whiskered Vireo has a protected habitat in land of about 13 percent or 1071 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (8420 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Black-whiskered Vireo breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	7	35	7	35	5	25	1	5	20
Probable	28	13	124	59	58	28	0	0	210 <sup>b</sup>
Possible	25	20	78	64	19	16	0	0	122
<b>Total</b>	<b>60</b>	<b>17</b>	<b>209</b>	<b>59</b>	<b>82</b>	<b>23</b>	<b>1</b>	<b>&lt;1</b>	<b>352</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.

<sup>b</sup> A different number of total hexagons for each breeding code in this table may not reflect the actual number of hexagons where the species was found breeding, as some of the hexagons in the coastal zone or on the water may not have ecological life zone data.



Number of Black-whiskered Vireo records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Caribbean Martin/ Golondrina de Iglesias

## *Progne dominicensis*

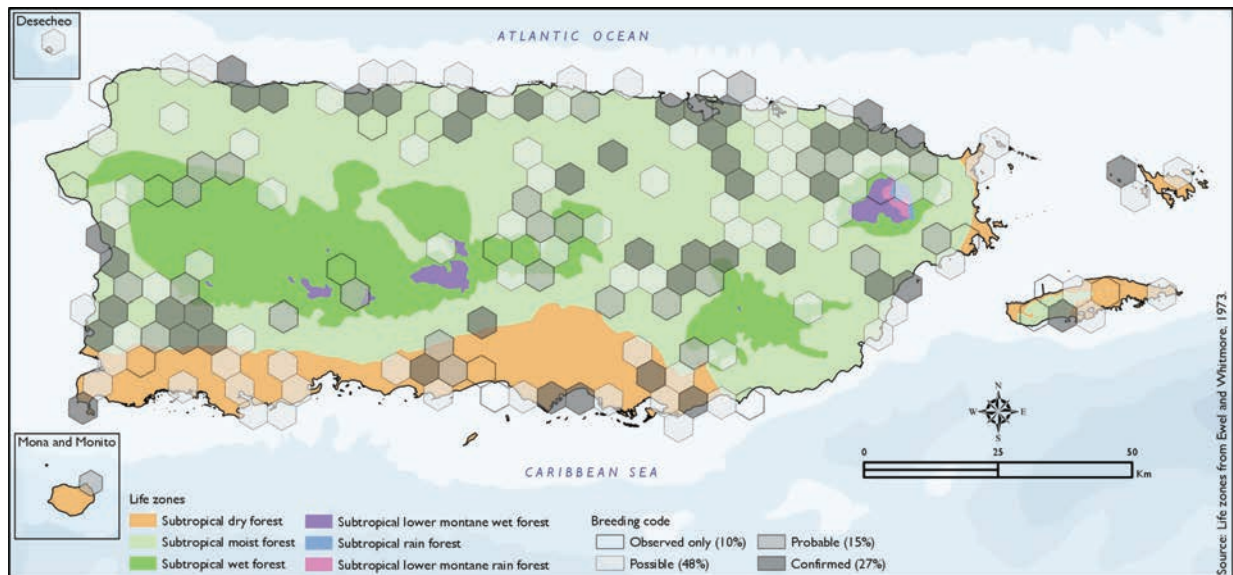


Photo by Pedro W. Santana

### Distribution and Habitat

The Caribbean Martin is a fairly common breeding resident in much of the West Indies including Puerto Rico (Raffaele and others 1998). It is considered a common summer visitor in Vieques (Gemmill 2015). Most migrate out of the region for the winter, presumably to South America (Oberle 2018, Raffaele and others 1998). This species occurs mostly in open areas with scattered trees and in rocky outcrops (Oberle 2018), as well as in towns, near freshwater

bodies and coastal areas with rock promontories (Raffaele and others 1998). The atlas fieldwork yielded a total of 260 records within 172 hexagons or 36 percent of the 479 total hexagons (see map). Of the 172 hexagons where this species was found, breeding met the atlas definition of confirmed in 27 percent (46) of the hexagons, probable in 15 percent (26), and possible in 48 percent (83), while the species was observed in 10 percent (17) of the hexagons but without evidence of breeding (see map).



Caribbean Martin distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding behavior:**

The Caribbean Martin nests in single pairs or small colonies in cavities in palms, trees, cliffs, or human-made structures (Oberle 2018) from February to August, according to previously published reports (Raffaele and others 1998). Atlas results indicate that the highest breeding activity for this species is during May and June (see chart). Results show that the Caribbean Martin breeds within all ecological life zones, but mostly in the subtropical moist (66 percent of

the hexagons) and subtropical dry forest (23 percent of the hexagons) life zones, and to a lesser extent in the subtropical wet (10 percent of the hexagons) and subtropical rain forest (1 percent of the hexagons) life zones (see table and map).

**Population Status and Conservation**

The Caribbean Martin’s global population size has not been quantified or assessed, but the species is described as fairly common but patchily distributed, and it is listed as a

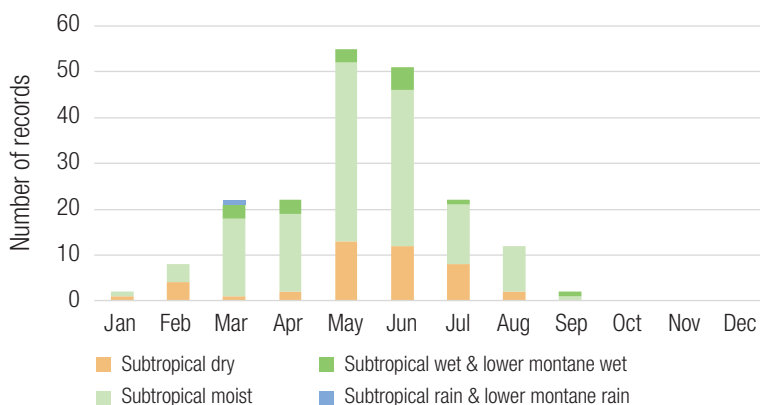
species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER or USFWS. In Puerto Rico, the Caribbean Martin has a protected habitat in land of 9 percent or 349 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (3681 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Caribbean Martin breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	7	15	39	85	0	0	0	0	46
Probable	3	12	17	68	5	20	0	0	25 <sup>b</sup>
Possible	26	31	45	54	11	13	1	1	83
<b>Total</b>	<b>36</b>	<b>23</b>	<b>101</b>	<b>66</b>	<b>16</b>	<b>10</b>	<b>1</b>	<b>1</b>	<b>154</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.

<sup>b</sup> A different number of total hexagons for each breeding code in this table may not reflect the actual number of hexagons where the species was found breeding, as some of the hexagons in the coastal zone or on the water may not have ecological life zone data.



Number of Caribbean Martin records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Cave Swallow/Golondrina de Cuevas

## *Petrochelidon fulva*



Photo by Michael Morel

### Distribution and Habitat

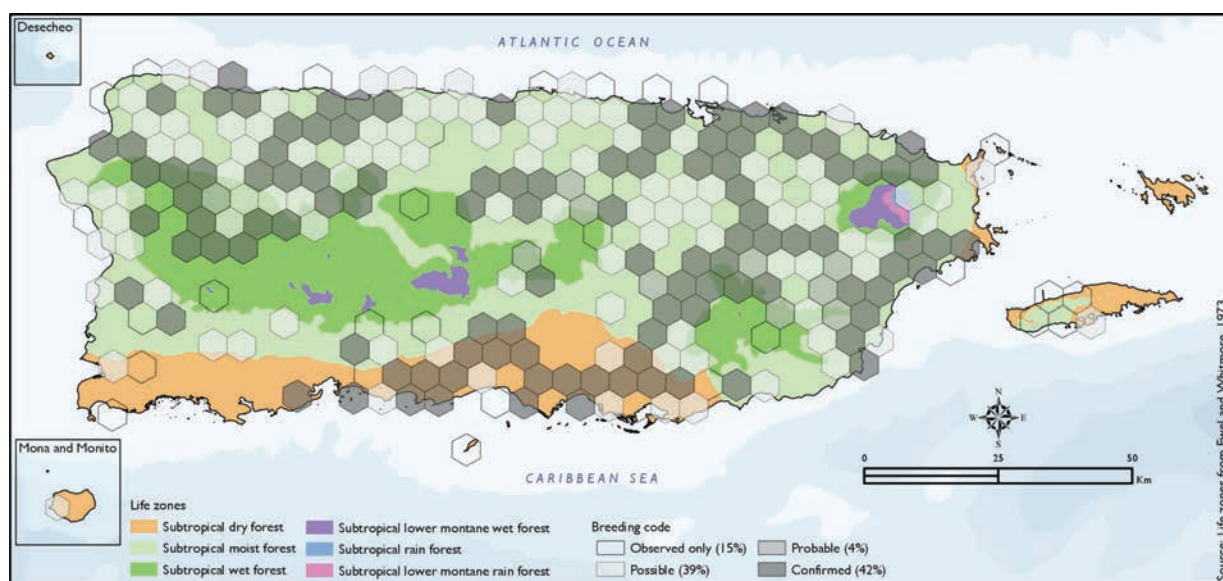
The Cave Swallow occurs in the South-central United States, Mexico, and the West Indies including Puerto Rico, where it is a common permanent resident (Raffaele 1989a, Raffaele and others 1998) and a fairly common passage migrant in Vieques (Gemmill 2015).

The Cave Swallow occurs in open country, farms, beaches, mangroves, marshes, and towns (Oberle 2018). The atlas fieldwork yielded a total of 449 records within 256 hexagons or 53 percent of the 479 total hexagons (see map). Of the 256

hexagons where this species was found, breeding met the atlas definition of confirmed in 42 percent (108) of the hexagons, probable in 4 percent (10), and possible in 39 percent (100), while the species was observed in 15 percent (38) of the hexagons but without evidence of breeding (see map).

### Breeding Ecology

The Cave Swallow breeds in colonies, by building a mud nest in a cave mouth, on a building, or under a bridge or ledge from March to July,



Cave Swallow distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

according to previously published reports (Oberle 2018, Raffaele and others 1998). Atlas results indicate that breeding activity for this species extends throughout the year and peaks in June (see chart). Results indicate that the Cave Swallow breeds in all ecological life zones, but most of the breeding activity was reported within the subtropical moist forest life zone (73 percent of the hexagons) (see table and map). Because

the swallow commonly breeds under bridges, its “confirmed” breeding distribution appears to follow major highways on the island where bridges are common and nests are easy to find (e.g., highway from San Juan to Caguas, Cayey, and Ponce) (see map).

**Population Status and Conservation**

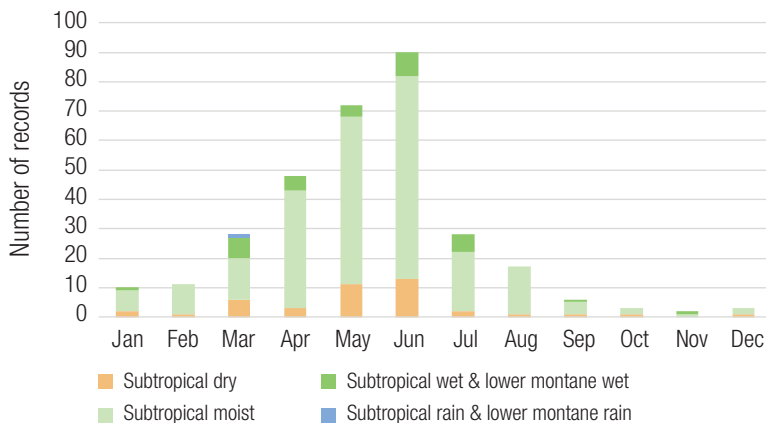
The overall current population trend of the Cave Swallow is increasing, and it is listed as a

species of least concern by the IUCN (BirdLife International 2019). Locally, this species is not listed in any of the threatened categories of PRDNER or USFWS. In Puerto Rico, the Cave Swallow has a protected habitat in land of 13 percent or 695 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (~5212 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Cave Swallow breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	19	18	75	69	14	13	0	0	108
Probable	0	0	7	70	3	30	0	0	10
Possible	11	11	78	78	10	10	1	1	100
<b>Total</b>	<b>30</b>	<b>14</b>	<b>160</b>	<b>73</b>	<b>27</b>	<b>12</b>	<b>1</b>	<b>&lt;1</b>	<b>218</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Cave Swallow records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Great Myna/Miná Grande

## *Acridotheres grandis*

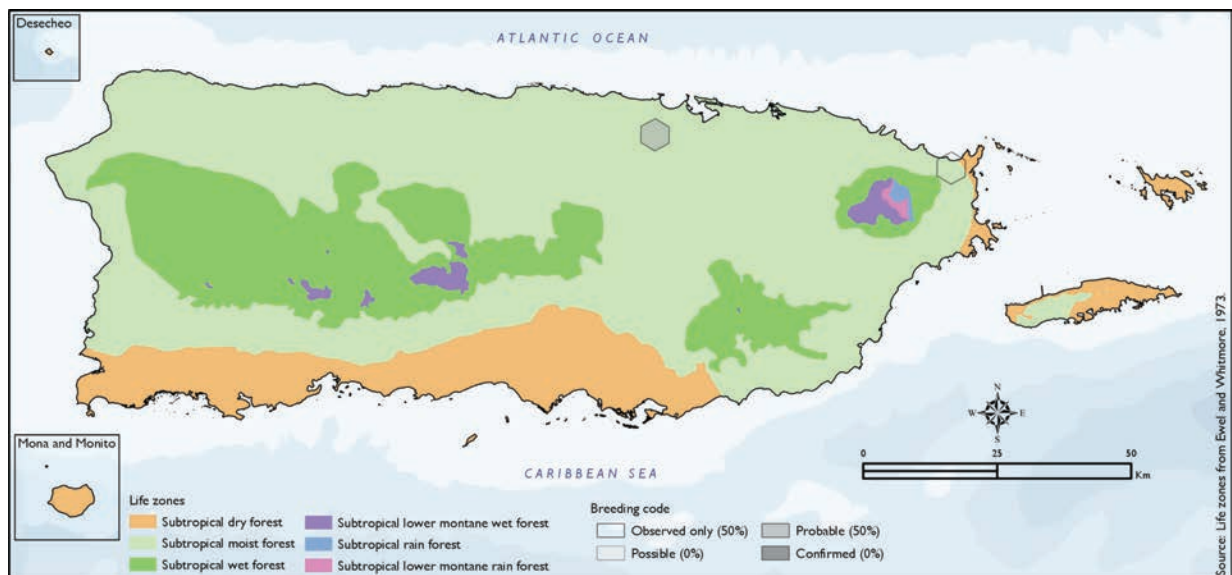


Photo by Mark Oberle

### Distribution and Habitat

The Great Myna occurs from Nagaland through Bangladesh and Manipur to Burma, as well as through Southeast Asia and in southern China (Craig and Feare 1998). Its native habitat includes mostly cultivated areas and other open habitats including grasslands and marshes, as well as parks, gardens, and golf courses (Craig and Feare 1998). The myna has been introduced via the pet trade to Puerto Rico where it has been found breeding only in the north and east coasts in open woodlands

(Raffaele 1989a). An escaped cage bird was the only myna record noted for Vieques by Raffaele (1989b) and Gemmill (2015) but with no evidence for breeding. The atlas fieldwork yielded a total of two records within two hexagons or 0.4 percent of the 479 total hexagons (see map). Of the two hexagons where this species was found, observations in one hexagon met the atlas definition of probable breeding, while the species was observed in the other hexagon but without evidence of breeding (see map).



Great Myna distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



### Breeding Ecology

Previously published reports indicate that the Great Myna normally breeds between April and July, and it usually nests in tree holes and roofs of houses (Deignan 1945). Only one probable breeding record was found during the atlas surveys, and the record occurred in the subtropical moist forest life zone in the month of February (see chart, map, and table). The two records for the myna indicated

that the species appears to have shown no shift in range from its north and east coast range initially described by Raffaele (1989b).

### Population Status and Conservation

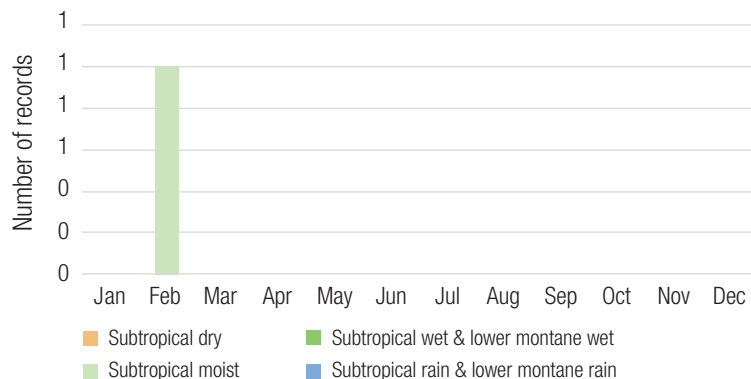
The global population size of the Great Myna has not been quantified or assessed, but the species is described as common throughout its native distributional range (Craig and Feare 1998). This species is

currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Great Myna has a protected habitat in land of about 23 percent (11 km<sup>2</sup>) of the total area covered by the hexagon where evidence of breeding was found for this species (48 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Great Myna breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	0	0	0	0	0	0	0
Probable	0	0	1	100	0	0	0	0	1
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Great Myna records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# European Starling/Estornino Pinto

*Sturnus vulgaris*



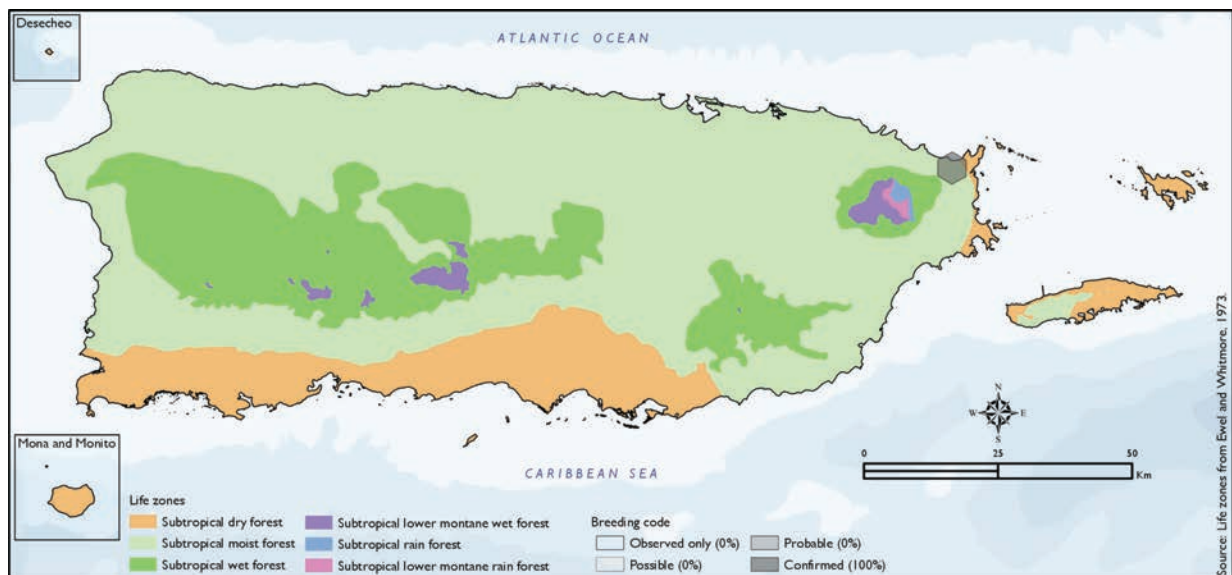
Photo by Pedro W. Santana

## Distribution and Habitat

The European Starling is native to Eurasia and North Africa, and in the West Indies it has been introduced or colonized from nearby source populations to The Bahamas, Jamaica, Puerto Rico, and the Virgin and Cayman Islands (Raffaele and others 1998). It primarily inhabits open lowland areas, pastures, and gardens (Raffaele and others 1998). The atlas fieldwork yielded a total of three records within one hexagon or 0.2 percent of the 479 total hexagons (see map). Breeding was confirmed in the only hexagon (100 percent) where this species was found (see map).

## Breeding Ecology

Previously published reports indicate that the European Starling breeds from April to June (Raffaele and others 1998). The nest is built in a cavity or at the base of palm fronds (Raffaele and others 1998). Atlas fieldwork yielded three records (one of which confirmed breeding in December), all in the same hexagon in Fajardo in the subtropical moist forest life zone (see map and table). During the Fajardo Christmas Bird Counts, seven individuals were observed in 2007, one individual was reported in 2009, six were reported in 2010, and none have



European Starling distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

been recorded in subsequent years through 2019 (Cornell University 2020).

**Population Status and Conservation**

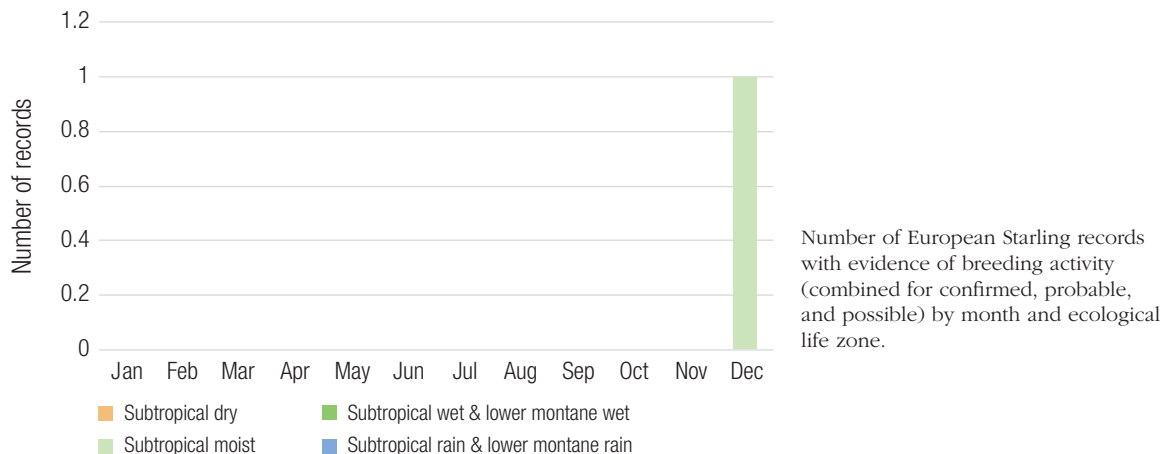
The European Starling is currently listed as a species of least concern by the IUCN (BirdLife International 2016). The species may have failed to successfully establish on Puerto Rico given absence of

recent observations. Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the European Starling has a protected habitat in land of 33 percent or 8 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (24 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where European Starling breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	1	100	0	0	0	0	1
Probable	0	0	0	0	0	0	0	0	0
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



# Red-legged Thrush/Zorzal Patirrojo

## *Turdus plumbeus*

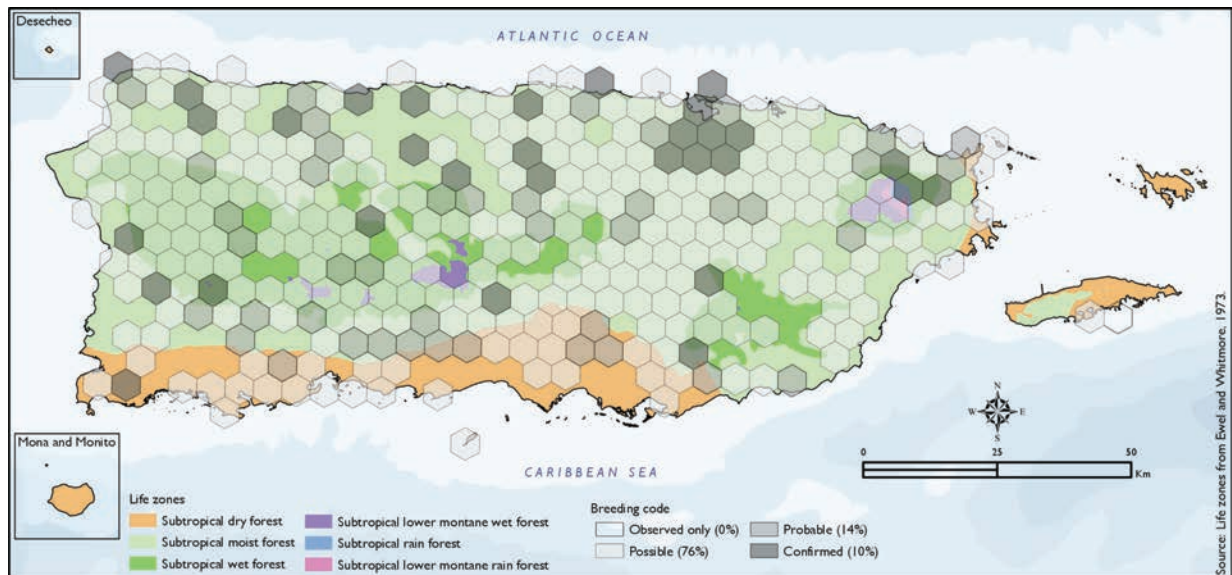


Photo by Marconi Campos Cerqueira

### Distribution and Habitat

The Red-legged Thrush is a year-round resident throughout the Greater Antilles (except Jamaica), The Bahamas (Oberle 2018, Raffaele and others 1998), the Cayman Islands (Raffaele and others 1998), and Dominica (Oberle 2018, Raffaele and others 1998). In Puerto Rico, it is common and widespread on the main island (Oberle 2018, Raffaele 1989a) and a rare visitor on the island of Vieques (Gemmill 2015). This species inhabits woodlands and forests at all elevations (Raffaele and others 1998), as well as coffee

plantations (Oberle 2018, Raffaele and others 1998) and gardens (Oberle 2018, Raffaele and others 1998). The atlas fieldwork yielded a total of 520 records within 303 hexagons or 63 percent of the 479 total hexagons (see map). Of the 303 hexagons where this species was found, breeding was confirmed in 10 percent (31) of the hexagons, probable in 14 percent (42), and possible in 76 percent (229), while the species was also observed in an additional hexagon (<1 percent) but without evidence of breeding (see map).



Red-legged Thrush distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

The Red-legged Thrush builds a bulky nest made of leaves, grass, and other material, usually placed up in a tree, but sometimes in a palm or on a stump (Raffaele and others 1998). Previously published reports indicate that it breeds from January to September, but breeding peaks from April to July (Raffaele and others 1998). Atlas results show that this species' breeding season extends throughout the year, with the most breeding activity from March to June (see chart). Overall, the breeding activity peaks in April, and it mostly

takes place in the subtropical moist forest life zone (see chart). Results show that this species breeds mostly within the subtropical moist forest life zone (63 percent of the hexagons) (see table and map), to a lesser extent in subtropical wet forest life zones (23 percent of the hexagons), and within subtropical dry and subtropical rain forest life zones as well (14 and <1 percent of the hexagons, respectively) (see table and map).

**Population Status and Conservation**

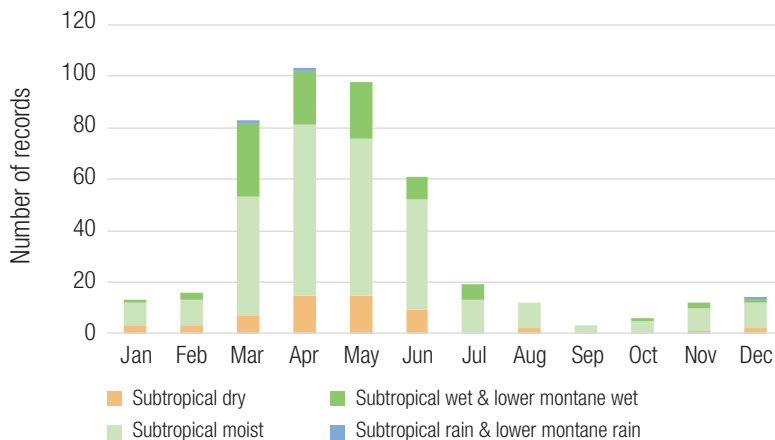
The global population size of the Red-legged Thrush has

not been quantified. However, the population is suspected to be stable due to the lack of evidence for any declines and threats (BirdLife International 2016). It is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Red-legged Thrush has a protected habitat of 13 percent or 967 km<sup>2</sup> of the total area covered by the hexagons where this species is known to breed (7222 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Red-legged Thrush breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	1	3	26	84	3	10	1	3	31
Probable	8	19	28	67	6	14	0	0	42
Possible	32	14	136	59	61	27	0	0	229
<b>Total</b>	<b>41</b>	<b>14</b>	<b>190</b>	<b>63</b>	<b>70</b>	<b>23</b>	<b>1</b>	<b>&lt;1</b>	<b>302</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Red-legged Thrush records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Pearly-eyed Thrasher/Zorzal Pardo

## *Margarops fuscatus*



Photo by José Salguero

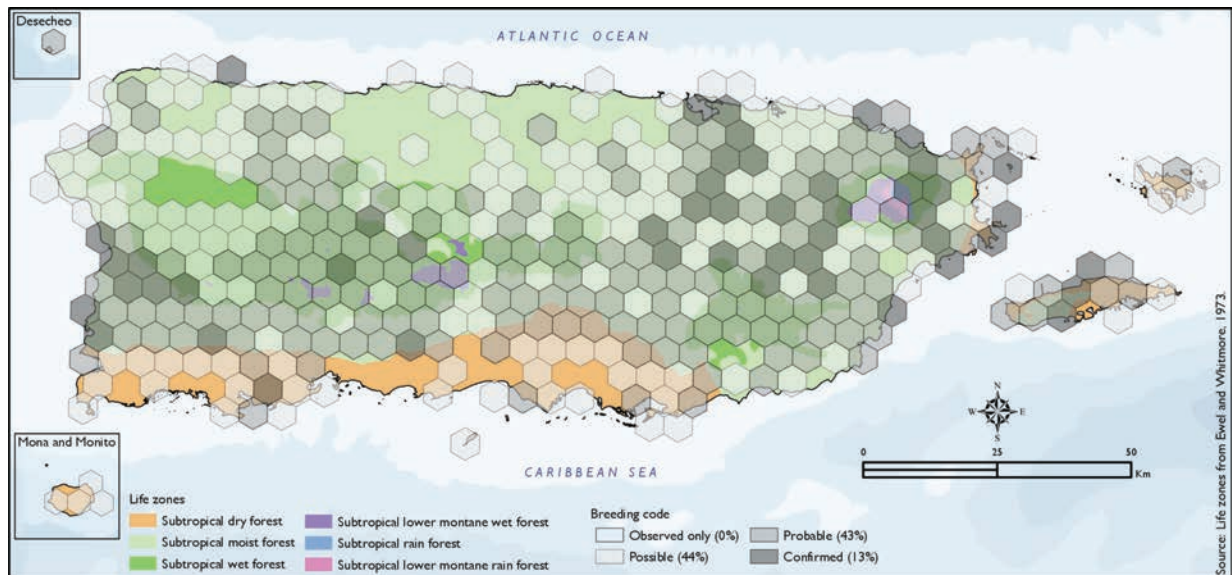
### Distribution and Habitat

The Pearly-eyed Thrasher is a widespread species throughout the West Indies (Arendt 2006, Raffaele and others 1998). In Puerto Rico, it is a common resident throughout Puerto Rico (Arendt 2006, Raffaele and others 1998, Recher and Recher 1966), Mona (Biaggi 1997, Terborgh and Faaborg 1973), Vieques (Gemmill 2015, Saliva 1994, Wetmore 1916), and Culebra (Wetmore 1917). This species is commonly found in trees and bushes in gardens, coffee plantations, mountain forests (Oberle 2018), thickets, woodlands, mangroves, coastal palm groves, mountain tops, urban areas, and forested

areas at all elevations (Raffaele and others 1998). The atlas fieldwork yielded a total of 781 records within 370 hexagons or 77 percent of the 479 total hexagons (see map). Of the 370 hexagons where this species was found, breeding met the atlas definition of confirmed in 13 percent (49) of the hexagons, probable in 43 percent (158), and possible in 44 percent (163) (see map).

### Breeding Ecology

The Pearly-eyed Thrasher builds a bulky nest made of twigs, sticks, dried grasses, and roots (Arendt 2006, Biaggi 1997, Raffaele and others 1998). The



Pearly-eyed Thrasher distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

thrasher is a predator of eggs and nestlings of many small bird species. It is known to compete with Puerto Rican Parrots for nest cavities and will destroy parrot eggs and kill parrot nestlings (Snyder and others 1987). Previously published reports indicate that it breeds from December to September, and the nests are usually constructed in a cavity, though occasionally open nests are placed in a bush or tree (Arendt 2004, Raffaele and others 1998), as well as on or in buildings (Snyder and others 1987). However, on Mona Island, nests have been found inside caves and in deep crevices on the cliffs (Barnés

1946). Atlas results show that this species' breeding season extends throughout the year with the most breeding activity from March to June (see chart). The breeding activity peaks in June, and the overall breeding pattern mostly takes place within the subtropical moist forest life zone (see chart). Atlas results show that this species breeds mostly within the subtropical moist forest life zone (59 percent of the hexagons) throughout the island. It also breeds in the subtropical dry (20 percent of the hexagons) and subtropical wet and lower montane wet forest life zones (21 percent of the hexagons) (see table and map).

### Population Status and Conservation

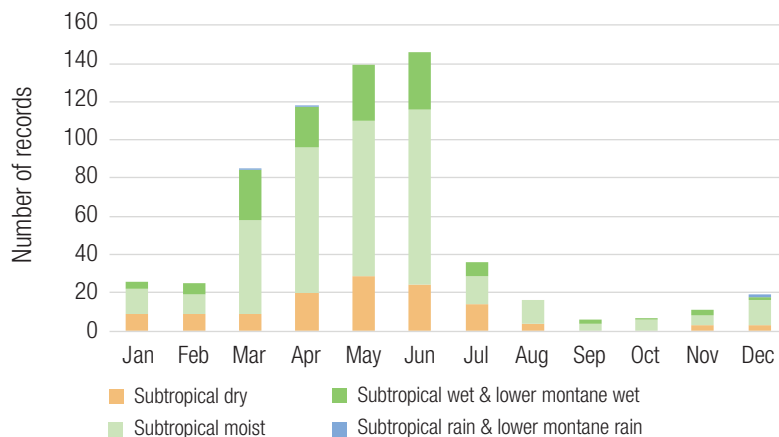
The global population size of the Pearly-eyed Thrasher has not been quantified or assessed, but it is described as 'common' (Stotz and others 1996). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Pearly-eyed Thrasher has a protected habitat in land of 12 percent or 1041 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (8824 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Pearly-eyed Thrasher breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	6	12	36	73	6	12	1	2	49
Probable	23	15	91	58	44	28	0	0	158
Possible	45	28	89	55	28	17	0	0	162 <sup>b</sup>
<b>Total</b>	<b>74</b>	<b>20</b>	<b>216</b>	<b>59</b>	<b>78</b>	<b>21</b>	<b>1</b>	<b>&lt;1</b>	<b>369</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.

<sup>b</sup> A different number of total hexagons for each breeding code in this table may not reflect the actual number of hexagons where the species was found breeding, as some of the hexagons in the coastal zone or on the water may not have ecological life zone data.



Number of Pearly-eyed Thrasher records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Northern Mockingbird/Ruiseñor

*Mimus polyglottos*

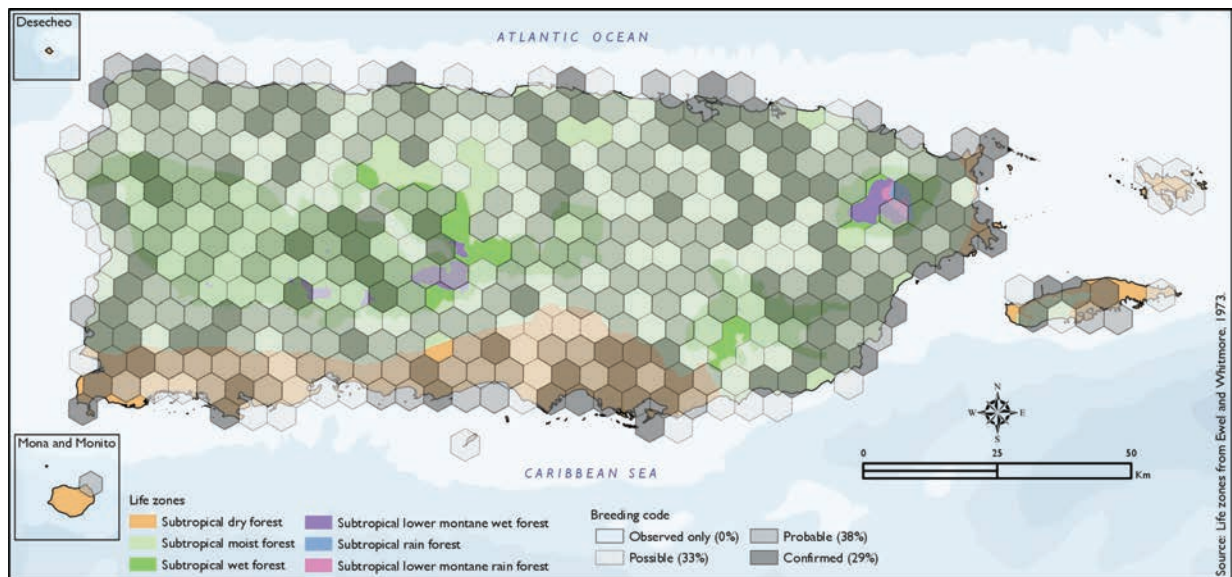


Photo by José Salguero

## Distribution and Habitat

The Northern Mockingbird is a common species that occurs mostly from southern Canada to southern Mexico, throughout the United States and the western West Indies (including Puerto Rico and the Virgin Islands). It is introduced and established in Hawaii and Bermuda (del Hoyo and others 2004). It is a common resident throughout Puerto Rico (Oberle 2018, Raffaele 1989a), Vieques (Gemmill 2015, Saliva 1994, Sorrié 1975, Wetmore 1916), Culebra (Wetmore 1917), and Mona (Terborgh and Faaborg 1973). The species usually inhabits open country with scattered trees or bushes

in the lowlands including dry coastal scrub, open mangrove forests, grasslands, farms, gardens, parks, and urban areas, but also ranges into the mountains where suitable habitat is available (Oberle 2018, Raffaele 1989a, Raffaele and others 1998). The atlas fieldwork yielded a total of 915 records within 406 hexagons or 85 percent of the 479 total hexagons (see map). Of the 406 hexagons where this species was found, breeding met the atlas definition of confirmed in 29 percent (117) of the hexagons, probable in 38 percent (153), and possible in 33 percent (136) (see map).



Northern Mockingbird distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



### Breeding Ecology

The mockingbird builds a nest that is a coarse open cup of twigs, usually placed from 1 to 3 m above the ground in dense shrubbery, tree branches, or vines, often near houses (Raffaele and others 1998). Previously published reports indicate that breeding occurs primarily from January to July (Raffaele and others 1998). Nonetheless, atlas results show that this species' breeding season extends throughout the year with the most breeding activity from March to June (see chart).

The breeding activity peaks in May, and breeding mostly takes place within the subtropical moist forest life zone (see chart). Results show that this species breeds mostly in lowlands within the subtropical moist forest life zone (61 percent of the hexagons) (see table) and less commonly in the subtropical dry forest life zone of the southern and eastern coastal plains (20 percent of the hexagons) and subtropical wet and lower montane wet forest life zones at higher elevations (19 percent of the hexagons) (see table and map).

### Population Status and Conservation

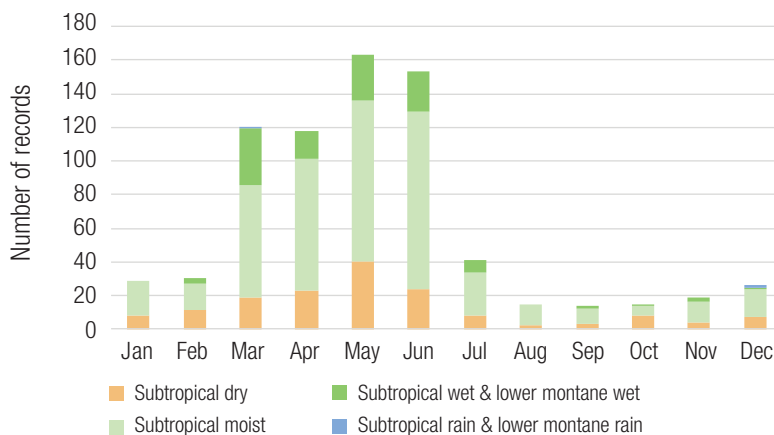
The current population trend for the Northern Mockingbird is described as stable, and it is currently listed as a species of least concern by the IUCN (BirdLife International 2017). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Northern Mockingbird has a protected habitat in land of about 12 percent or 1122 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (9686 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Northern Mockingbird breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	26	22	76	65	14	12	1	1	117
Probable	29	19	87	57	36	24	0	0	152 <sup>b</sup>
Possible	24	18	85	63	27	20	0	0	136
<b>Total</b>	<b>79</b>	<b>20</b>	<b>248</b>	<b>61</b>	<b>77</b>	<b>19</b>	<b>1</b>	<b>&lt;1</b>	<b>405</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.

<sup>b</sup> A different number of total hexagons for each breeding code in this table may not reflect the actual number of hexagons where the species was found breeding, as some of the hexagons in the coastal zone or on the water may not have ecological life zone data.



Number of Northern Mockingbird records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Northern Red Bishop/ Obispo Anaranjado

## *Euplectes franciscanus*

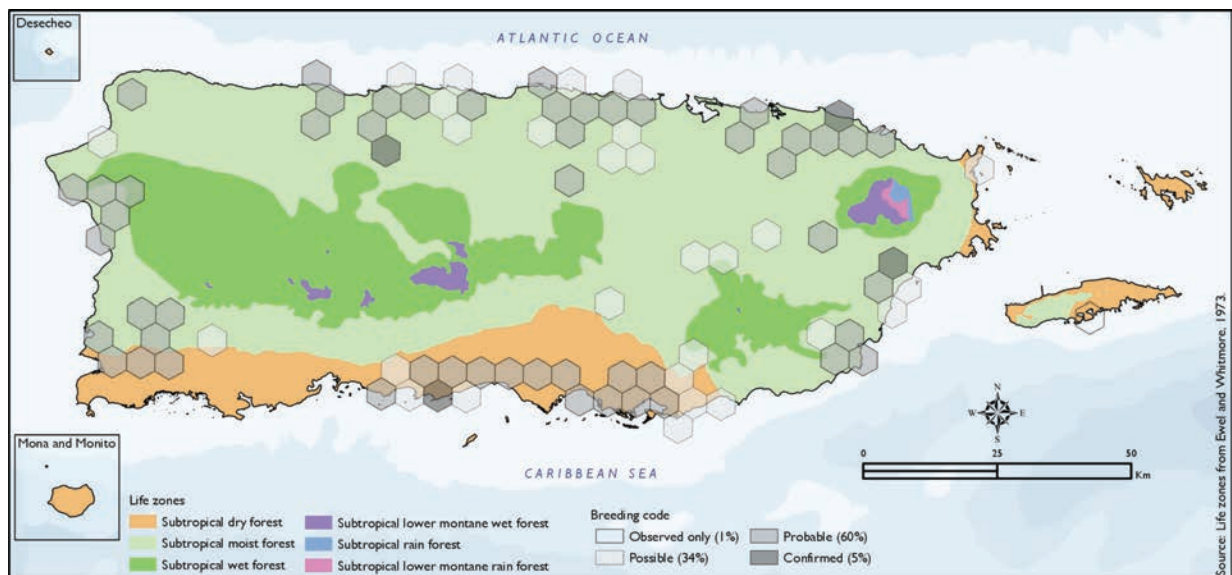
### Distribution and Habitat

The Northern Red Bishop is native to Africa and has been introduced to some of the West Indies islands such as Puerto Rico, Jamaica, Martinique, Guadeloupe, and St. Croix (Raffaele and others 1998). Its popularity as a cage bird has allowed the establishment of feral populations worldwide (del Hoyo and others 2013). First observed on Puerto Rico in 1971 (Raffaele and Kepler 1992), it is uncommon in the north coast from San Juan to Arecibo and favors mostly sugarcane fields bordered by grassy edges (Raffaele 1983, Raffaele

and others 1998) and wet tall grassy fields of the lowlands (Oberle 2018). It is considered a rare visitor, from Puerto Rico's mainland, on Vieques (Gemmill 2015). The atlas fieldwork yielded a total of 150 records within 86 hexagons or 18 percent of the 479 total hexagons (see map). Of the 86 hexagons where this species was found, breeding met the atlas definition of confirmed in 5 percent (4) of the hexagons, probable in 60 percent (52), and possible in 34 percent (29), while the species was observed in 1 percent (1) of the hexagons but without evidence of breeding (see map).



Photo by Guillermo Plaza



Northern Red Bishop distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

The Northern Red Bishop builds a bulky spherical nest, usually in dense cane or reeds, and often near water (Raffaele and others 1998). Previously published reports indicate that breeding occurs from March to November (Raffaele and others 1998). Nevertheless, atlas results show that this species' breeding season extends throughout the year, with the most breeding activity from May to August (see chart). The breeding activity peaks in June, and it mostly takes place in the subtropical moist forest life

zone (see chart). Results show that this species breeds mostly within the subtropical moist (69 percent of the hexagons) and subtropical dry forest life zones (30 percent of the hexagons) (see table and map).

**Population Status and Conservation**

The global population size of the Northern Red Bishop has not been quantified or assessed, but the species is described as 'common' to 'abundant' throughout its distribution range (Urban and others 2004). Due to the lack of evidence for any

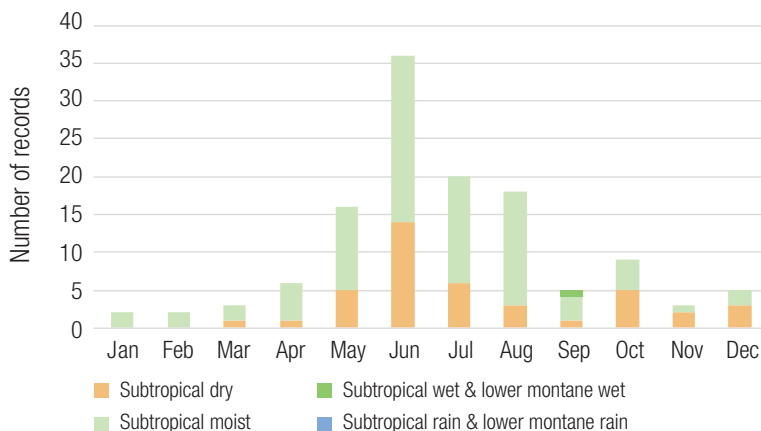
declines or substantial threats, the current population trend is suspected to be 'stable.' This species is currently listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Northern Red Bishop has a protected habitat in land of 9 percent or 172 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (2009 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Northern Red Bishop breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	1	25	3	75	0	0	0	0	4
Probable	16	31	35	67	1	2	0	0	52
Possible	8	29	20	71	0	0	0	0	28 <sup>b</sup>
<b>Total</b>	<b>25</b>	<b>30</b>	<b>58</b>	<b>69</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>84</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.

<sup>b</sup> A different number of total hexagons for each breeding code in this table may not reflect the actual number of hexagons where the species was found breeding, as some of the hexagons in the coastal zone or on the water may not have ecological life zone data.



Number of Northern Red Bishop records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by José Salguero

# Yellow-crowned Bishop/ Napoleón Tejedor

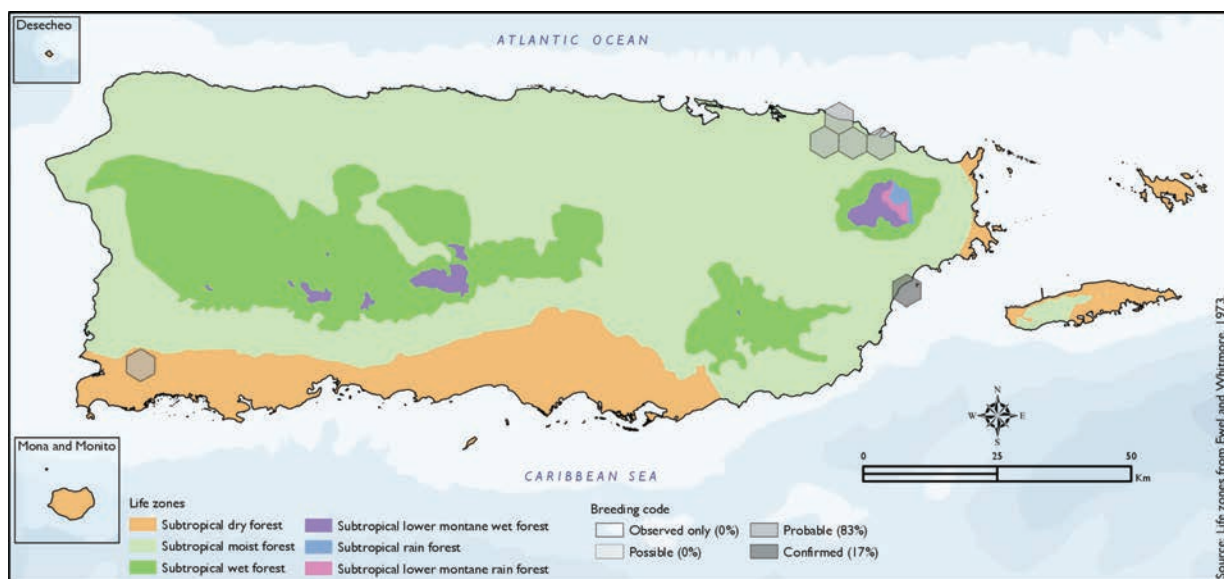
*Euplectes afer*

## Distribution and Habitat

The Yellow-crowned Bishop is native to Sub-Saharan Africa and has been introduced to Puerto Rico and Jamaica in the West Indies (Camacho Rodríguez and others 1999, Raffaele and others 1998). The species was

first recorded in Puerto Rico in 1971 (Raffaele and Kepler 1992). It is uncommon in Puerto Rico and has been observed mostly in marshes around San Juan, the Río Piedras Botanical Garden, Torrecillas, Cartagena Lagoon and the Agriculture Experimental Station at Lajas, fields around the Ponce airport, and in the Humacao Natural Reserve (Hernández-Machado 2003, Raffaele 1989a, Raffaele and others 1998, Rivera 2003, Salguero 2003). It is also found locally in the municipalities of Canóvanas and Río Grande, as well as the southwestern region of the island (Oberle 2018).

This species is found locally in areas of high grasses and reeds near bodies of freshwater including along rivers and freshwater lagoons (Raffaele 1989a, Raffaele and others 1998), as well as marshes and shrubby fields (Oberle 2018). The atlas fieldwork yielded a total of 21 records within six hexagons or 1 percent of the 479 total hexagons (see map). Of the six hexagons where this species was found, breeding met the atlas definition of confirmed in 17 percent (one) of the hexagons and probable in 83 percent (five) (see map).



Yellow-crowned Bishop distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the Yellow-crowned Bishop breeds between June and October (Raffaele and others 1998). Atlas results indicate that bishop breeding peaks in June through August, although evidence for some breeding was found in other months (see chart). Most breeding occurs in the subtropical moist forest life zone (see map and table). Results suggest that this species breeds mostly within the

subtropical moist forest life zone (83 percent of the hexagons) (see table and map).

**Population Status and Conservation**

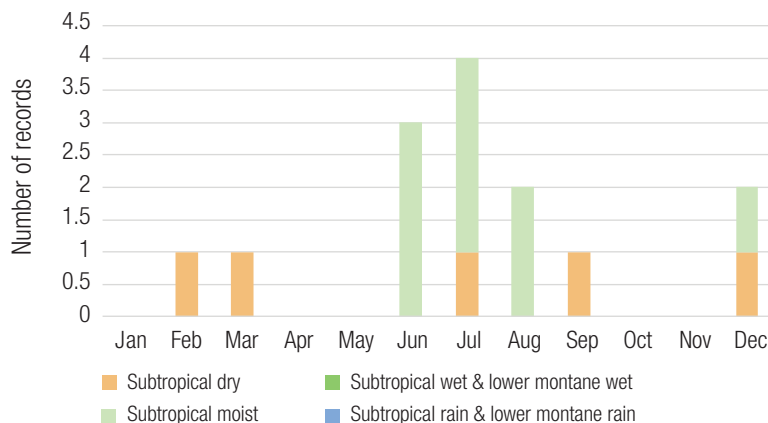
The global population size of the Yellow-crowned Bishop has not been quantified or assessed, but the species is described as ‘common’ (Urban and others 2004). Due to the lack of evidence for any declines or substantial threats, the current population trend is suspected to be ‘stable.’ This species is

currently listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Yellow-crowned Bishop has a protected habitat in land of 10 percent or 15 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (143 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Yellow-crowned Bishop breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	1	100	0	0	0	0	1
Probable	1	20	4	80	0	0	0	0	5
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>1</b>	<b>17</b>	<b>5</b>	<b>83</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Yellow-crowned Bishop records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Pin-tailed Whydah/Viuda Colicinta

## *Vidua macroura*



Photo by Noelia Nieves

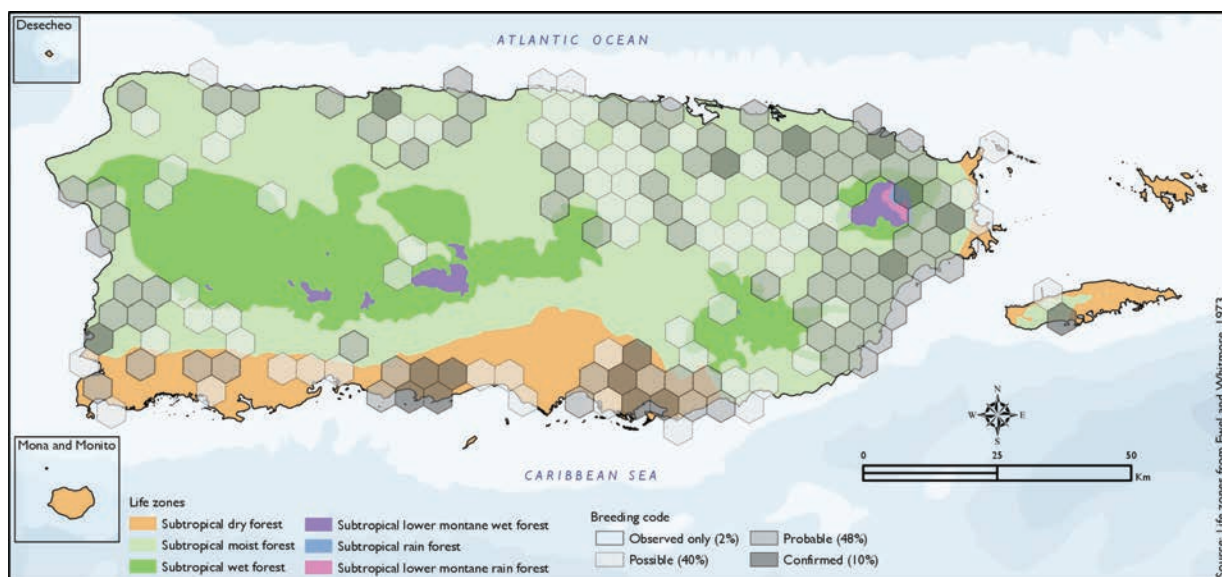
### Distribution and Habitat

The Pin-tailed Whydah is native to Sub-Saharan Africa and was introduced to Puerto Rico where it was first recorded in 1971 (Raffaele and Kepler 1992). In Puerto Rico, it is most common in the lowlands and can be regularly seen in the grassy fields and fence lines near La Parguera in the municipality of Lajas (Oberle 2018). It also occurs on Vieques, where it is a fairly recent arrival (Gemmill 2015). This species' habitat includes mostly grasslands, lawns (Oberle 2018), and fields with short grasses (Raffaele and others 1998). The atlas fieldwork yielded a total of 281 records within 168 hexagons or 35 percent of the 479 total hexagons (see map). Of the 168 hexagons

where this species was found, breeding met the atlas definition of confirmed in 10 percent (17) of the hexagons, probable in 48 percent (80), and possible in 40 percent (68), while the species was observed in 2 percent (3) of the hexagons but without evidence of breeding (see map).

### Breeding Ecology

Previously published reports indicate that the Pin-tailed Whydah breeds from April through November, and it does not build a nest; rather, the female lays her eggs in the nests of other birds, especially waxbills and other nonnative finches (Oberle 2018, Raffaele and others 1998). Atlas results show that this species' breeding season



Pin-tailed Whydah distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

extends throughout the year, with the most breeding activity from May to July (see chart). The breeding activity peaks in June, and it mostly takes place in the subtropical moist forest life zone (see chart). Results show that this species breeds mostly within the subtropical moist forest life zone (72 percent of the hexagons) (see table). It also breeds in the coastal plains of the subtropical dry forest life zone (21 percent of the hexagons) and at higher elevations within subtropical wet and subtropical rain forest life zones as well (7 and 1 percent of the hexagons, respectively) (see table and map).

**Population Status and Conservation**

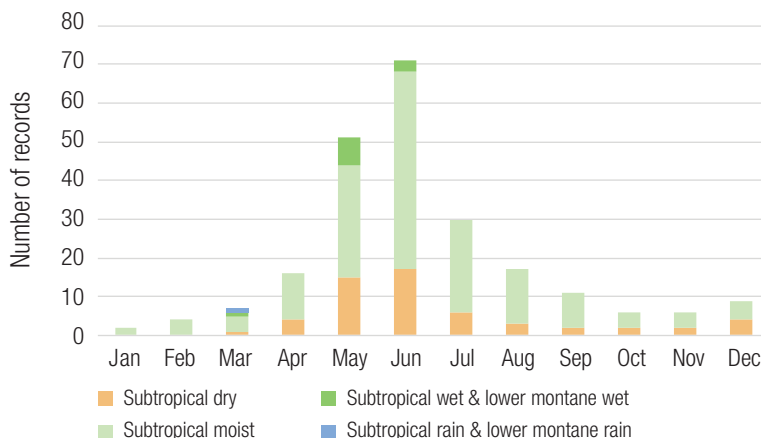
The global population size of the Pin-tailed Whydah has not been quantified or assessed, but the species is described as ‘uncommon’ (Borrow and Demey 2001), and due to the lack of evidence for any declines or substantial threats, the current population trend is suspected to be ‘stable.’ This species is currently listed as a species of least concern by the IUCN (BirdLife International 2018). After Hurricanes Irma and María in September 2017, the whydah population declined in the Fajardo Christmas Bird

Count (Wunderle, Jr. 2017) in the northeast portion of the island and elsewhere, but it has since been found in large groups in the southwest portion of the island (J.A. Salguero-Farías, personal observation 2009). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Pin-tailed Whydah has a protected habitat in land of 10 percent or 385 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (3943 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Pin-tailed Whydah breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	8	47	8	47	0	0	1	6	17
Probable	13	16	63	79	4	5	0	0	80
Possible	14	21	47	69	7	10	0	0	68
<b>Total</b>	<b>35</b>	<b>21</b>	<b>118</b>	<b>72</b>	<b>11</b>	<b>7</b>	<b>1</b>	<b>1</b>	<b>165</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Pin-tailed Whydah records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Orange-cheeked Waxbill/Veterano

## *Estrilda melpoda*

### Distribution and Habitat

The Orange-cheeked Waxbill is native to west Africa and has been introduced to Puerto Rico, Guadeloupe, and Martinique in the Caribbean (Camacho Rodríguez and others 1999, Raffaele and others 1998). It is a common resident in the coastal plains of Puerto Rico (Raffaele and others 1998), where it was introduced before 1874 (Biaggi 1997), and can be regularly seen in the tall grasses and marshy edges of the Laguna Cartagena National Wildlife Refuge in the municipality of Lajas, and the Humacao Natural Reserve (Oberle 2018). Habitat includes mostly brushlands, pasturelands, grasslands, marshes (Biaggi 1997), sugarcane fields and borders, seeding grasses at

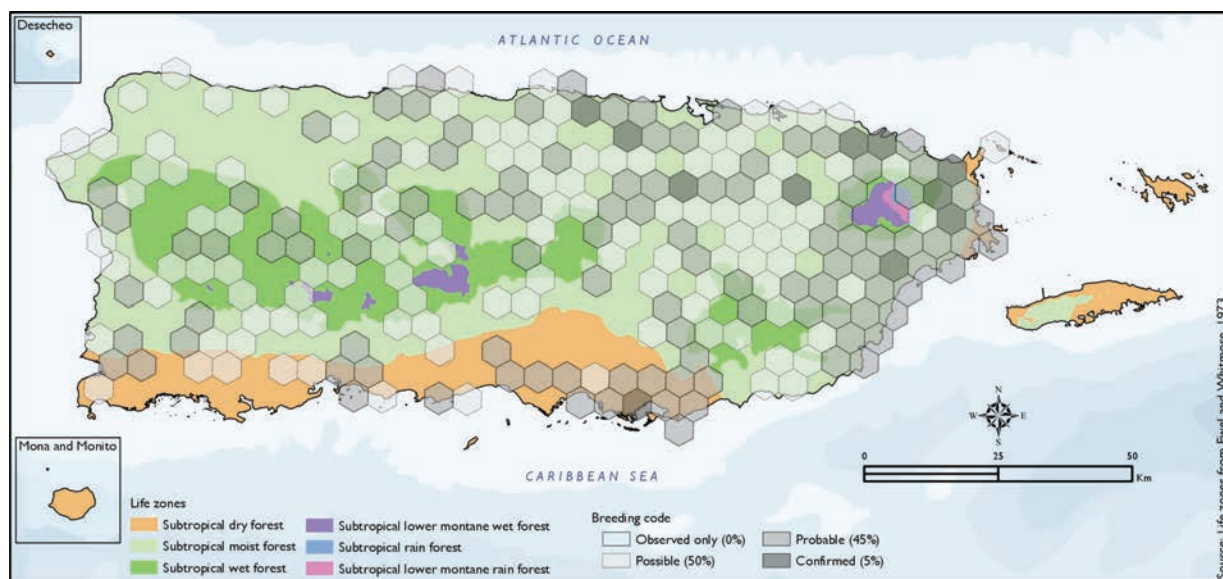
agricultural stations, and road edges (Raffaele 1989b, Raffaele and others 1998). The atlas fieldwork yielded a total of 375 records within 233 hexagons or 49 percent of the 479 total hexagons (see map). Of the 233 hexagons where this species was found, breeding met the atlas definition of confirmed in 5 percent (11) of the hexagons, probable in 45 percent (106), and possible in 50 percent (116) (see map).

### Breeding Ecology

The Orange-cheeked Waxbill appears to breed from June to August, according to previously published reports (Raffaele and others 1998). The nest is made of both thick and fine grasses,



Photo by José Salguero



Orange-cheeked Waxbill distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



and is usually built at ground level in the base of grass clumps (Biaggi 1997, Raffaele and others 1998). Atlas results show that this species breeds throughout the year with the most breeding activity from March to July (see chart). The breeding activity peaks in June, and it mostly takes place within the subtropical moist forest life zone (see chart). Results suggest that this species breeds throughout the island but mostly within the subtropical moist forest life zone (68 percent of the hexagons) (see table). It also breeds in subtropical wet and lower montane wet forest

life zones at higher elevations (18 percent of the hexagons), and in the southern region within the subtropical dry forest life zone as well (14 percent of the hexagons) (see table and map).

**Population Status and Conservation**

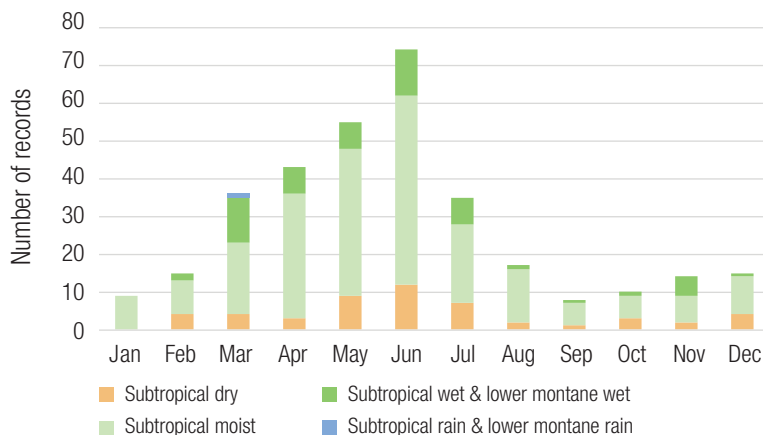
The global population size of the Orange-cheeked Waxbill has not been quantified or assessed, but the species is described as ‘common or locally common’ to ‘abundant’ (Clement 1999). Due to the lack of evidence for any declines or threats, the current population trend is suspected to be ‘stable,’ and it

is currently listed as a species of least concern by the IUCN (BirdLife International 2018). In Puerto Rico, nests of the Orange-cheeked Waxbill have been found to be parasitized by the nonnative Pin-tailed Whydah (Raffaele 1989b). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Orange-cheeked Waxbill has a protected habitat in land of 10 percent or 543 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (5570 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Orange-cheeked Waxbill breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	1	9	9	82	1	9	0	0	11
Probable	21	20	67	63	17	16	1	1	106
Possible	10	9	82	71	24	21	0	0	116
<b>Total</b>	<b>32</b>	<b>14</b>	<b>158</b>	<b>68</b>	<b>42</b>	<b>18</b>	<b>1</b>	<b>&lt;1</b>	<b>233</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Orange-cheeked Waxbill records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Red Avadavat/Chamorro Fresa

## *Amandava amandava*



Photo by Jack Jeffrey

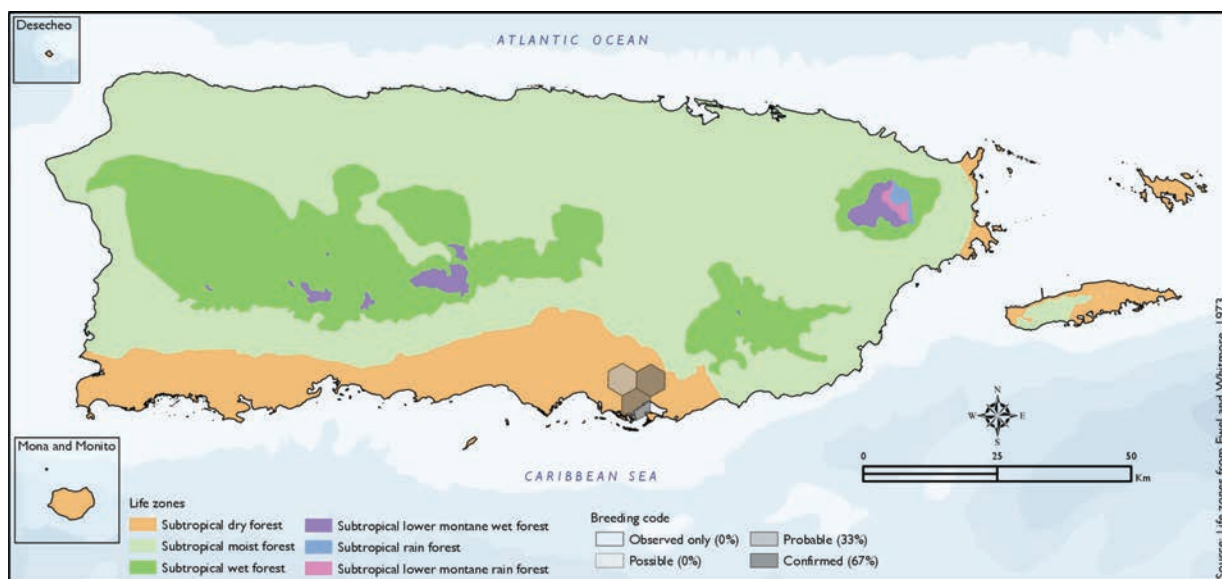
### Distribution and Habitat

The Red Avadavat is native from Pakistan through southeast Asia and Indonesia, and has been introduced to Puerto Rico, Guadeloupe, and Martinique in the West Indies (Camacho Rodríguez and others 1999, Raffaele and others 1998). It was probably introduced to Puerto Rico via the pet trade and first recorded in the wild in 1971 (Raffaele and Kepler 1992). This species mostly inhabits grassy borders of wetlands, freshwater swamps, and sugarcane fields (Raffaele and others 1998). The atlas fieldwork found the species

in three hexagons or 0.6 percent of the 479 total hexagons in the vicinity of Salinas (see map). Of the three hexagons where this species was found, breeding met the atlas definition of confirmed in 67 percent (two) of the hexagons and probable in 33 percent (one) (see map).

### Breeding Ecology

Previously published reports indicate that the Red Avadavat seems to breed from June to November in the West Indies (Raffaele and others 1998). However, atlas results show that this species breeds during



Red Avadavat distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

February and May, and breeding activity appears to peak in February (see chart). Results show that this species breeds in the coastal plain of the subtropical dry forest life zone (100 percent of the hexagons) (see table and map).

**Population Status and Conservation**

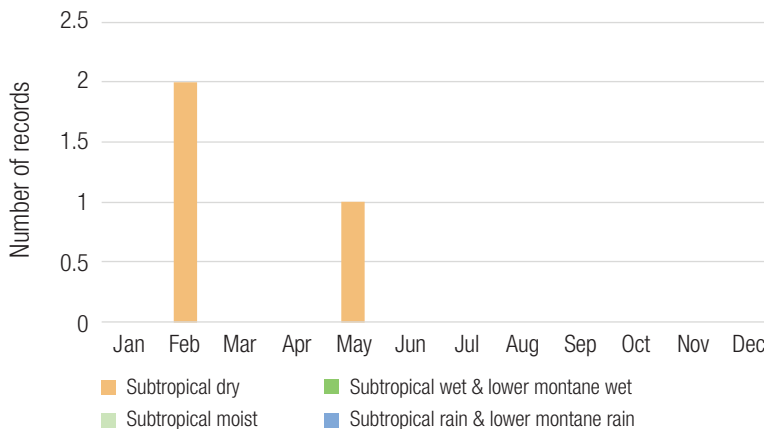
The global population size of the Red Avadavat has not been quantified or assessed, but the species is described as ‘common’ or ‘locally common’ (Clement 1999). Due to the lack of evidence for any declines or

substantial threats, the current population trend is suspected to be ‘stable.’ This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Red Avadavat has a protected habitat in land of 4 percent or 3 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (72 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Red Avadavat breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	2	100	0	0	0	0	0	0	2
Probable	1	100	0	0	0	0	0	0	1
Possible	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>3</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Red Avadavat records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Bronze Mannikin/Diablito

## *Lonchura cucullata*

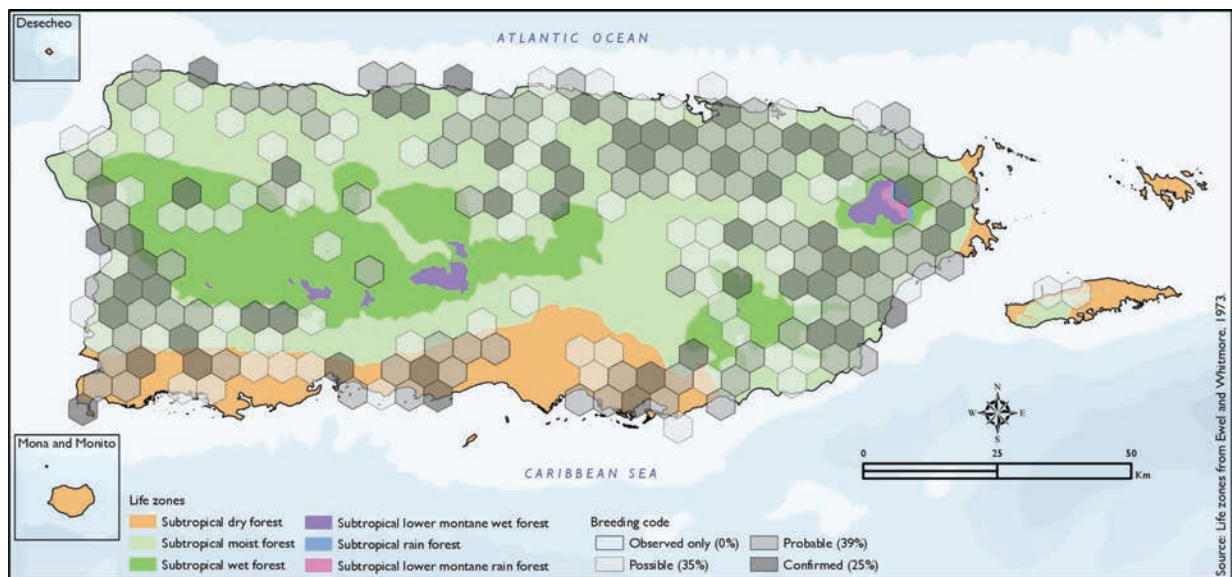


Photo by Guillermo Plaza

### Distribution and Habitat

The Bronze Mannikin is a species widespread in Africa (Oberle 2018) and a common resident in Puerto Rico, where it was likely introduced during the early colonial era (Raffaele and others 1998). In Puerto Rico, this species commonly occurs in lowland gardens, weedy lots (Oberle 2018), fields, lawns, and almost all habitats where grass seeds are available (Raffaele and others 1998). It has also been reported for Culebra (Ventosa-Febles and others 2005) and Vieques islands (Gemmill 2015). It is generally seen at elevations

lower than 300 m (Oberle 2018), but it has been seen above 450 m (Biaggi 1997). The atlas fieldwork yielded a total of 331 records within 213 hexagons or 44 percent of the 479 total hexagons (see map). Of the 213 hexagons where this species was found, breeding met the atlas definition of confirmed in 25 percent (54) of the hexagons, probable in 39 percent (84), and possible in 35 percent (74), while the species was observed in an additional hexagon (<1 percent) but without evidence of breeding (see map).



Bronze Mannikin distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that Bronze Mannikin breeding extends from March to October (Raffaele and others 1998). The nests are round-shaped structures made of hay and dried grass (Biaggi 1997). Atlas results show that this species breeds throughout the year with the most breeding activity during May and June. (see chart). Breeding peaks in June, and the breeding activity mostly takes place within the subtropical moist forest life zone.

Results show that this species mostly breeds in lowlands within the subtropical moist forest life zone (74 percent of the hexagons) (see table). However, results also indicate that this species breeds in the subtropical dry (17 percent of the hexagons) and subtropical wet forest (9 percent of the hexagons) life zones as well (see table and map).

**Population Status and Conservation**

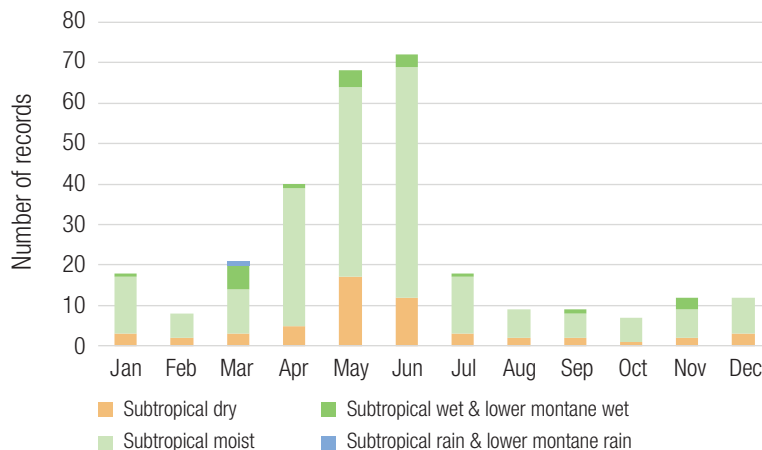
The global population size for the Bronze Mannikin has not been quantified or assessed,

but the species is described as ‘common and widespread’ (Clement 1999). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Bronze Mannikin has a protected habitat in land of 10 percent or 512 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (5069 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Bronze Mannikin breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	8	15	43	80	2	4	1	2	54
Probable	17	20	61	73	6	7	0	0	84
Possible	12	16	52	70	10	14	0	0	74
<b>Total</b>	<b>37</b>	<b>17</b>	<b>156</b>	<b>74</b>	<b>18</b>	<b>9</b>	<b>1</b>	<b>&lt;1</b>	<b>212</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Bronze Mannikin records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Indian Silverbill/Gorrión Picoplata

## *Euodice malabarica*

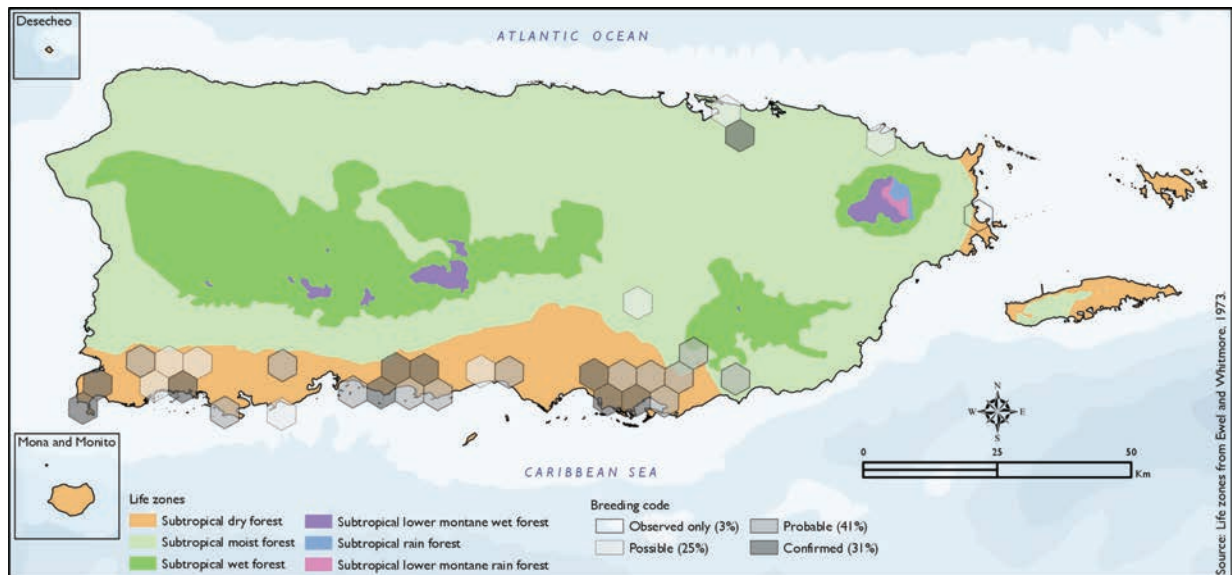


Photo by Gloria Archilla

### Distribution and Habitat

The Indian Silverbill is native to India, Sri Lanka, the Arabian Peninsula, Pakistan, and Nepal (Restall 1997). It is a popular cage bird that has been introduced into many countries and is established as a breeding nonnative species in Jamaica, the Virgin Islands (St. Croix), and Puerto Rico (Camacho Rodríguez and others 1999, Raffaele and others 1998). The species was first recorded in Puerto Rico in 1971 (Raffaele and Kepler 1992) and has been described as locally common in the coastal regions, particularly along the southwestern coast, as well as in the metropolitan area of San

Juan, occurring locally west to Dorado (Raffaele and others 1998). The species usually occurs in scrub and bushy areas around human habitation, and in Puerto Rico it occurs in arid pastures and gardens where grass is in seed (Raffaele 1983). The atlas fieldwork yielded a total of 42 records within 32 hexagons or 7 percent of the 479 total hexagons (see map). Of the 32 hexagons where this species was found, breeding was confirmed in 31 percent (10) of the hexagons, probable in 41 percent (13), and possible in 25 percent (8), while the species was observed in 3 percent (1) of the hexagons but without evidence of breeding (see map).



Indian Silverbill distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

The Indian Silverbill builds a domed grass nest with a side entrance, usually in trees or on window ledges (Raffaele and others 1998). Previously published reports indicate that it breeds primarily from June to November but also in other months (Raffaele and others 1998). Atlas results indicate that this species' breeding season extends throughout the year with the most breeding activity during June, although no data were available for February (see chart). Though breeding mostly occurs in the subtropical dry

forest life zone, results show that some breeding activity occurs in the subtropical moist forest life zone during March and June (see chart). Results show that this species breeds mostly along the southern coast within the subtropical dry forest life zone (81 percent of the hexagons) (see map and table). It also breeds within the subtropical moist forest life zone in the coastal plain (19 percent of the hexagons) (see table and map).

**Population Status and Conservation**

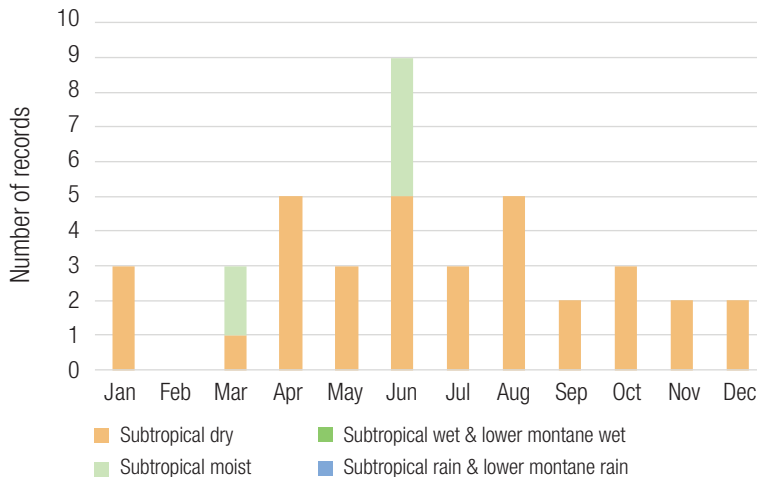
The global population size for the Indian Silverbill has not been

assessed, but it is described as 'common or locally common' (Clement 1999). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Indian Silverbill has a protected habitat in land of about 9 percent or 65 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (743 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Indian Silverbill breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	9	90	1	10	0	0	0	0	10
Probable	11	85	2	15	0	0	0	0	13
Possible	5	63	3	38	0	0	0	0	8
<b>Total</b>	<b>25</b>	<b>81</b>	<b>6</b>	<b>19</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>31</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Indian Silverbill records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Java Sparrow/Gorrión de Java

*Lonchura oryzivora*



Photo by Jordi Salguero Roig

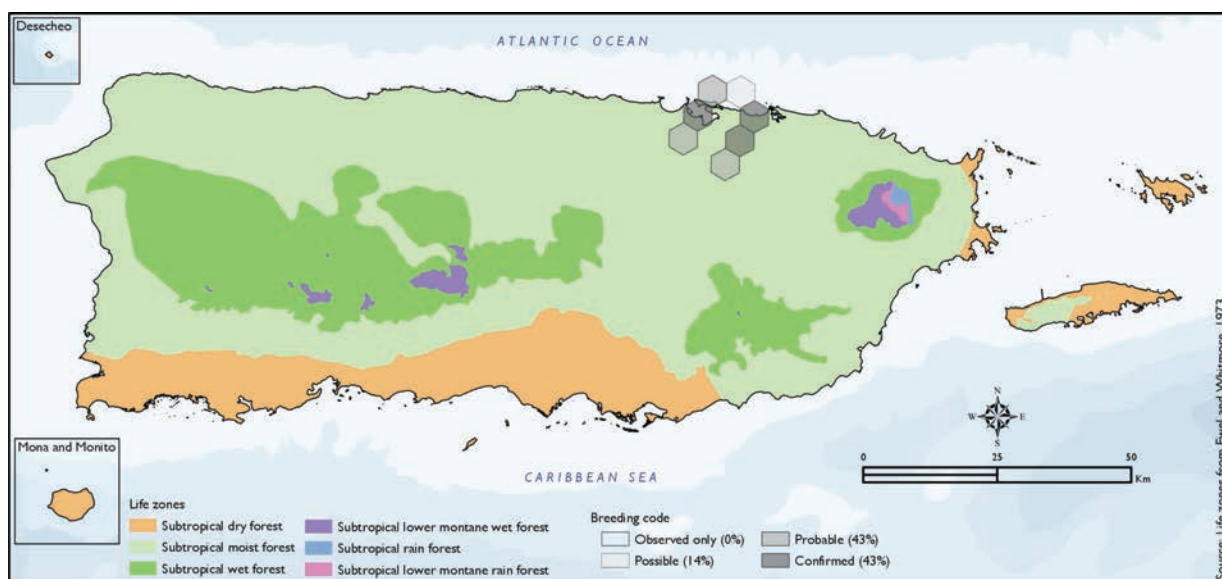
## Distribution and Habitat

The Java Sparrow is native to Java, Sumatra, and Bali, and has been introduced to Puerto Rico, Jamaica (Camacho Rodríguez and others 1999, Raffaele and others 1998), Hawaii, and other tropical regions (Oberle 2018). In Puerto Rico, it is established and fairly common in metropolitan San Juan (Oberle 2018, Raffaele and others 1998), and it is one of the most common bird species in Old San Juan (Oberle 2018). Habitat includes mostly urban areas with short grass and lawns with seeding grasses (Raffaele and others 1998). In its native habitat, it is considered a pest in rice fields (Oberle 2018).

The atlas fieldwork yielded a total of 11 records within seven hexagons or 1.4 percent of the 479 total hexagons (see map). Of the seven hexagons where this species was found, breeding met the atlas definition of confirmed in 43 percent (three) of the hexagons, probable in 43 percent (three), and possible in 14 percent (one) (see map).

## Breeding Ecology

Previously published reports indicate that the Java Sparrow breeds from July to February (Raffaele and others 1998). The nest is usually made of grass and is built in a crevice, window ledge (Raffaele and others



Java Sparrow distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



1998), hole, or under eaves of a building (Oberle 2018). Atlas results show that this species breeds mostly from May to July and to a lesser extent during August and November, and the breeding activity peaks in May (see chart). Results show that this species breeds in the subtropical moist forest life zone (100 percent of the hexagons) (see table and map).

**Population Status and Conservation**

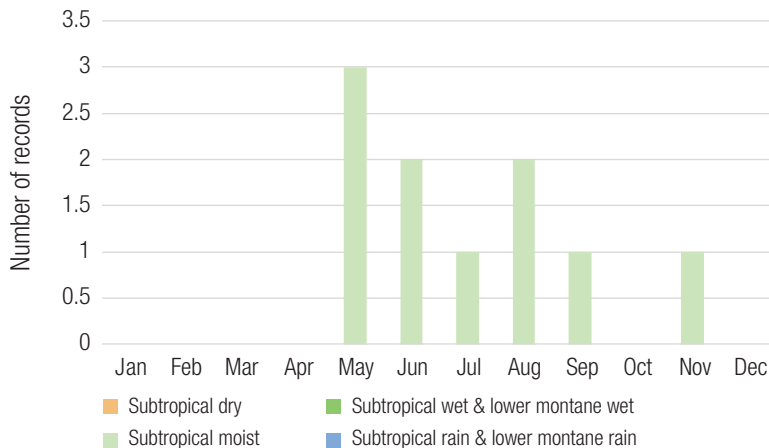
The current population trend of the Java Sparrow is described as ‘decreasing’ in its native range

(BirdLife International 2018, Yuda 2008). This species is currently listed as Endangered by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Java Sparrow has a protected habitat in land of 5 percent or 7 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (143 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Java Sparrow breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	3	100	0	0	0	0	3
Probable	0	0	3	100	0	0	0	0	3
Possible	0	0	1	100	0	0	0	0	1
<b>Total</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>7</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Java Sparrow records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Scaly-breasted Munia/Gorrión Canela

## *Lonchura punctulata*

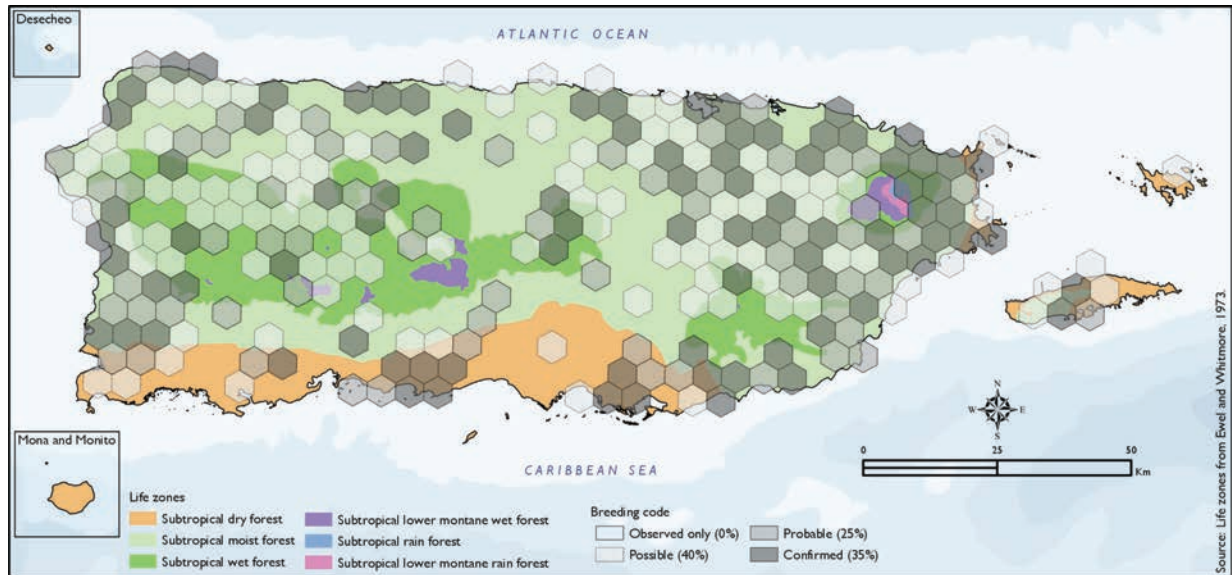


Photo by Guillermo Plaza

### Distribution and Habitat

The Scaly-breasted Munia is native from India and Pakistan to southeastern Asia, Taiwan, and the Philippines (Restall 1997), and has been introduced to Cuba, Jamaica, the Dominican Republic, Puerto Rico, and Guadeloupe (Camacho Rodríguez and others 1999, Raffaele and others 1998). Introduced to Puerto Rico in 1971 (Raffaele and Kepler 1992), it is common from Ceiba to Vega Baja and occurs less frequently in lowlands throughout the island. It has also been reported from Culebra (J.A. Salguero-Farías, personal observation 2009) and Vieques islands, in

the latter being a rare resident throughout the year (Gemmill 2015). The species usually occurs in lowland open areas with grasses, borders of sugarcane plantations, agricultural areas, road edges, and parks in urban areas (Raffaele and others 1998). Atlas fieldwork yielded a total of 388 records within 247 hexagons or 52 percent of the 479 total hexagons (see map). Of the hexagons where the Scaly-breasted Munia was found, breeding met the atlas definition of confirmed in 35 percent (86) of the hexagons, probable in 25 percent (61), and possible in 40 percent (100) (see map).



Scaly-breasted Munia distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the Scaly-breasted Munia breeds primarily from June to October (Raffaele and others 1998). Nests are bulky and dome-shaped, usually built at a moderate height in trees (Raffaele and others 1998). Atlas results show that this species’ breeding season extends throughout the year with the most breeding activity from March to July (see chart). The breeding activity peaks in June after the onset of the rainy season, and breeding mostly occurs in the subtropical moist forest life zone (see chart).

Results show that this species breeds mostly in lowlands within the subtropical moist forest life zone (66 percent of the hexagons) (see table and map). However, results indicate that it also breeds at higher elevations within the subtropical wet forest life zones (19 percent of the hexagons), as well as in the coastal plains of the subtropical dry forest life zone (15 percent of the hexagons) (see table and map).

**Population Status and Conservation**

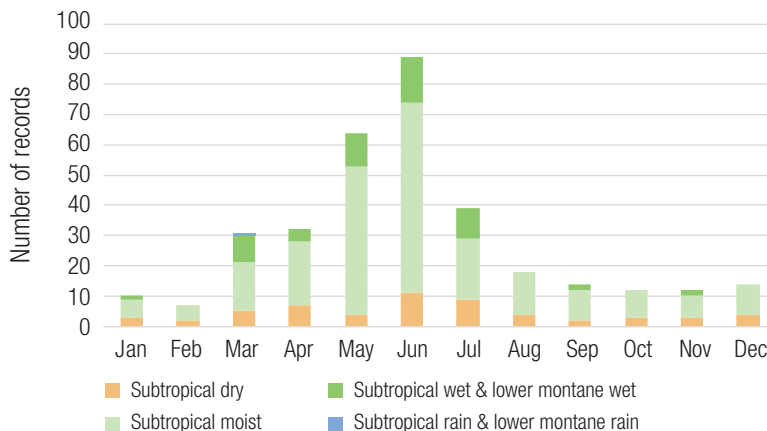
The global population size for the Scaly-breasted Munia has not been quantified or assessed,

but it is described as ‘abundant, common or locally common’ (Clement 1999). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Scaly-breasted Munia has a protected habitat in land of about 10 percent or 620 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (5905 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Scaly-breasted Munia breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	14	16	60	70	11	13	1	1	86
Probable	10	16	42	69	9	15	0	0	61
Possible	13	13	61	61	26	26	0	0	100
<b>Total</b>	<b>37</b>	<b>15</b>	<b>163</b>	<b>66</b>	<b>46</b>	<b>19</b>	<b>1</b>	<b>&lt;1</b>	<b>247</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Scaly-breasted Munia records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Tricolored Munia/Monjita Tricolor

## *Lonchura malacca*



Photo by José Salguero

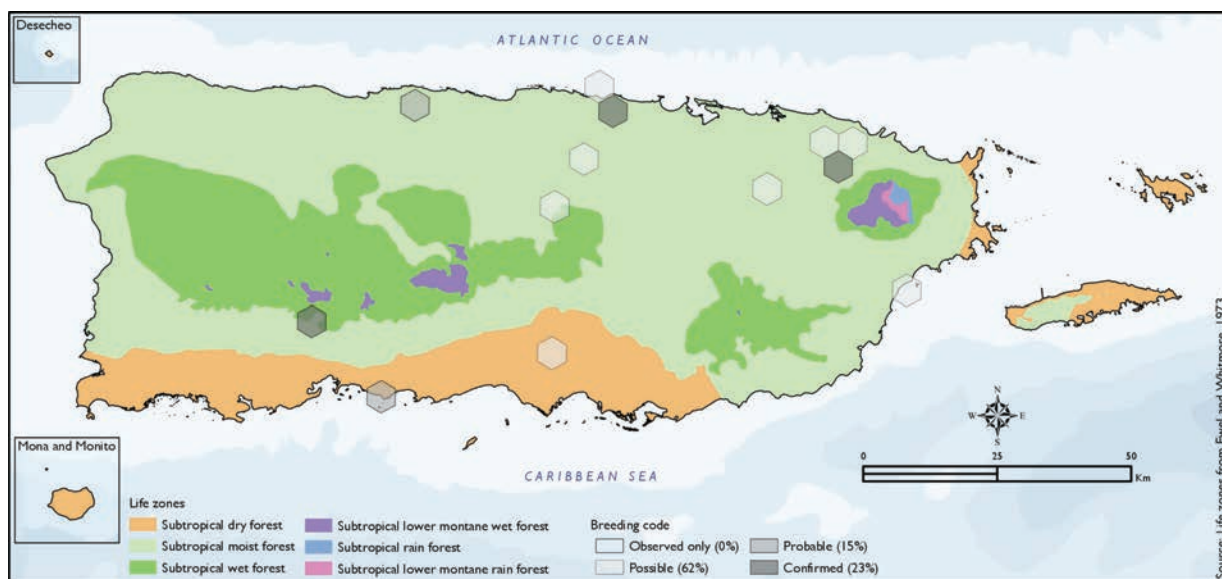
### Distribution and Habitat

The Tricolored Munia is a species native from India through southeastern Asia to Taiwan, Indonesia, and the Philippines (Raffaele and others 1998). It is a nonnative species in Puerto Rico, which occurs around the entire coast in association with high grass next to sugarcane fields, “swampy areas,” croplands with seeding grass, and canals (Raffaele and others 1998, Restall 1997). It was brought to the island as a cage bird in 1971 and subsequently became naturalized (Raffaele and Kepler 1992). The atlas fieldwork yielded a total of 13 records within 13 hexagons or 3 percent of the 479 total

hexagons (see map). Of the 13 hexagons where this species was found, breeding met the atlas definition of confirmed in 23 percent (three) of the hexagons, probable in 15 percent (two), and possible in 62 percent (eight) (see map).

### Breeding Ecology

Previously published reports indicate that the Tricolored Munia breeds primarily from June to September (Raffaele and others 1998). In Puerto Rico, the nests are bulky structures built from 1 to 3 m above the ground in dense sugarcane (Raffaele 1983), but in the municipality of Humacao it has been found



Tricolored Munia distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

nesting in clumps of sedges (*Cyperus* spp.) growing on top of coconut palm (*Cocos nucifera*) stumps (Burger and Gochfeld 1989). Atlas results suggest that this species breeds mostly from March to July and to a lesser extent in January, September, and October (see chart). Breeding peaks in May, and breeding mostly occurs within the subtropical moist forest life zone (see chart). Results show

that this species breeds mostly in lowlands within the subtropical moist forest life zone (85 percent of the hexagons) (see table and map).

**Population Status and Conservation**

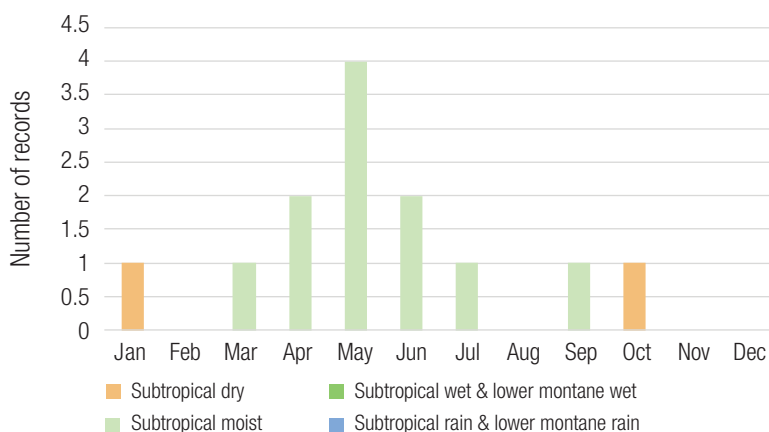
The global population size for the Tricolored Munia has not been quantified or assessed, but the species is described as ‘locally common’ (Clement 1999).

This species is currently listed as a species of least concern by the IUCN (BirdLife International 2018). In Puerto Rico, the Tricolored Munia has a protected habitat in land of about 6.1 percent or 19 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (310 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Tricolored Munia breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	0	0	3	100	0	0	0	0	3
Probable	1	50	1	50	0	0	0	0	2
Possible	1	13	7	88	0	0	0	0	8
<b>Total</b>	<b>2</b>	<b>15</b>	<b>11</b>	<b>85</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>13</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Tricolored Munia records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# House Sparrow/Gorrión Doméstico

## *Passer domesticus*



Photo by Carina Roig

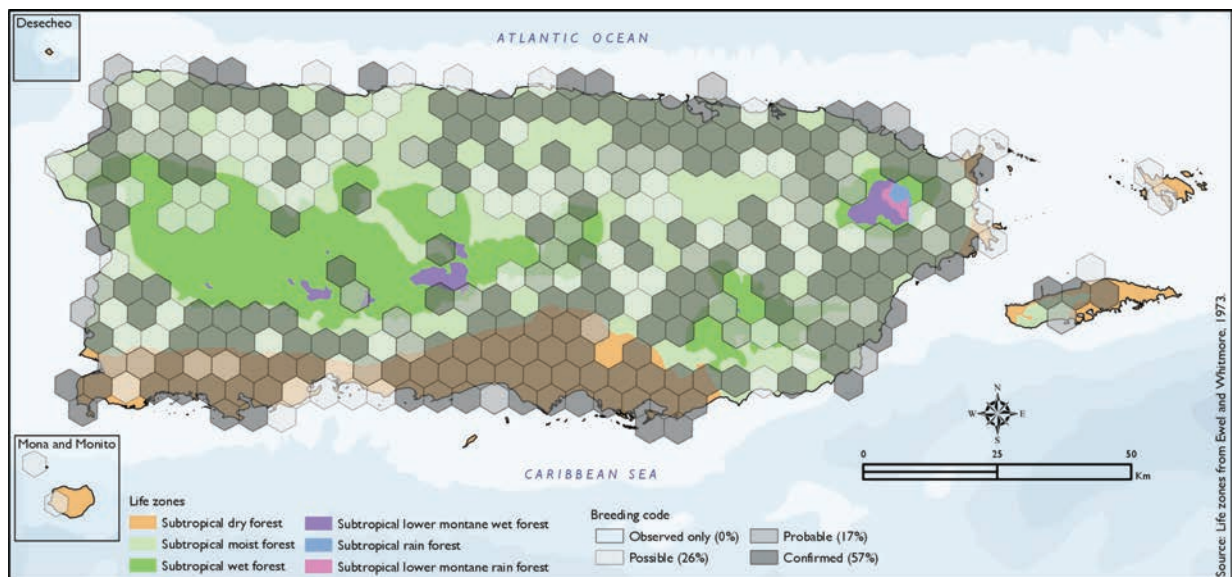
### Distribution and Habitat

The House Sparrow is native to Eurasia and Africa, and has been introduced to the West Indies. It is locally common in urban areas throughout Puerto Rico, and it has spread during the last decades from the south coast through the entire coastal plain (Raffaele and others 1998). It also occurs on Vieques where it is a fairly common resident (Gemmill 2015), as well as Culebra and Mona (Ventosa-Febles and others 2005). Its habitat consists mostly of urban areas (Oberle 2018, Raffaele and others 1998). The atlas fieldwork yielded a total of 584 records within 306 hexagons or 64 percent of the 479 total

hexagons (see map). Of the 306 hexagons where this species was found, breeding met the atlas definition of confirmed in 57 percent (173) of the hexagons, probable in 17 percent (53), and possible in 26 percent (80) (see map).

### Breeding Ecology

The House Sparrow generally builds a small cup-shaped bulky nest that is often placed in trees of gardens or parks, roofs, holes in walls, light posts, pipes, or any other type of cavity in urban areas (Oberle 2018, Raffaele and others 1998). Previously published reports indicate that breeding occurs throughout the



House Sparrow distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

year but mostly from March to September (Raffaele and others 1998). Atlas results show that this species breeds throughout the year with the most breeding activity from March to June (see chart). Overall, the breeding activity peaks in June, and it mostly takes place within the subtropical moist forest life zone (see chart). Results (see table and map) show that this species breeds mostly within the subtropical moist forest life zone (66 percent of the hexagons)

but also in the subtropical dry forest life zone (24 percent of the hexagons) and at higher elevations within the subtropical wet forest life zone (10 percent of the hexagons).

**Population Status and Conservation**

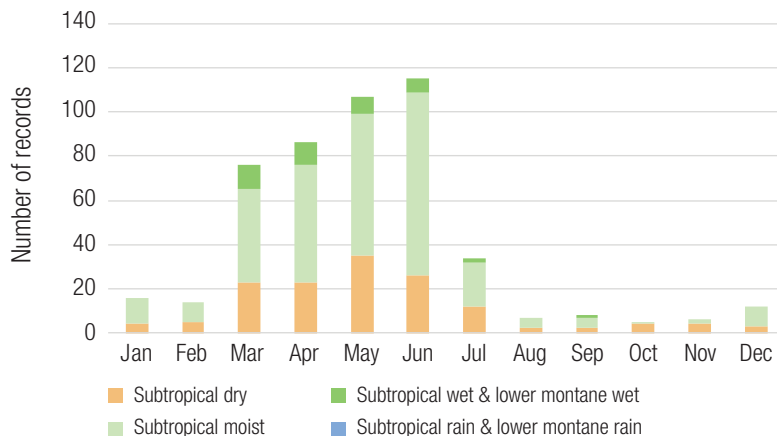
The current population trend for the House Sparrow is described as ‘decreasing’ in many urban areas of Europe (De Laet and Summers-Smith 2007). This species is currently listed as a

species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the House Sparrow has a protected habitat in land of 11 percent or 826 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (7318 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where House Sparrow breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	50	29	113	65	10	6	0	0	173
Probable	7	13	37	70	9	17	0	0	53
Possible	16	20	53	66	11	14	0	0	80
<b>Total</b>	<b>73</b>	<b>24</b>	<b>203</b>	<b>66</b>	<b>30</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>306</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of House Sparrow records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Antillean Euphonia/Jilguero

## *Euphonia musica*

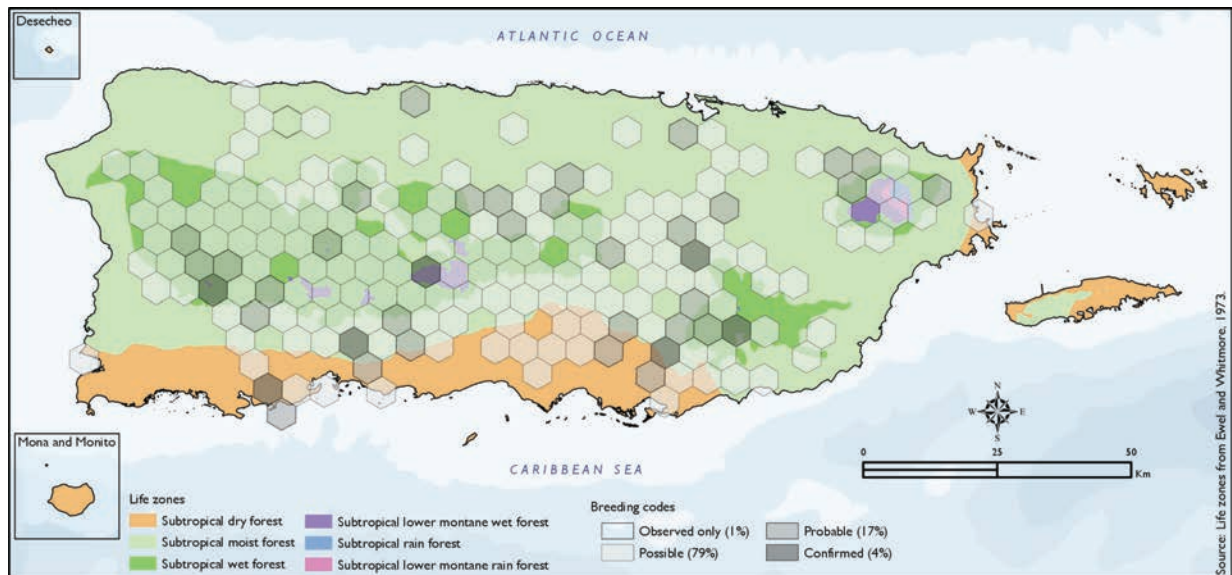


Photo by Guillermo Plaza

### Distribution and Habitat

The Antillean Euphonia occurs on Hispaniola, Puerto Rico, and many of the islands throughout the eastern Caribbean (Oberle 2018). It is a resident species in Puerto Rico (Raffaele 1989a), where it is common in mountain forests, the northern karst region, and dry forests within the southwestern area (Ventosa-Febles and others 2005). On Vieques, the species is described as a rare former breeder for which an attempted re-introduction failed to re-establish the species (Gemmill 2015). This species inhabits mountain forests, shade coffee plantations, lowland dry scrub forests (Oberle 2018), and the dry hills of the south coast up to the rainy dwarf forest at the highest elevations (Raffaele

1989a). The Antillean Euphonia feeds heavily on the fruits of mistletoes (Loranthaceae), hemiparasitic plants found on trees. The availability of these fruits may influence the species' distribution. The atlas fieldwork yielded a total of 273 records within 185 hexagons or 39 percent of the 479 total hexagons (see map). Of the 185 hexagons where this species was found, breeding met the atlas definition of confirmed in 4 percent (7) of the hexagons, probable in 17 percent (31), and possible in 79 percent (146), while the species was observed in 1 percent (1) of the hexagons but without evidence of breeding (see map). The species was not found on Vieques and Culebra during atlas surveys.



Antillean Euphonia distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

The Antillean Euphonia is a diurnal species that nests on trees or among vines, epiphytes, or forest palms from January to July, according to previously published reports (Oberle 2018). Atlas results show that Antillean Euphonia breeding activity extends throughout the year but is most active from March to June, with a peak in June (see chart). This seasonal pattern of Antillean Euphonia breeding appears to coincide in each of the life zones with no evidence to suggest breeding times differ

among the life zones. Results show that the Antillean Euphonia mostly breeds within the subtropical moist forest life zone (49 percent of the hexagons). Breeding for this species was also reported for the subtropical wet and lower montane wet forest life zones (39 percent of the hexagons), the subtropical dry forest life zone (12 percent of the hexagons), and for only one hexagon (1 percent of hexagons) in the subtropical rain and lower montane rain forest life zones (see table and map).

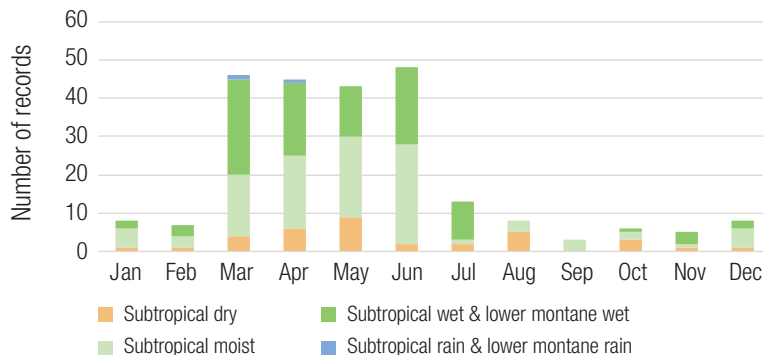
**Population Status and Conservation**

The Antillean Euphonia is listed as a species of least concern by the IUCN (BirdLife International 2017). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Antillean Euphonia has a protected habitat in land of 14 percent or 604 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (4402 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Antillean Euphonia breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	1	14	3	43	3	43	0	0	<b>7</b>
Probable	4	13	18	58	9	29	0	0	<b>31</b>
Possible	17	12	69	47	59	40	1	1	<b>146</b>
<b>Total</b>	<b>22</b>	<b>12</b>	<b>90</b>	<b>49</b>	<b>71</b>	<b>39</b>	<b>1</b>	<b>1</b>	<b>184</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Antillean Euphonia records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and broken down for the different life zones.

# Grasshopper Sparrow/Gorrión Chicharra

## *Ammodramus savannarum*

### Distribution and Habitat

The Grasshopper Sparrow is widespread from North America to northwestern South America including the West Indies, where it is a common year-round resident on Puerto Rico, Hispaniola, and Jamaica (Raffaele and others 1998). It is a common resident in grasslands of Puerto Rico (Oberle 2018), and it has also been reported on Vieques, where it is considered an extremely rare resident in winter, spring, and summer (Gemmill 2015). Habitat includes mostly weedy fields and pastures with tall grasses (Oberle 2018, Raffaele and others 1998). The atlas fieldwork yielded a total of

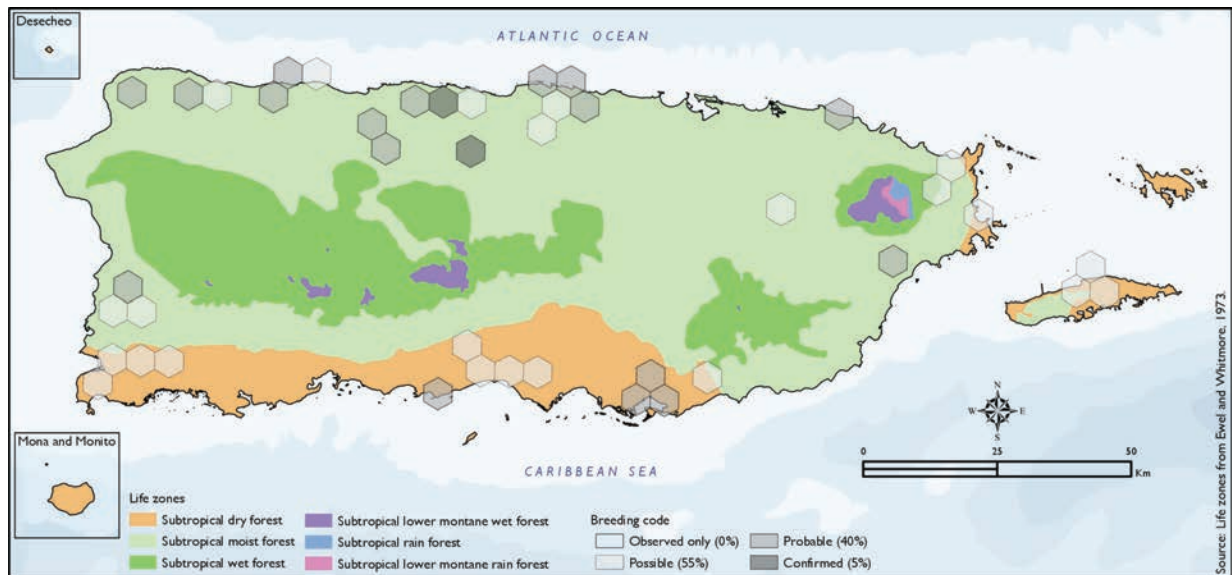
66 records within 42 hexagons or 9 percent of the 479 total hexagons (see map). Of the 42 hexagons where this species was found, breeding met the atlas definition of confirmed in 5 percent (2) of the hexagons, probable in 40 percent (17), and possible in 55 percent (23) (see map).

### Breeding Ecology

Previously published reports indicate that the Grasshopper Sparrow breeds primarily from May to August but also in other months (Raffaele and others 1998). The nest consists of a dome-shaped structure that is usually made of dry weeds,



Photo by Guillermo Plaza



Grasshopper Sparrow distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

rootlets and hairs, and is built hidden in the grass or ground (Biaggi 1997). Atlas results show that this species basically breeds throughout the year with the most breeding activity from May to July (see chart). The breeding activity peaks in May, and it mostly takes place within the subtropical moist forest life zone (see chart). Results show that this species breeds mostly on the coastal plain and mostly within the subtropical moist forest life zone (57 percent of the hexagons), but it also

breeds within the subtropical dry forest life zone (40 percent of the hexagons) and rarely in the subtropical wet and lower montane wet forest life zones at higher elevations (2 and 2 percent of the hexagons, respectively) (see table and map).

**Population Status and Conservation**

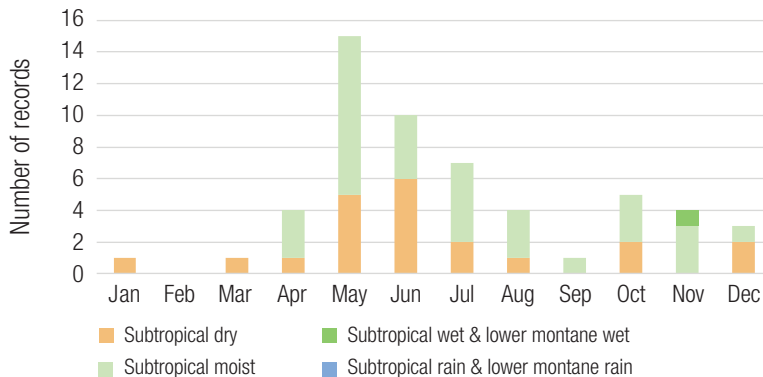
The current population trend for the Grasshopper Sparrow is described as ‘decreasing’ in North America (Butcher and

Niven 2007). Nonetheless, it is currently listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Grasshopper Sparrow has a protected habitat in land of about 17 percent or 166 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (1004 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Grasshopper Sparrow breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	2	100	0	0	0	0	2
Probable	4	24	13	76	0	0	0	6	17
Possible	13	57	9	39	1	4	0	0	23
<b>Total</b>	<b>17</b>	<b>40</b>	<b>24</b>	<b>57</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>42</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Grasshopper Sparrow records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by Pedro W. Santana

# Puerto Rican Tanager/Llorosa

## *Nesospingus speculariferus*

mountain region surrounding Maricao and Los Tres Picachos State Forest (Miranda-Castro and others 2000). In addition, it has also been documented in the Carite Forest (Raffaele 1989a), other higher montane forests, and a second-growth forest near Cidra (Raffaele 1989a). In the early 1900s, it was restricted to montane regions at a limited number of locations such as Maricao, Toro Negro and Carite State Forests, El Yunque National Forest, and near Cidra. Nevertheless, this species has recently expanded its distribution range to other suitable habitats in municipalities such as Comerío, Aibonito, Baranquitas, Adjuntas, and the haystack hills of Ciales (Oberle 2018). The species occurs primarily in undisturbed mountain forests but can also be seen in disturbed second-growth

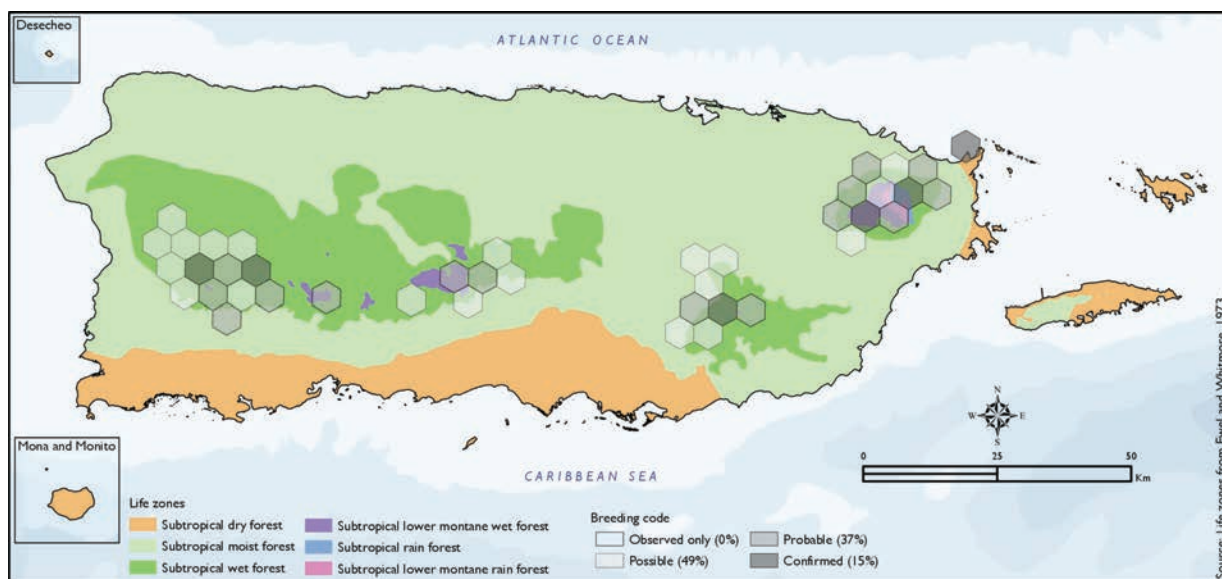
forests (Raffaele and others 1998) and is restricted mainly to the subtropical moist, wet, and montane forest life zones (Biaggi 1997, Raffaele 1989a). The atlas fieldwork yielded a total of 82 records within 41 hexagons or 8.5 percent of the 479 total hexagons (see map). Of the 41 hexagons where this species was found, breeding met the atlas definition of confirmed in 15 percent (6) of the hexagons, probable in 37 percent (15), and possible in 49 percent (20) (see map).

### Distribution and Habitat

The Puerto Rican Tanager is endemic to Puerto Rico and is placed in its own family (Nesospingidae), representing the only endemic family known from Puerto Rico. It is commonly found in humid montane forests in the Sierra de Luquillo, Toro Negro State Forest, and the western

### Breeding Ecology

Previously published reports indicate that the Puerto Rican Tanager breeding extends from January through August (Raffaele 1998), but active nests have also been seen in September (Pérez-



Puerto Rican Tanager distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

Rivera 1993). The nests are cup-shaped, built from 2 to 10 m above the ground (Raffaele 1998), and are usually made of vines, roots of epiphytes, and fibers of sierra palm leaves (Pérez-Rivera 1993). Formation of pairs starts in May, and nesting is usually completed by August (Recher and Recher 1966). The nesting territories are usually defended from late December to the end of July (Pérez-Rivera 1993). Atlas results indicate that the breeding season extends from November through July (see chart). The breeding pattern peaks during May at the onset of the rainy season, and the breeding activity mostly takes place in humid montane areas within the subtropical wet forest life zone. However, an unusual

observation at the eastern coast of the island suggests that this species also breeds in the subtropical dry forest life zone during December. Results show that this species breeds mostly at high elevations in the subtropical wet and lower montane wet forest life zones (71 percent of the hexagons), as well as other mountain regions within the subtropical moist forest life zone (24 percent of the hexagons) (see table and map). It also breeds in the subtropical rain and lower montane rain forest life zones located in the Sierra de Luquillo (2 percent of the hexagons), and in a coastal locality at the eastern region within the subtropical dry forest life zone (2 percent of the hexagons) (see table and map).

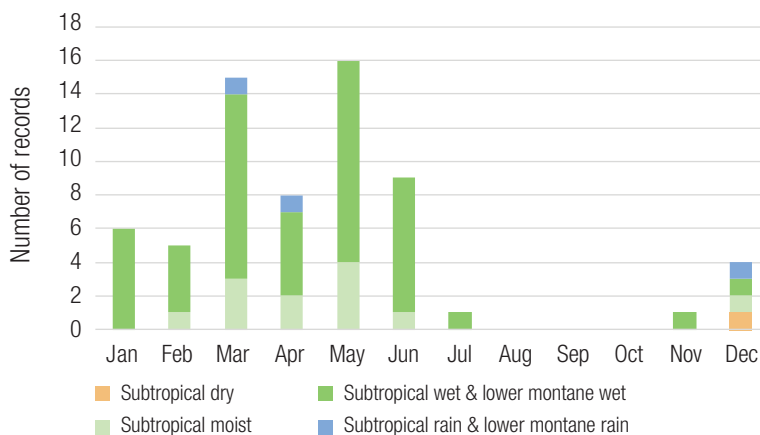
**Population Status and Conservation**

The population size for the Puerto Rican Tanager has not been quantified or assessed, but it is described as ‘fairly common’ (Stotz and others 1996). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Puerto Rican Tanager has a protected habitat in land of about 21 percent (205 km<sup>2</sup>) of the total area covered by the hexagons where evidence of breeding was found for this species (980 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Puerto Rican Tanager breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	1	17	0	0	4	67	1	17	6
Probable	0	0	4	27	11	73	0	0	15
Possible	0	0	6	30	14	70	0	0	20
<b>Total</b>	<b>1</b>	<b>2</b>	<b>10</b>	<b>24</b>	<b>29</b>	<b>71</b>	<b>1</b>	<b>2</b>	<b>41</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Puerto Rican Tanager records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Puerto Rican Spindalis/Reinamora

## *Spindalis portoricensis*



Photo by Victor Cuevas

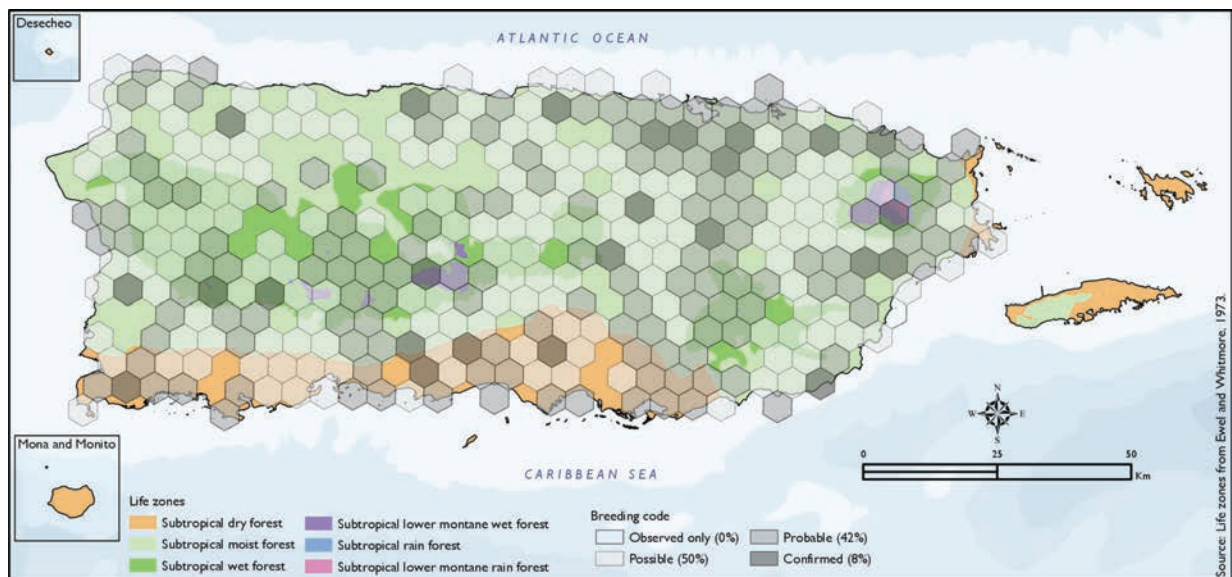
### Distribution and Habitat

The Puerto Rican Spindalis is an endemic species restricted to the main island of Puerto Rico where it is widespread (Oberle 2018, Raffaele 1989a). This species inhabits varied habitats, from forests to gardens and plantations (Biaggi 1997, Oberle 2018, Raffaele 1989a). The atlas fieldwork yielded a total of 627 records within 330 hexagons or 69 percent of the 479 total hexagons (see map). Of the 330 hexagons where this species was found, breeding met the atlas definition of confirmed in 8 percent (25) of the hexagons, probable in 42 percent (138), and possible in 50 percent

(166), while the species was observed in an additional hexagon (<1 percent) but without evidence of breeding. In addition, there were no records of the Puerto Rican Spindalis in Puerto Rico's outer islands (see map).

### Breeding Ecology

The Puerto Rican Spindalis is an abundant bird that breeds from January to June, according to previously published reports (Biaggi 1997). The nest consists of a loose cup of vegetation and is usually built low in a bush, tree, or palm (Raffaele and others 1998). Atlas results indicate an increase in breeding



Puerto Rican Spindalis distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

activity from March to June, and most breeding occurs in the subtropical moist forest life zone (see chart). Results show that this species breeds in all subtropical forest life zones (see table and map). It was recorded in the subtropical moist forest life zone (61 percent of the hexagons), subtropical wet and lower montane wet forest life zones (22 percent of the hexagons), and subtropical dry forest life zone (16 percent of the hexagons). There was

one observation (classified as probable breeding) located in the subtropical rain and lower montane rain forest life zones.

**Population Status and Conservation**

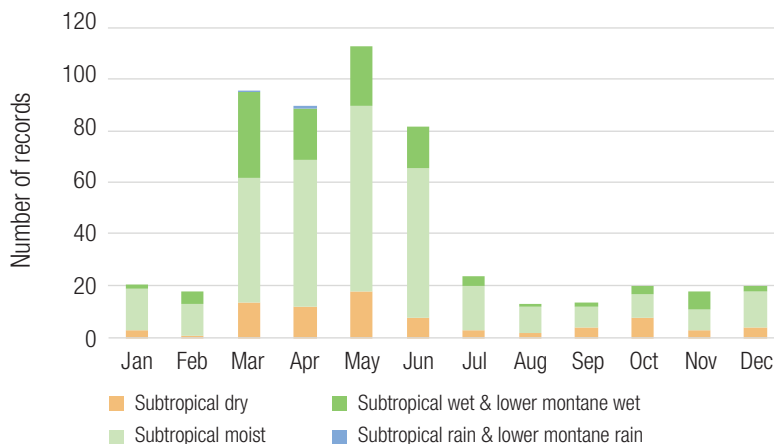
The Puerto Rican Spindalis population is believed to be stable, and it is listed as a species of least concern by the IUCN (BirdLife International 2016). In 2005, this species was locally listed as Data Deficient, but a 2015 assessment classified it

as Low Risk (PRDNER 2015). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Puerto Rican Spindalis has a protected habitat in land of 11 percent or 898 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (7869 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Puerto Rican Spindalis breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	4	16	17	68	4	16	0	10	25
Probable	25	18	80	58	32	23	1	1	138
Possible	24	14	104	63	38	23	0	0	166
<b>Total</b>	<b>53</b>	<b>16</b>	<b>201</b>	<b>61</b>	<b>74</b>	<b>22</b>	<b>1</b>	<b>&lt;1</b>	<b>329</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Puerto Rican Spindalis records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Puerto Rican Oriole/ Calandria de Puerto Rico

*Icterus portoricensis*



Photo by José Salguero

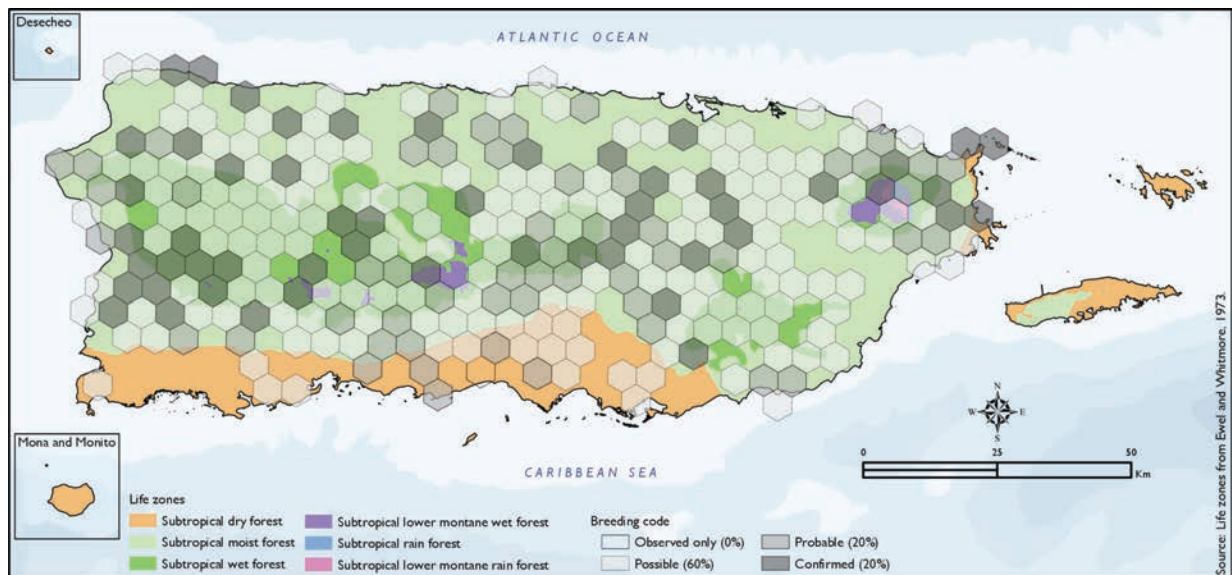
## Distribution and Habitat

The Puerto Rican Oriole is a common endemic species in Puerto Rico (Oberle 2018), whereas its presence in Vieques is unconfirmed (Gemmill 2015). This species occurs in forests, shade coffee plantations, citrus orchards, mangroves, palm groves, and gardens (Oberle 2018), especially where royal palms occur (J.A. Salguero-Farías, personal observation 2009). The atlas fieldwork yielded a total of 431 records within 270 hexagons or 56 percent of the 479 total hexagons (see map). Of the 270 hexagons where this species

was found, breeding met the atlas definition of confirmed in 20 percent (53) of the hexagons, probable in 20 percent (53), and possible in 60 percent (163), while the species was observed in an additional hexagon (<1 percent) but without evidence of breeding (see map).

## Breeding Ecology

Previously published reports indicate that the Puerto Rican Oriole breeds throughout the year, but it is most active from March to June (Raffaele and others 1998). It builds a fibrous hanging nest, which is often



Puerto Rican Oriole distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



placed in a palm tree (Oberle 2018). Atlas results confirm the breeding information described in the literature (see chart). Results show that the Puerto Rican Oriole breeds mostly within the subtropical moist and subtropical wet forest life zones (65 and 26 percent of the hexagons, respectively) (see table and map).

**Population Status and Conservation**

The Puerto Rican Oriole population is in decline owing to ongoing habitat loss and fragmentation (BirdLife International 2016), but it is classified as a species of least concern by the IUCN (BirdLife International 2016). Nonetheless, it is currently threatened by

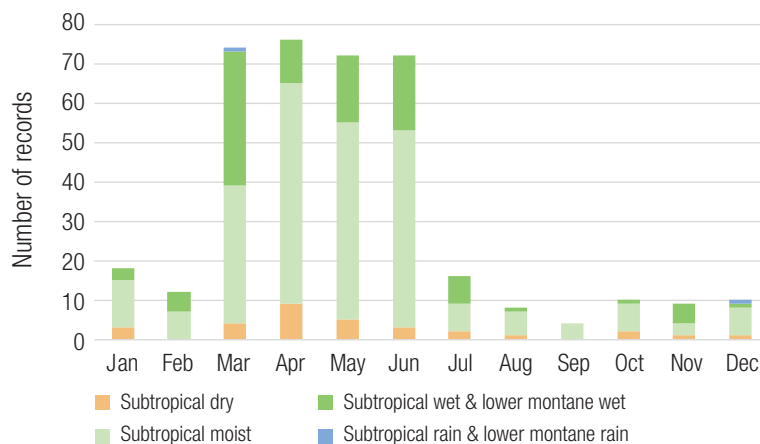
cowbird nest parasitism (Oberle 2018). Locally, this species is listed as Data Deficient (PRDNER 2015). In Puerto Rico, the Puerto Rican Oriole has a protected habitat in land of 12 percent or 794 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (6410 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Puerto Rican Oriole breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	3	6	34	64	16	30	0	0	53
Probable	5	9	38	72	9	17	1	2	53
Possible	15	9	101	62	46	28	0	0	162 <sup>b</sup>
<b>Total</b>	<b>23</b>	<b>9</b>	<b>173</b>	<b>65</b>	<b>71</b>	<b>26</b>	<b>1</b>	<b>&lt;1</b>	<b>268</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.

<sup>b</sup> A different number of total hexagons for each breeding code in this table may not reflect the actual number of hexagons where the species was found breeding, as some of the hexagons in the coastal zone or on the water may not have ecological life zone data.



Number of Puerto Rican Oriole records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Venezuelan Troupial/ Turpial Venezolano

*Icterus icterus*

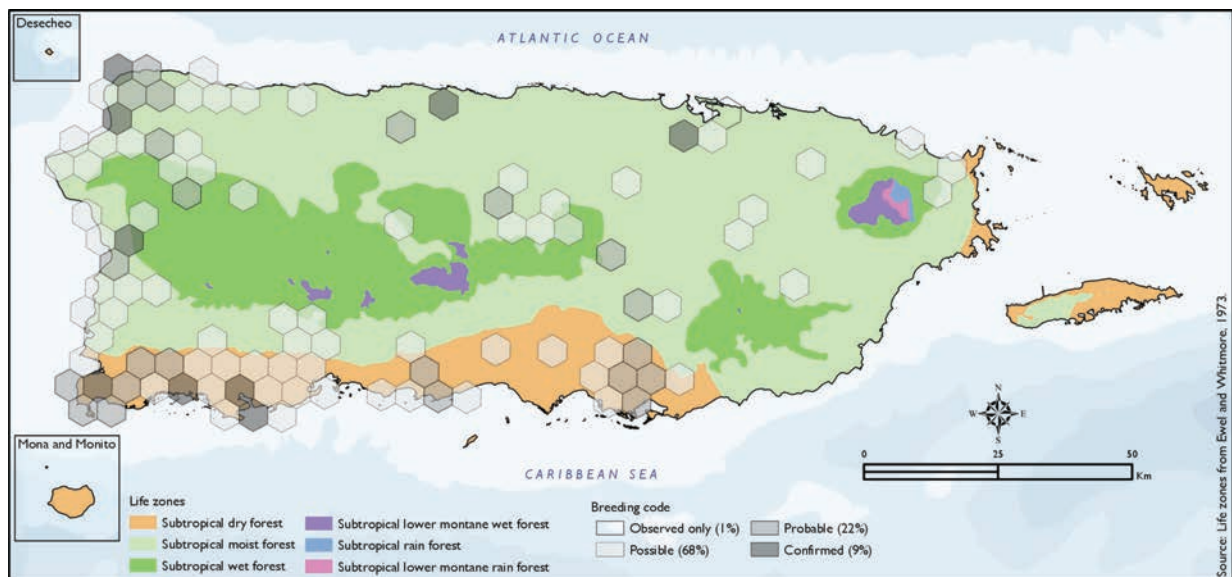


Photo by Carina Roig

## Distribution and Habitat

The Venezuelan Troupial is native to northern South America and islands off the north coast (Jaramillo and Burke 1999), and has been introduced to a number of Caribbean islands (Oberle 2018, Raffaele and others 1998) in association with the pet trade. It is established on Puerto Rico, where it is relatively common in the southwestern region and uncommon throughout the rest of the island (Raffaele and others 1998). No published troupial records are listed in Gemmill (2015). It usually inhabits dry deciduous forests, open wooded country, palm groves, suburban gardens (Oberle 2018), and arid

scrublands (Raffaele and others 1998). The atlas fieldwork yielded a total of 166 records within 101 hexagons or 21 percent of the 479 total hexagons (see map). Of the 101 hexagons where this species was found, breeding met the atlas definitions of confirmed in 9 percent (9) of the hexagons, probable in 22 percent (22), and possible in 68 percent (69), while the species was observed in 1 percent (1) of the hexagons but without evidence of breeding (see map). Atlas fieldwork suggests that the species is expanding its distribution into higher elevations and eastward as also documented by recent records of occurrence in the Fajardo Christmas Bird Count.



Venezuelan Troupial distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the Venezuelan Troupial breeds primarily from March to June (Raffaele and others 1998). The nest is a deep cup-shaped structure that is usually built in a cactus or among thorny scrub (Raffaele and others 1998). Atlas results show that this species breeds throughout the year with the most breeding activity from March to June (see chart). Overall, the breeding activity peaks in May, and during this month it mostly takes place within the subtropical dry forest life zone (see chart). Overall, results (see table and

map) show that this species breeds primarily in lower elevations mostly within the subtropical moist forest life zone (55 percent of the hexagons) and the subtropical dry forest life zone (38 percent of the hexagons) and rarely breeds at higher elevations within the subtropical wet forest life zones (7 percent of the hexagons).

**Population Status and Conservation**

The current global population trend of the Venezuelan Troupial has not been quantified or assessed, but the species is described as ‘fairly common but

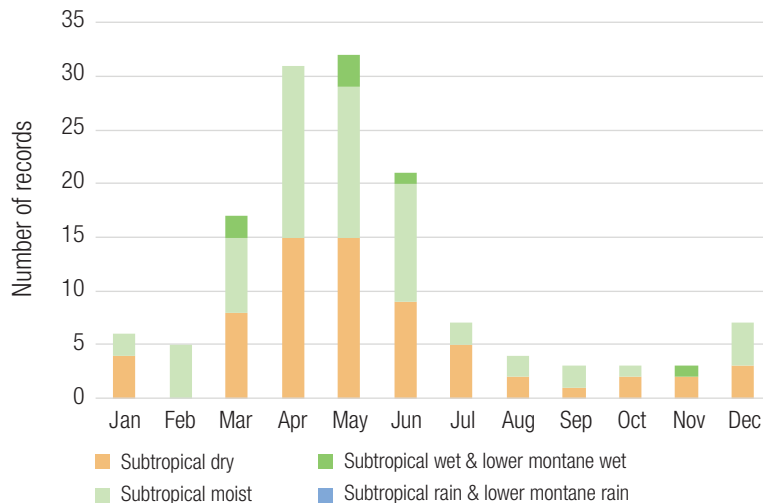
patchily distributed’ (Stotz and others 1996). Due to the lack of evidence for any threats or declines, the overall population is suspected to be ‘stable.’ This species is currently listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Venezuelan Troupial has a protected habitat in land of about 9 percent or 210 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (2372 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Venezuelan Troupial breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	4	44	5	56	0	0	0	0	9
Probable	12	55	9	41	1	5	0	0	22
Possible	22	32	40	59	6	9	0	0	68 <sup>b</sup>
<b>Total</b>	<b>38</b>	<b>38</b>	<b>54</b>	<b>55</b>	<b>7</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>99</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.

<sup>b</sup> A different number of total hexagons for each breeding code in this table may not reflect the actual number of hexagons where the species was found breeding, as some of the hexagons in the coastal zone or on the water may not have ecological life zone data.



Number of Venezuelan Troupial records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by José Salguero

# Yellow-shouldered Blackbird/ Mariquita

## *Agelaius xanthomus*

### Distribution and Habitat

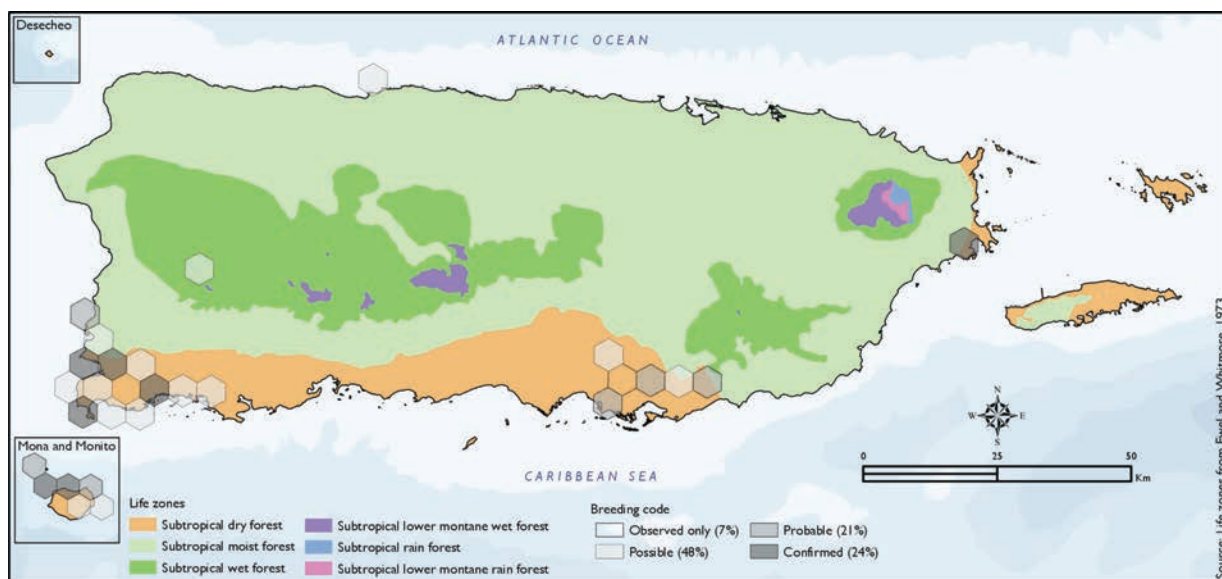
The Yellow-shouldered Blackbird is an endemic and endangered species in Puerto Rico that can be found primarily in mangroves and arid scrubland (Raffaele and others 1998) (see map). The species was once commonly found in the coastal forests of the archipelago of Puerto Rico (Wetmore 1916), but during the early 20th century,

Puerto Rico's coastal forests were destroyed for sugar cane plantations and later for urban development (Post 1981, USFWS 2011). According to Oberle (2018), the Yellow-shouldered Blackbird was formerly found in lowlands around Puerto Rico. At present, the species is primarily limited to four areas: Mona and Monito islands, and three populations in eastern, southern, and southwestern Puerto Rico, where the largest population is found (in the municipalities of Cabo Rojo and Lajas) (USFWS 2011). The species has been observed as far inland as the mountain towns of Lares and Ciales (USFWS 2011). The atlas fieldwork yielded a total of 60 records within 29 hexagons or 6 percent of the 479 hexagons (see map). Of the 29 hexagons where this species was found,

breeding met the atlas definition of confirmed in 24 percent (7) of the hexagons, probable in 21 percent (6), and possible in 48 percent (14), while the species was observed in 7 percent (2) of the hexagons but without evidence of breeding (see map). Atlas results support the current distribution described in the literature for the Yellow-shouldered Blackbird.

### Breeding Ecology

The Yellow-shouldered Blackbird nests in a variety of sites, including cliff crevices or cavities in trees and in palms at the base of palm fronds (Biaggi 1997, Oberle 2018, Post 1981, Raffaele and others 1998). Previously published reports indicate that breeding activity occurs from February to November,



Yellow-shouldered Blackbird distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

but the beginning of the species' breeding season coincides with the onset of the rainy season, which explains the fluctuation in the start and end of the breeding period (USFWS 2011). Atlas results indicate breeding activity occurs year-round, except for the months of August and September, when no breeding data are available (see chart). Most breeding evidence is clustered in the subtropical dry forest life zone (81 percent of the hexagons), followed by the subtropical moist forest life zone (15 percent of the hexagons) and one hexagon in the subtropical wet forest life zone (4 percent of the hexagons) (see table and map).

**Population Status and Conservation**

The Yellow-shouldered Blackbird is listed as Endangered by the IUCN (BirdLife International 2017) and

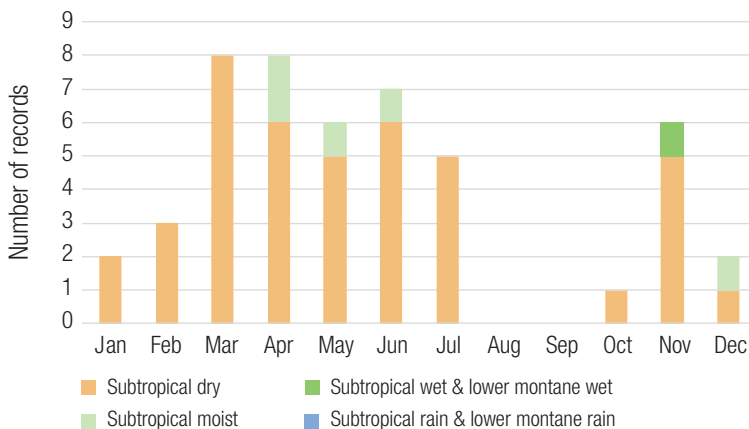
by local and Federal laws (PRDNER 2016; USFWS 1973, 2011). Nest parasitism by the Shiny Cowbird (*Molothrus bonariensis*) is the single most important factor reducing blackbird reproductive output on Puerto Rico (reviewed in Cruz and others [2005]), but other factors including habitat loss, predation, and low effective population size are also affecting the species' population viability (Liu 2016). Trapping of cowbirds and providing blackbirds with nest boxes, which the cowbirds do not enter, has resulted in fewer parasitized blackbird nests, and parasitism declined from 95 percent (from 1973–1983) to <3 percent (from 2000–2003) in the southwestern portion of the island (Cruz and others 2005). The population of blackbirds is less threatened by cowbird parasitism as the female cowbirds will not

enter the cavities in cliffs used for nesting by the blackbirds on Mona. The USFWS considers the Yellow-shouldered Blackbird population to be improving because the population has a high recovery potential with a population size increasing since 1995 and because some of the major threats to the species have been greatly reduced (USFWS 2011). In Puerto Rico, the Yellow-shouldered Blackbird has a protected habitat in land of 16 percent (103 km<sup>2</sup>) of the total area covered by the hexagons where this species is known to breed (648 km<sup>2</sup>). In addition, the PRDNER proposed to designate natural critical habitat in locations within the municipalities of Cabo Rojo, Ceiba, Guánica, Guayama, Lajas, Mayagüez (including Mona and Monito), Salinas, and Santa Isabel (PRDNER 2009).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Yellow-shouldered Blackbird breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	6	86	1	14	0	0	0	0	7
Probable	5	83	1	17	0	0	0	0	6
Possible	11	79	2	14	1	7	0	0	14
<b>Total</b>	<b>22</b>	<b>81</b>	<b>4</b>	<b>15</b>	<b>1</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>27</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Yellow-shouldered Blackbird records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by José Salguero

# Shiny Cowbird/Tordo Lustroso

## *Molothrus bonariensis*

The cowbird is believed to have arrived in Puerto Rico before 1955 (Post and Wiley 1977a), where it is now established (Bond 1961, Raffaele 1989a) and has also colonized the island of Culebra (Sorrié 1975). In Vieques, the cowbird is an uncommon resident in spring, summer, and fall, and rare in winter (Gemmill 2015). This species occurs mostly near livestock in open or brushy fields, but can also be found in gardens, open forests (Oberle 2018), and agricultural areas with available grains (Raffaele and others 1998), as well as into the mountains where suitable habitat is available (Raffaele 1989b, Raffaele and others 1998). The atlas fieldwork yielded a total of 502 records within 317 hexagons or 66 percent of the 479 total hexagons (see map). Of the 317 hexagons

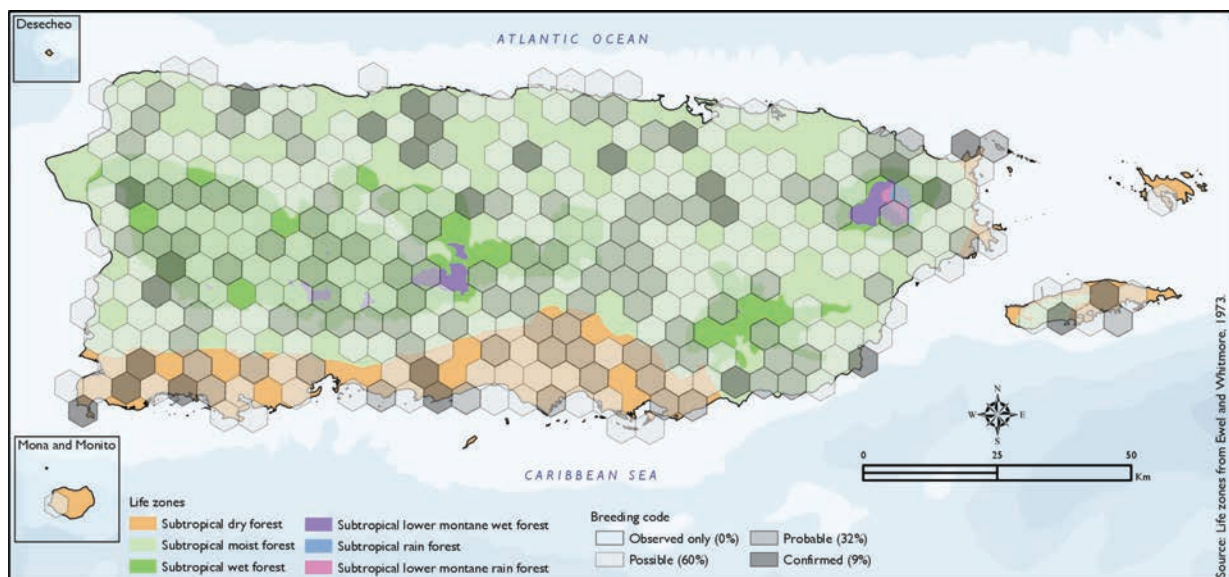
where this species was found, breeding met the atlas definition of confirmed in 9 percent (27) of the hexagons, probable in 32 percent (101), and possible in 60 percent (189) (see map).

### Breeding Ecology

Previously published reports indicate that the Shiny Cowbird breeds primarily from March through July (Raffaele and others 1998). Cowbirds are brood parasites in which the females do not build nests, but rather lay their eggs in the nests of other species, which serve as foster parents, incubate the cowbird eggs and brood, and feed the nestling and fledgling cowbirds. Cowbird nest parasitism has reduced the nesting success of several host species including the endemic Yellow-shouldered Blackbird

### Distribution and Habitat

The Shiny Cowbird is a common resident species native to South America but has expanded its distribution range north throughout the Lesser and Greater Antilles, The Bahamas, and the Southern United States (Cruz and others 1985, Post and Wiley 1977a, Raffaele and others 1998).



Shiny Cowbird distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

(*Agelaius xanthomus*) (Post and Wiley 1977b) and Puerto Rican Vireo (*Vireo latimeri*) (Woodworth 1997). The cowbird is a generalist in terms of host selection as it has been found to parasitize the nests of 27 bird species on Puerto Rico, although these host species differ in their abilities to successfully fledge cowbird young (Wiley 1985). Cowbird breeding tends to coincide with the breeding periods of “high-quality” hosts (i.e., those that fledge >55 percent of cowbird eggs hatched) and not with breeding periods of “low-quality” hosts (i.e., species that fledge <55 percent of cowbird chicks that hatch) (Wiley 1985). Atlas results show that this

species’ breeding season extends throughout the year with the most breeding activity from March to June (see chart). The breeding activity peaks in May during the onset of the rainy season, and the overall breeding pattern mostly takes place in the subtropical moist forest life zone (see chart). Results show that this species breeds mostly in lowlands within the subtropical moist forest life zone (58 percent of the hexagons) (see table and map). However, results indicate that it also breeds at higher elevations within the subtropical wet forest life zones (22 percent of the hexagons), as well as in the coastal plains of the subtropical dry forest life zones

(20 percent of the hexagons) (see table and map).

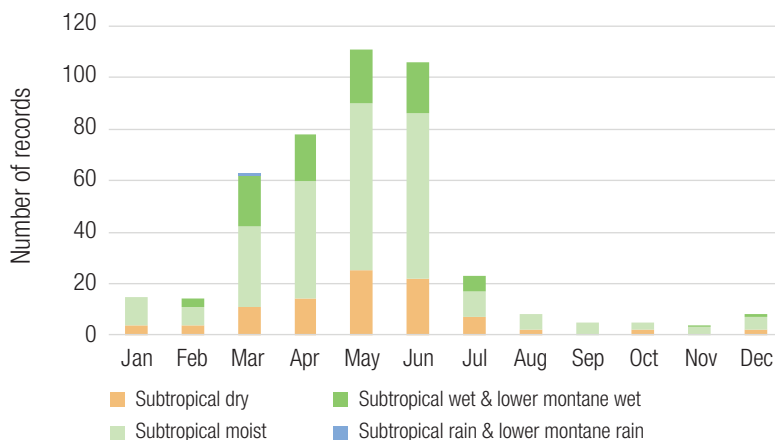
**Population Status and Conservation**

The current population trend for the Shiny Cowbird is described as ‘increasing.’ This species is currently listed as a species of least concern by the IUCN (BirdLife International 2016). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Shiny Cowbird has a protected habitat in land of about 12 percent or 929 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (7582 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Shiny Cowbird breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	N	%	N	%	N	%	N	%	
Confirmed	8	30	16	59	3	11	0	0	27
Probable	19	19	54	53	27	27	1	1	101
Possible	35	19	114	60	40	21	0	0	189
<b>Total</b>	<b>62</b>	<b>20</b>	<b>184</b>	<b>58</b>	<b>70</b>	<b>22</b>	<b>1</b>	<b>&lt;1</b>	<b>317</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Shiny Cowbird records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Greater Antillean Grackle/Mozambique

## *Quiscalus niger*



Photo by Marconi Campos Cerqueira

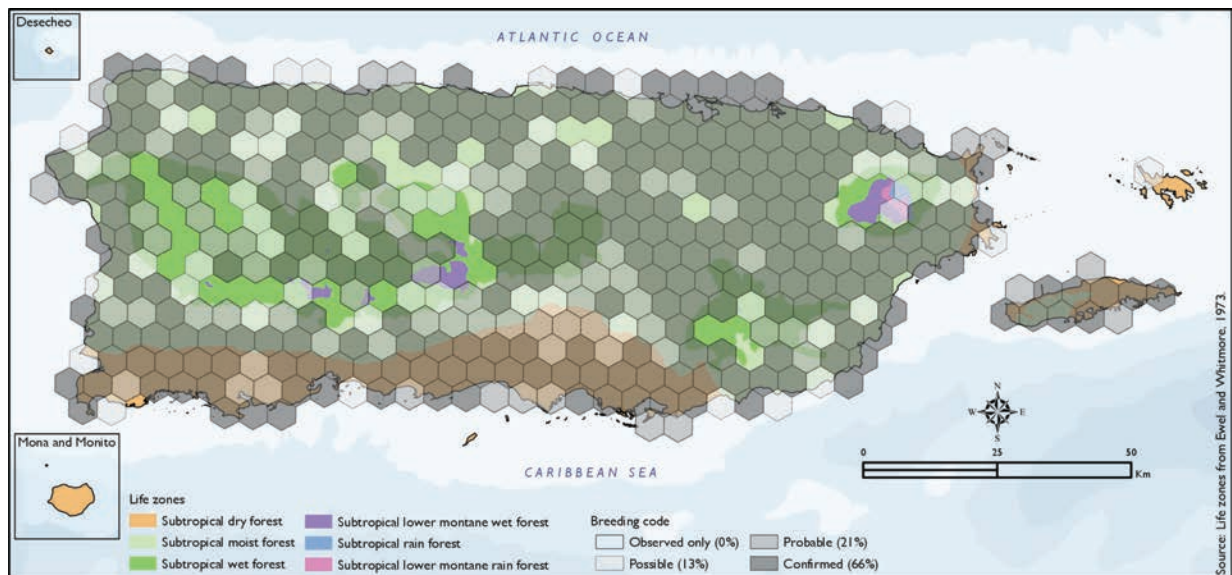
### Distribution and Habitat

The Greater Antillean Grackle occurs in the Greater Antillean islands of Cuba, Jamaica, Hispaniola, and Puerto Rico (Jaramillo and Burke 1999, Raffaele and others 1998). It is a very common resident in Puerto Rico, including Vieques (Gemmill 2015) and Culebra. The Greater Antillean Grackle occurs mostly in lowlands and open areas including mangrove forest edges, pastures (Raffaele and others 1998), farms, and towns, but it avoids deep forests (Oberle 2018). The atlas fieldwork yielded a total of 955 records within 394 hexagons or 82

percent of the 479 total hexagons (see map). Of the 394 hexagons where this species was found, breeding met the atlas definition of confirmed in 66 percent (261) of the hexagons, probable in 21 percent (81), and possible in 13 percent (52) (see map).

### Breeding Ecology

This species builds a nest made of grass and sticks (Oberle 2018), and breeds from February to September, with most breeding activity from April to August, according to previously published reports (Raffaele and others 1998). However, atlas results indicate that this



Greater Antillean Grackle distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



species' breeding season extends throughout the year, but it is most active from March to June (see chart). Results show that the Greater Antillean Grackle breeds within all ecological life zones but mostly within the subtropical moist forest life zone (64 percent of the hexagons) (see table and map).

**Population Status and Conservation**

The Greater Antillean Grackle has a stable population within its distribution range, and it is listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is very common and not listed under any threatened categories of PRDNER or USFWS. In Puerto Rico, the Greater

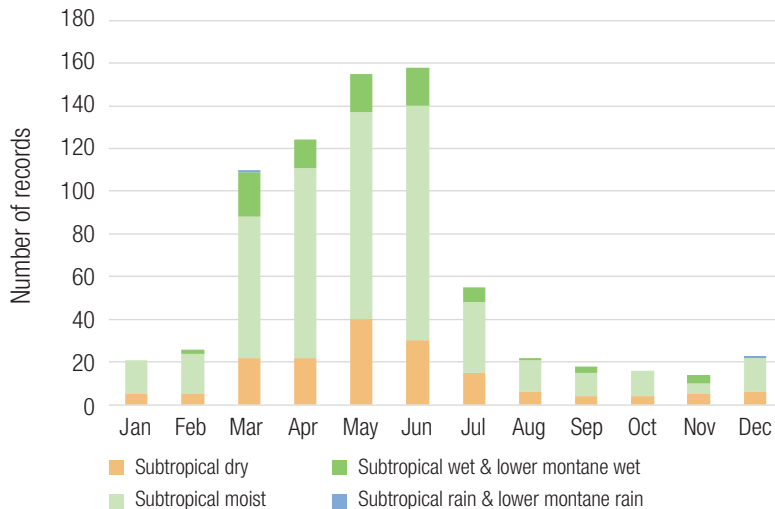
Antillean Grackle has a protected habitat in land of 11 percent or 1078 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (9398 km<sup>2</sup>). Note this area is larger than the total terrestrial area of the island because coastal hexagons and those hexagons covering small cays include a portion of water.

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Greater Antillean Grackle breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	54	21	177	68	29	11	0	0	260 <sup>b</sup>
Probable	20	25	44	54	17	21	0	0	81
Possible	6	12	30	58	15	29	1	2	52
<b>Total</b>	<b>80</b>	<b>20</b>	<b>251</b>	<b>64</b>	<b>61</b>	<b>16</b>	<b>1</b>	<b>&lt;1</b>	<b>393</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.

<sup>b</sup> A different number of total hexagons for each breeding code in this table may not reflect the actual number of hexagons where the species was found breeding, as some of the hexagons in the coastal zone or on the water may not have ecological life zone data.



Number of Greater Antillean Grackle records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by Gloria Archilla

# Elfin-Woods Warbler/ Reinita de Bosque Enano

## *Setophaga angelae*

### Distribution and Habitat

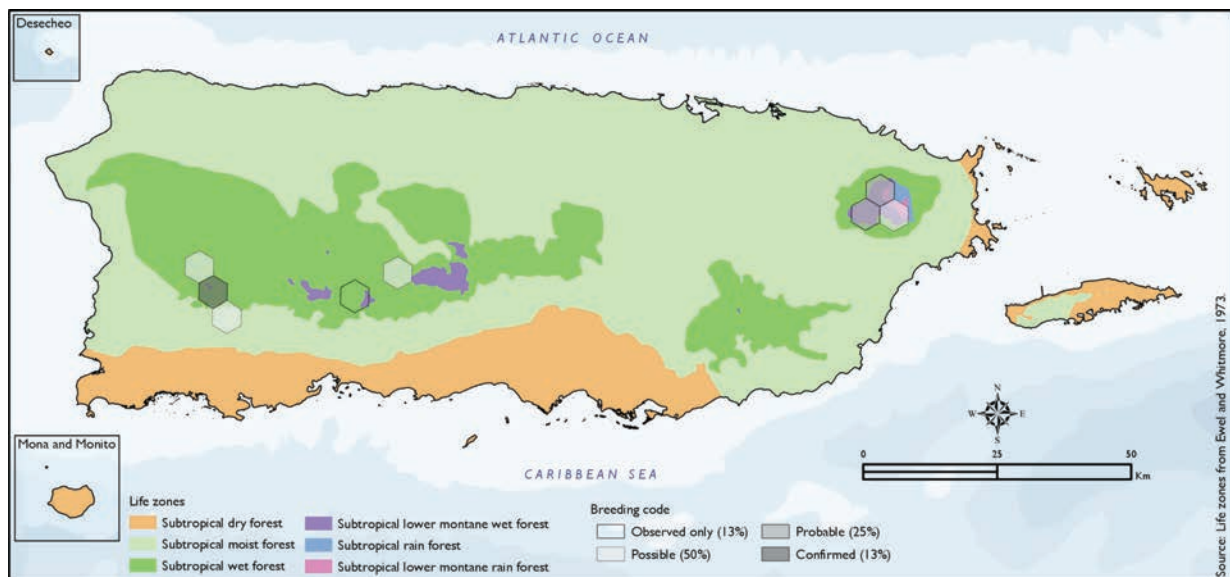
The Elfin-Woods Warbler is a rare endemic species in Puerto Rico that occurs in mountain cloud forests and lower montane forests from 370 to 1030 m above sea level (Oberle 2018). This species is currently restricted to two mountainous protected areas: El Yunque

National Forest and Maricao Commonwealth Forest (Campos-Cerqueira and Aide 2016), although its former distribution range included the mountains of Cayey. Most recent studies indicate that this species occurs in high-elevation areas within the elfin woodland (*Tabebuia-Eugenia-Ocotea*), Palo Colorado (*Cyrilla racemiflora*) forests, yucca plum pine (*Podocarpus coriaceus*) forests, secondary forests, coffee plantations, and even pasturelands (Anadón-Irizarry and others 2017), as well as dense hardwood forests with vines (J.A. Salguero-Farías, personal observation 2009). The atlas fieldwork yielded a total of 23 records within eight hexagons

or 2 percent of the 479 total hexagons (see map). Of the eight hexagons where this species was found, breeding met the atlas definition of confirmed in 13 percent (one) of the hexagons, probable in 25 percent (two), and possible in 50 percent (four), while the species was observed in 13 percent (one) of the hexagons but without evidence of breeding (see map).

### Breeding Ecology

The Elfin-Woods Warbler constructs a compact cup nest close to the trunk or hidden among epiphytes on small trees (Raffaele and others 1998), or in a stump, a tangle of vines, or a



Elfin-Woods Warbler distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

clump of leaves in the canopy (Oberle 2018), from March to June, according to previously published reports (Raffaele and others 1998). However, a nest was found in an open cavity of a vertical rotten stump (Rodríguez-Mojica 2004). Atlas results indicate that the breeding season mostly extends during the first period of the year, with two peaks in March and June (see chart). Results show that the Elfin-Woods Warbler mostly breeds within the subtropical wet and lower montane wet forest life zones (see table and map).

**Population Status and Conservation**

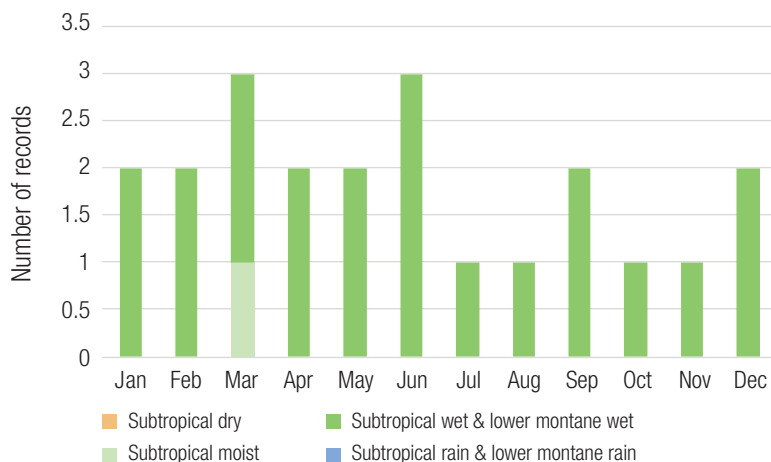
The population of the Elfin-Woods Warbler is decreasing, and it is listed as ‘Endangered’ by the IUCN (BirdLife International 2017). Locally, the species’ status was changed from vulnerable in 2005 to endangered in 2015 (PRDNER 2016), and the species was listed as threatened under the Federal Endangered Species Act (USFWS 1973). Major threats affecting this species include habitat loss, fragmentation, and degradation resulting predominantly from increasing development and unsustainable agricultural practices and vegetation clearance (Arendt and others 2013, Rivera-Milán

and others 2019b). Restricted distribution, continued habitat degradation, and climate change make the species increasingly vulnerable to extinction (Arendt and others 2013). In Puerto Rico, the Elfin-Woods Warbler has a protected habitat in land of 52 percent or 99 km<sup>2</sup> of the total area covered by the hexagons where this species is known to breed (~191 km<sup>2</sup>). Besides El Yunque National Forest and Maricao Commonwealth Forest, this species breeds within or very close to the Río Maricao Natural Protected Area, Finca Colon, and Susúa and Pueblo de Adjuntas Commonwealth Forests.

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Elfin-Woods Warbler breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	0	0	1	100	0	0	1
Probable	0	0	0	0	2	100	0	0	2
Possible	0	0	1	25	3	75	0	0	4
<b>Total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>14</b>	<b>6</b>	<b>86</b>	<b>0</b>	<b>0</b>	<b>7</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Elfin-Woods Warbler records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Yellow Warbler/Canario de Mangle

## *Setophaga petechia*



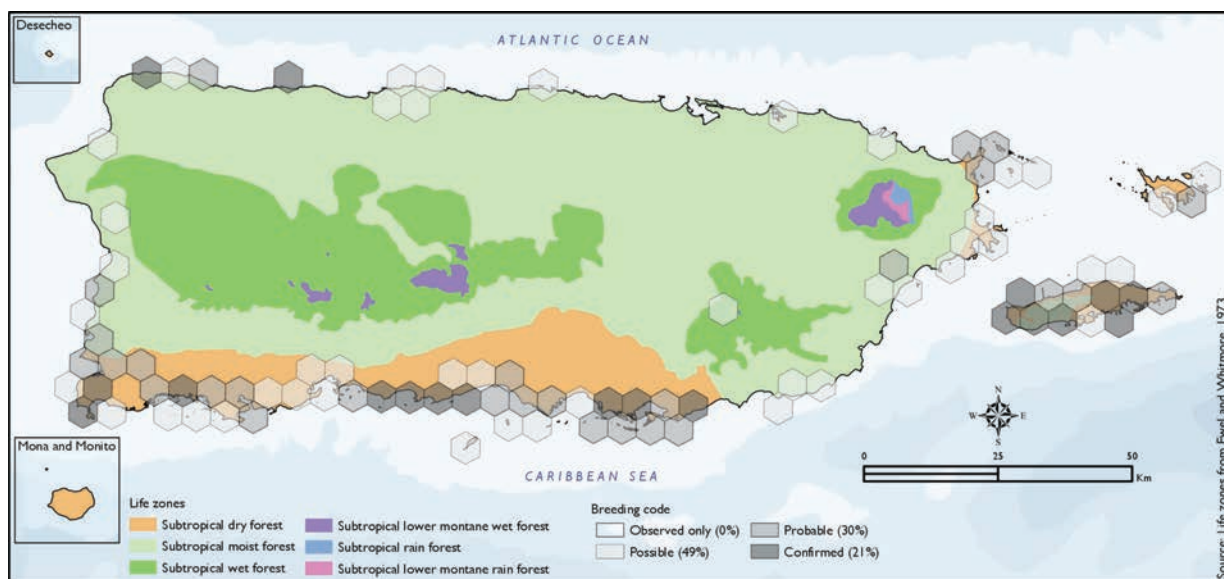
Photo by José Salguero

### Distribution and Habitat

The Yellow Warbler occurs throughout North America, Central America including the

West Indies, and northern South America (Biaggi 1997, Raffaele and others 1998). It is a common resident throughout most of the West Indies, although it is uncommon in the northern Bahamas, rare on Providencia, and considered a vagrant on Saba (Raffaele and others 1998). In addition, some migrants that breed in North America occur in the Greater Antilles mostly from October to March (Raffaele and others 1998). It occurs commonly on Puerto Rico's south coast (Biaggi 1997), as well as on satellite islands such as Culebra (Wetmore 1917), Vieques (Gemmill 2015, Sorrié 1975, Wetmore 1916), and other mangrove and vegetated cays off the northeast, while

it is uncommon in the north coast. It can be observed in Boquerón Nature Reserve in the municipality of Cabo Rojo (Oberle 2018). In the West Indies, this species inhabits mostly mangroves and coastal scrub (Raffaele and others 1998), as well as dry coastal forests, marshes, and lowland rivers (Oberle 2018). The atlas fieldwork yielded a total of 214 records within 92 hexagons or 19 percent of the 479 total hexagons (see map). Of the 92 hexagons where this species was found, breeding met the atlas definition of confirmed in 21 percent (19) of the hexagons, probable in 30 percent (28), and possible in 49 percent (45) (see map).



Yellow Warbler distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

Previously published reports indicate that the Yellow Warbler breeds primarily from March to July (Raffaele and others 1998). It builds a cup-shaped nest made of fine grasses, cotton, and other soft plant material, usually placed in a bush or tree close to water (Biaggi 1997, Raffaele and others 1998). Atlas results show that this species' breeding season extends throughout the year with the most breeding activity from March to July (see chart). The breeding activity peaks in May at the onset of the rainy season,

and it mostly takes place in the subtropical dry forest life zone (see chart). Results show that this species breeds primarily on the coastal plain, mostly within the subtropical dry forest life zone (68 percent of the hexagons), and less commonly in the subtropical moist forest life zone (30 percent of the hexagons) (see table and map).

**Population Status and Conservation**

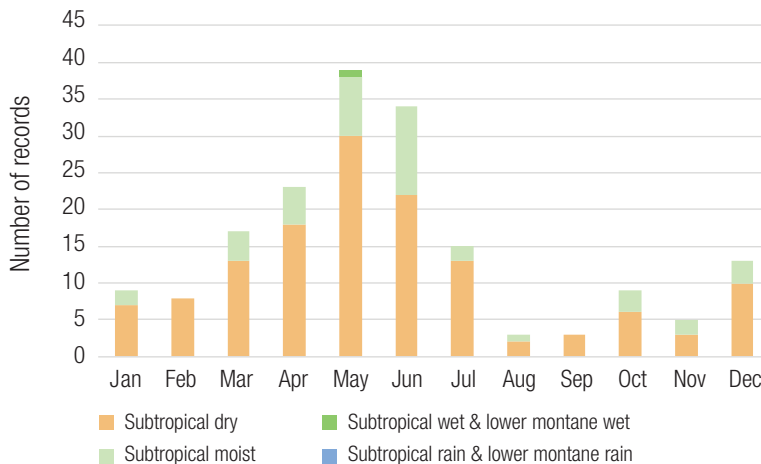
The current population trend of the Yellow Warbler is described as 'stable' in North America (Butcher and Niven

2007). This species is currently listed as a species of least concern by the IUCN (BirdLife International 2017). The nests of Yellow Warblers are frequently parasitized by Shiny Cowbirds, which reduce warbler fledging success (Wiley 1985). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Yellow Warbler has a protected habitat of 12 percent or 255 km<sup>2</sup> of the total area covered by the hexagons where this species is known to breed (2200 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Yellow Warbler breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	15	79	4	21	0	0	0	0	19
Probable	23	82	5	18	0	0	0	0	28
Possible	25	56	19	42	1	2	0	0	45
<b>Total</b>	<b>63</b>	<b>68</b>	<b>28</b>	<b>30</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>92</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Yellow Warbler records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Adelaide's Warbler/Reinita Mariposera

## *Setophaga adelaidae*

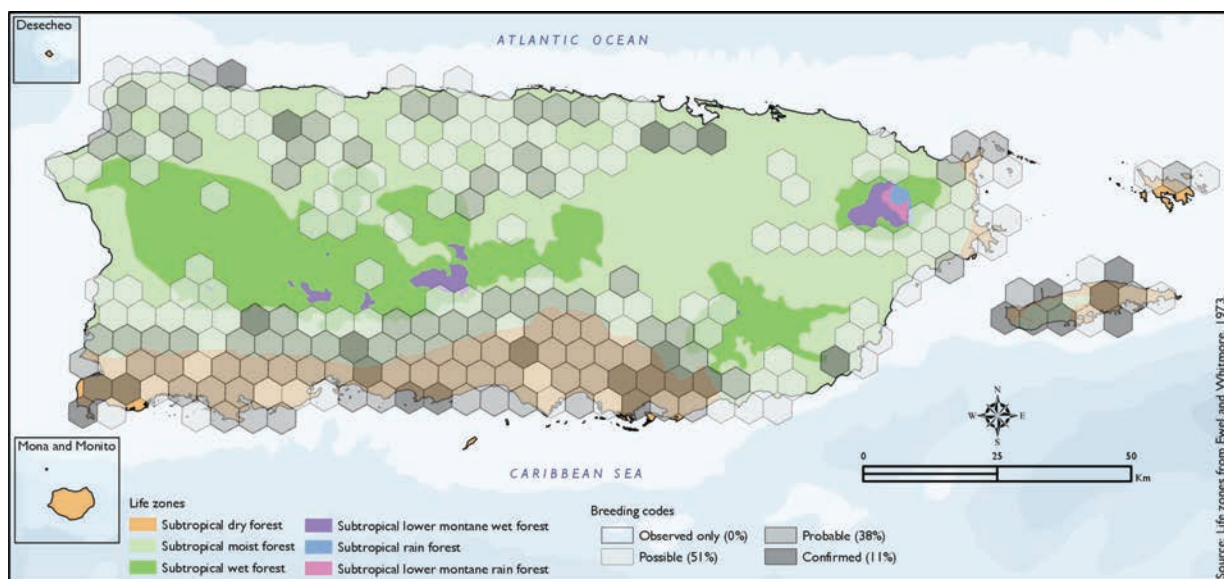


Photo by José Salguero

### Distribution and Habitat

The Adelaide's Warbler is a common endemic species in Puerto Rico, most abundant in the western two-thirds of the island (Raffaele and others 1998). It has expanded its geographic distribution range and abundance along the southern coast up to the lower Cordillera Central and into the lower Luquillo mountains, as well as in the northeastern region, as documented from 1993 through 2016 in the Fajardo Christmas Bird Count (Wunderle, Jr. 2017, Ventosa-Febles and others 2005). It also occurs on Culebra, Culebrita, and Vieques (Oberle 2018), and in the latter it has also

expanded its range and increased in abundance (Gemmill 2015) since it was first collected in 1912 (Wetmore 1916). This species' habitat includes mainly dry lowland forests and some moist forests, especially in the southwestern region and the northern limestone hills (Oberle 2018). The atlas fieldwork yielded a total of 528 records within 242 hexagons or 51 percent of the 479 total hexagons (see map). Of the 242 hexagons where this species was found, breeding met the atlas definition of confirmed in 11 percent (27) of the hexagons, probable in 38 percent (91), and possible in 51 percent (124) (see map).



Adelaide's Warbler distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

**Breeding Ecology**

The Adelaide's Warbler builds a cup-shaped nest in a tree or dense thicket above the ground from March to June, according to previously published reports (Raffaele and others 1998). Atlas results indicate that the breeding activity extends throughout the year, but it is most active from March to June, with a peak in May (see chart). This seasonal pattern of breeding appears to coincide in each of the life zones with no evidence to suggest that

breeding times differ among the life zones. Results show that the Adelaide's Warbler mostly breeds within subtropical moist (58 percent of the hexagons) and subtropical dry forest life zones (34 percent of the hexagons) (see table and map).

**Population Status and Conservation**

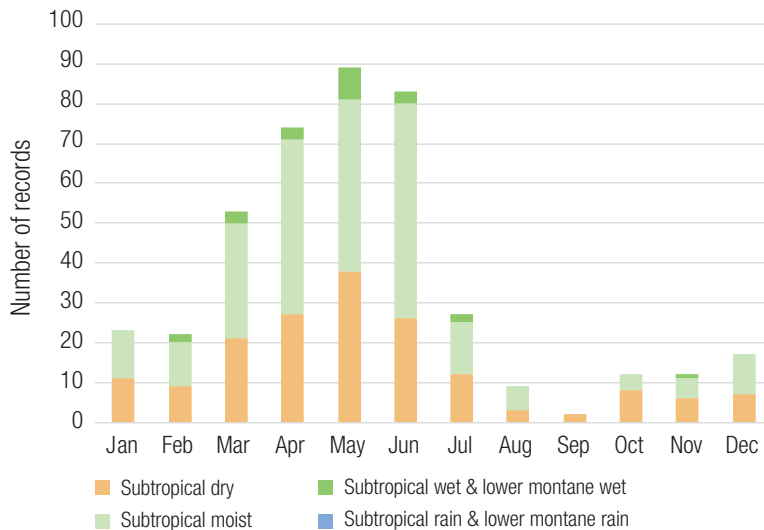
The Adelaide's Warbler exhibits a stable population within its distribution range, and it is listed as a species of least concern by the IUCN (BirdLife International

2016). Locally, this species is considered at lower risk of extinction (PRDNER 2016). In Puerto Rico, the Adelaide's Warbler has a protected habitat in land of 22 percent or 1304 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (5789 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Adelaide's Warbler breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	16	59	11	41	0	0	0	0	27
Probable	44	48	47	52	0	0	0	0	91
Possible	23	19	83	67	18	15	0	0	124
<b>Total</b>	<b>83</b>	<b>34</b>	<b>141</b>	<b>58</b>	<b>18</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>242</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Adelaide's Warbler records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Saffron Finch/Gorrión Azafrán

## *Sicalis flaveola*

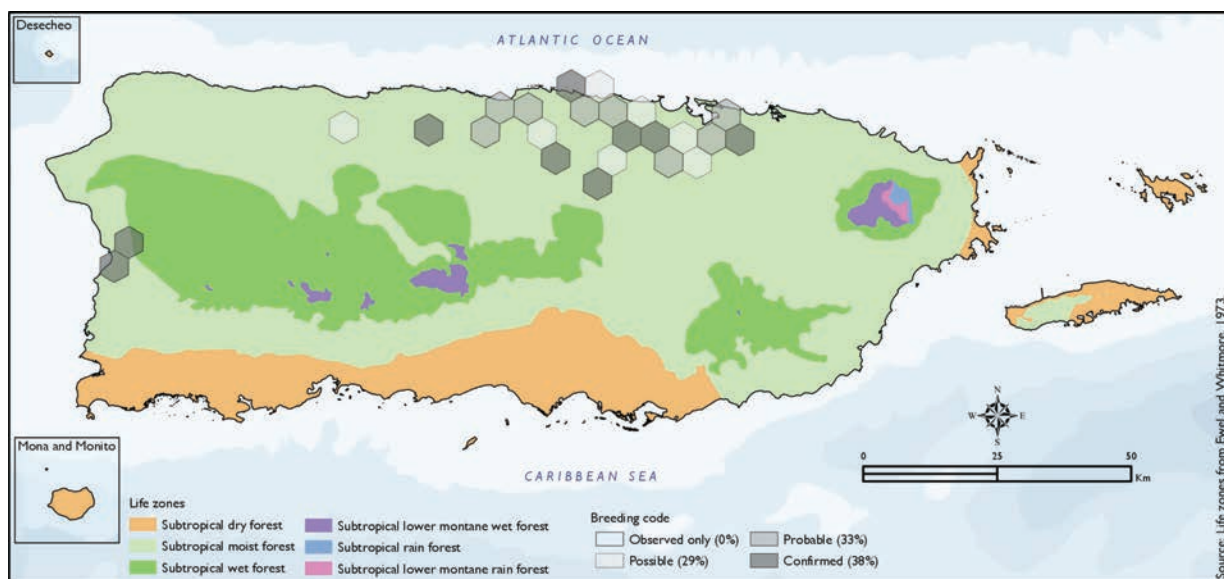


Photo by José Salguero

### Distribution and Habitat

The Saffron Finch is native to South America and believed to have been introduced to Puerto Rico through the pet trade in the 1960s (Raffaele 1989a, Raffaele and Kepler 1992). This songbird subsequently has become established on the island, and it is found mostly in the northern coast from the San Juan metropolitan area west to Arecibo (J.A. Salguero-Farías, personal observation 2009). However, during the last few decades it has expanded its range southward into the Cordillera Central with the construction of major highways

(J.A. Salguero-Farías, personal observation 2009). In Puerto Rico, it occurs in cultivated lawns with scattered trees including parks, golf course edges, and gardens (Oberle 2018, Raffaele 1989b). The species is unknown from Culebra and Vieques islands. The atlas fieldwork yielded a total of 35 records within 24 hexagons or 5 percent of the 479 total hexagons. Of the 24 hexagons where this species was found, breeding met the atlas definition of confirmed in 38 percent (nine) of the hexagons, probable in 33 percent (eight), and possible in 29 percent (seven) (see map).



Saffron Finch distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



**Breeding Ecology**

The Saffron Finch builds its nests in cavities on buildings or trees, clumps of palm leaves (Oberle 2018), and even cement powerline posts (J.A. Salguero-Farías, personal observation 2009) from August to October, according to previously published reports (Raffaele and others 1998). Atlas results show breeding evidence year-round, especially in May and June (see chart). Most of the

hexagons where this species was found occurred in or near the metropolitan area of San Juan (see map). In addition, most of the hexagons where this species is confirmed to breed are located in the lowlands and within the subtropical moist forest life zone (see table and map).

**Population Status and Conservation**

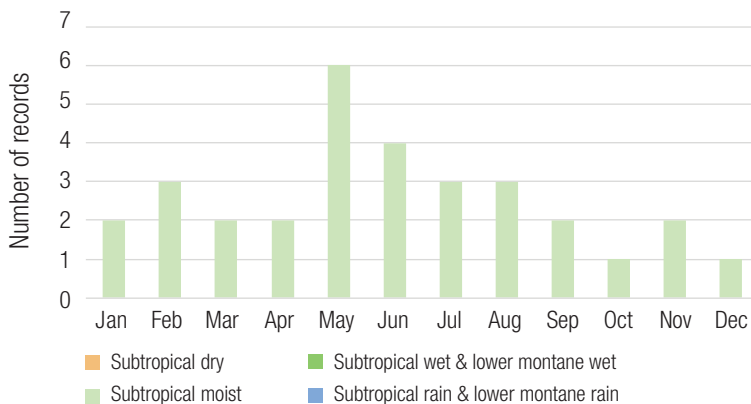
The population of the Saffron Finch is stable across its distribution range, and it is

considered a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, the Saffron Finch has a protected habitat of about 15 percent (87 km<sup>2</sup>) of the total area covered by the hexagons where this species is known to breed (573 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Saffron Finch breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	0	0	9	100	0	0	0	0	9
Probable	0	0	8	100	0	0	0	0	8
Possible	0	0	7	100	0	0	0	0	7
<b>Total</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>100</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>24</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Saffron Finch records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Bananaquit/Reinita Común

## *Coereba flaveola*



Photo by Marconi Campos Cerqueira

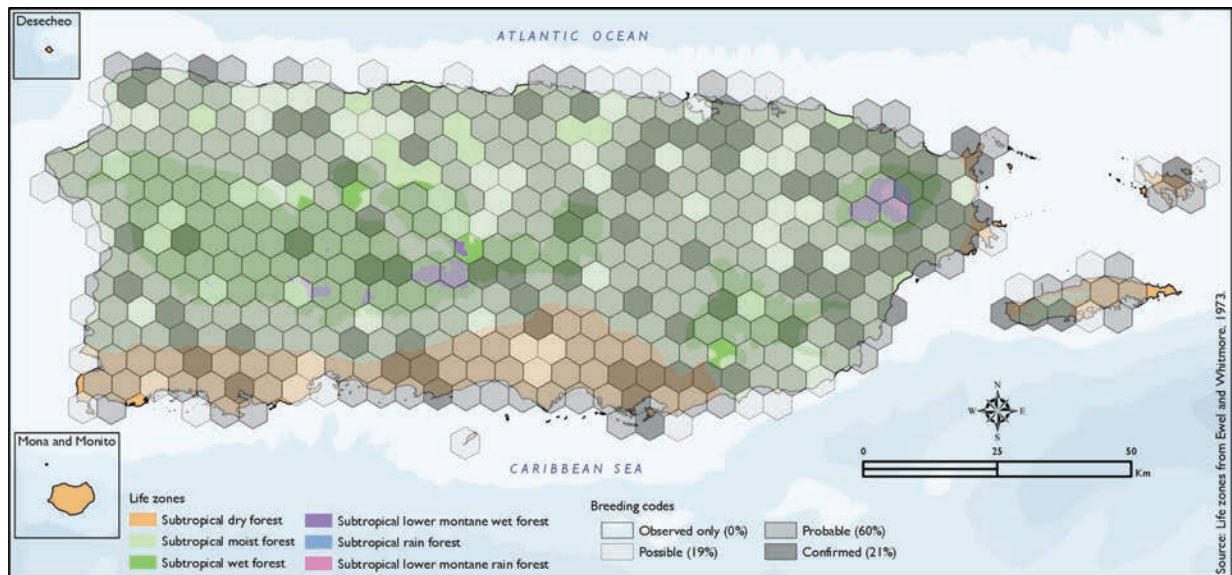
### Distribution and Habitat

The Bananaquit occurs throughout the West Indies, as well as Central and South America (Raffaele and others 1998). It is one of the most common resident species in Puerto Rico that occurs throughout the island and associated satellite islands (Raffaele and others 1998). However, it appears to be absent from Mona, Monito, and Desecheo islands (Terborgh and Faaborg 1973, Ventosa-Febles and others 2005). This species occurs in most habitats including urban areas and gardens, from scrubland to tropical lowland forest edges, but it is rare in the highest mountain tops and driest lowlands (Raffaele and others 1998). The atlas fieldwork

yielded a total of 1,101 records within 418 hexagons or 87 percent of the 479 total hexagons (see map). Of the 418 hexagons where this species was found, breeding met the atlas definition of confirmed in 21 percent (87) of the hexagons, probable in 60 percent (252), and possible in 19 percent (79) (see map).

### Breeding Ecology

The Bananaquit constructs a nest made of grass and fine plant fiber year-round, but primarily from March to June, and following the seasonality of rainfall, according to previously published reports (Raffaele and others 1998). Atlas results indicate that the breeding season extends throughout the year, with a



Bananaquit distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

peak of breeding from March through June, as consistent with previous literature (see chart). The seasonal breeding pattern appears to coincide in each of the life zones with no evidence to suggest breeding times differ among the life zones. Results show that this species breeds in all of the ecological life zones, but most of the breeding activity was reported for the subtropical moist forest life zone (59 percent of the hexagons) that occupies the largest portion of the island, and also for the subtropical dry

and subtropical wet forest life zones (20 and 20 percent of the hexagons, respectively) (see table and map). Evidence of breeding activity was reported for only one hexagon in the subtropical rain forest life zone.

**Population Status and Conservation**

The population trend for the Bananaquit across its distribution is stable, and it is listed as a species of least concern by the IUCN (BirdLife International 2016), while locally this species

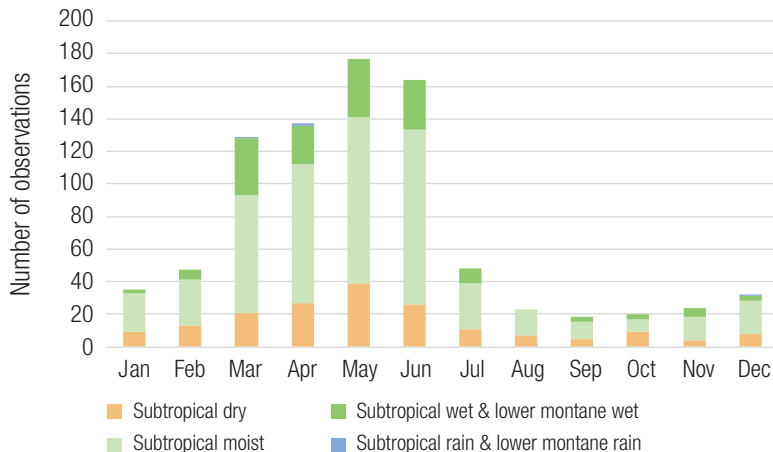
is not listed in any of the threatened categories used by PRDNER and USFWS. In Puerto Rico, the Bananaquit has a protected habitat in land of 12 percent or 1183 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (~9972 km<sup>2</sup>). Note this area is larger than the total terrestrial area of the island because coastal hexagons and those hexagons covering small cays include a portion of water.

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Bananaquit breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	17	20	55	63	14	16	1	1	87
Probable	50	20	143	57	59	23	0	0	252
Possible	18	23	50	64	10	13	0	0	78 <sup>b</sup>
<b>Total</b>	<b>85</b>	<b>20</b>	<b>248</b>	<b>59</b>	<b>83</b>	<b>20</b>	<b>1</b>	<b>0</b>	<b>417</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.

<sup>b</sup> A different number of total hexagons for each breeding code in this table may not reflect the actual number of hexagons where the species was found breeding, as some of the hexagons in the coastal zone or on the water may not have ecological life zone data.



Number of Bananaquit records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.



Photo by Michael Morel

# Yellow-faced Grassquit/ Gorrión Barba Amarilla

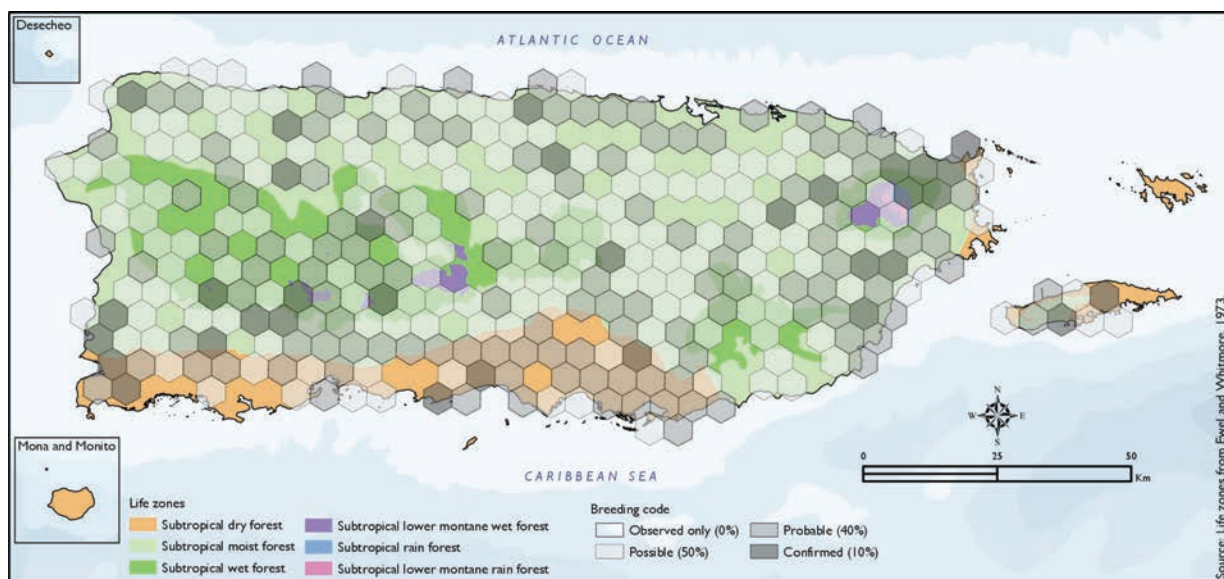
*Tiaris olivaceus*

## Distribution and Habitat

The Yellow-faced Grassquit occurs from Mexico to northwestern South America, and it is a common resident throughout the Greater Antilles and the Cayman Islands in

the Caribbean (Raffaele and others 1998). In Puerto Rico, it is found throughout the main island but occurs mostly in the municipalities of Humacao and Fajardo at the eastern region (Biaggi 1997). It also occurs sporadically in El Yunque National Forest and near El Verde field station along grassy roadsides (Recher and Recher 1966). In addition, it has also been reported from Culebra (Bond 1961, Wetmore 1917) and Vieques islands (Bond 1961, Saliva 1994, Sorrié 1975, Wetmore 1916), in the latter being an uncommon resident (Gemmill 2015). The species

usually inhabits open grassy areas from the lowlands into the high mountains (Raffaele and others 1998), as well as marshy areas, open brushy fields, and roadsides with tall grasses (Oberle 2018). The atlas fieldwork yielded a total of 532 records within 316 hexagons or 66 percent of the 479 total hexagons (see map). Of the 316 hexagons where this species was found, breeding met the atlas definition of confirmed in 10 percent (33) of the hexagons, probable in 40 percent (125), and possible in 50 percent (158) (see map).



Yellow-faced Grassquit distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

### Breeding Ecology

Previously published reports indicate that the Yellow-faced Grassquit breeds throughout the year (Raffaele and others 1998) but primarily during February, March, and April (Biaggi 1997). The nests are dome-shaped structures made mostly of fine grasses and are built just off the ground in grass clumps (Raffaele and others 1998). Atlas results show that this species' breeding season extends throughout the year with the most breeding activity from March to June (see

chart). The breeding activity peaks in May at the onset of the rainy season, and it mostly occurs in the subtropical moist forest life zone (see chart). Results show that this species breeds mostly within the subtropical moist forest life zone (62 percent of the hexagons) and less frequently at higher elevations within the subtropical wet forest life zones (20 percent of the hexagons) and in the subtropical dry forest life zone (17 percent of the hexagons) (see table and map).

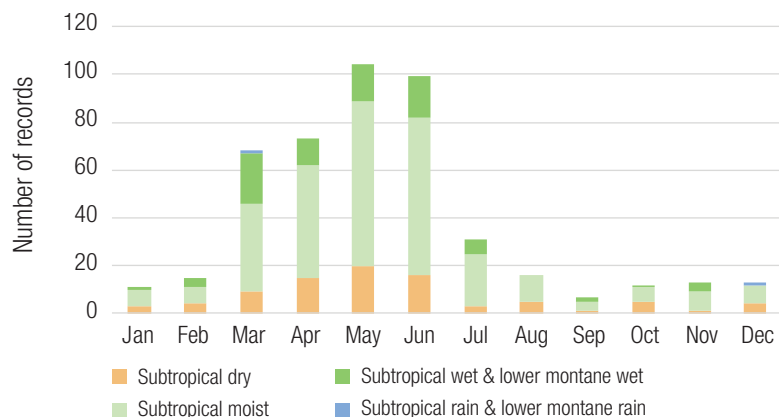
### Population Status and Conservation

The Yellow-faced Grassquit is currently listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories of PRDNER and USFWS. In Puerto Rico, it has a protected habitat in land of 12 percent or 928 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (7557 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Yellow-faced Grassquit breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	7	21	20	61	5	15	1	3	33
Probable	28	22	74	59	23	18	0	0	125
Possible	20	13	103	65	35	22	0	0	158
<b>Total</b>	<b>55</b>	<b>17</b>	<b>197</b>	<b>62</b>	<b>63</b>	<b>20</b>	<b>1</b>	<b>&lt;1</b>	<b>316</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Yellow-faced Grassquit records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Black-faced Grassquit/Gorrión Negro

## *Melanospiza bicolor*



Photo by José Salguero

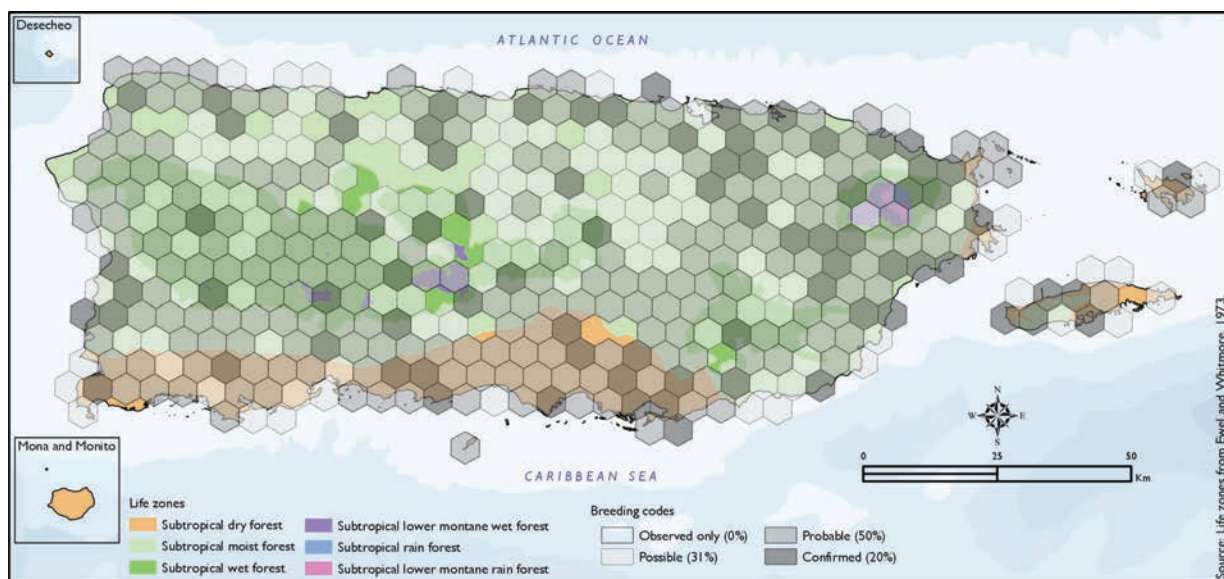
### Distribution and Habitat

The Black-faced Grassquit occurs from northern South America through the West Indies, where it is a common resident species in Puerto Rico (Oberle 2018, Raffaele and others 1998), Culebra (Ventosa-Febles and others 2005), and Vieques (Gemmill 2015). This species is common in urban areas and open areas with grasses and shrubs including gardens, road edges, and forest clearings (Oberle 2018, Raffaele and others 1998). The atlas fieldwork yielded a total of 861 records within 400 hexagons or 84

percent of the 479 total hexagons (see map). Of the 400 hexagons where this species was found, breeding met the atlas definition of confirmed in 20 percent (78) of the hexagons, probable in 50 percent (199), and possible in 31 percent (123) (see map).

### Breeding Ecology

Previously published reports indicate that the Black-faced Grassquit breeds year-round (Raffaele and others 1998). Atlas results show that the breeding season for this species extends throughout the year, but it is most active from March through



Black-faced Grassquit distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.

June, with a peak in May (see chart). Results show that the Black-faced Grassquit breeds in all ecological life zones but mostly within the subtropical moist, subtropical dry, and subtropical wet forest life zones (59, 21, and 20 percent of the hexagons, respectively), while breeding activity has also been reported for one hexagon in the subtropical rain forest life zone (see table and map).

**Population Status and Conservation**

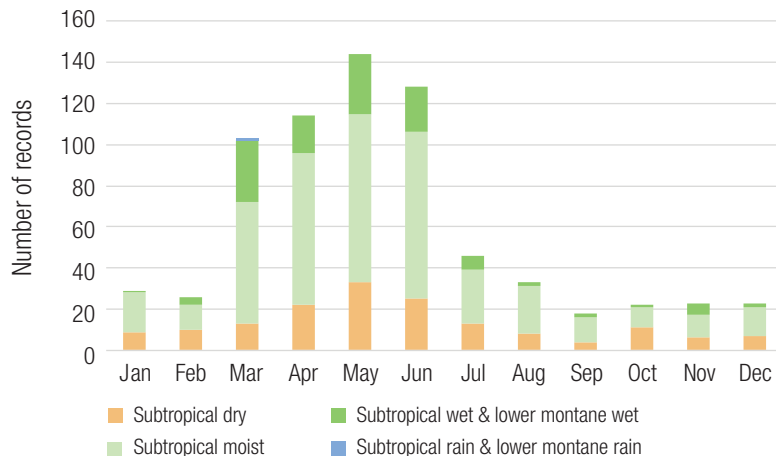
The population of the Black-faced Grassquit is listed as a species of least concern by the IUCN (BirdLife International 2018). Locally, this species is not listed in any of the threatened categories used by PRDNER and USFWS. In Puerto Rico, the Black-faced Grassquit has a protected habitat in land of 12 percent or 1102 km<sup>2</sup> of

the total area covered by the hexagons where evidence of breeding was found for this species (9565 km<sup>2</sup>). Note this area is larger than the total terrestrial area of the island because coastal hexagons and those hexagons covering small cays include a portion of water.

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Black-faced Grassquit breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	19	24	46	59	12	15	1	1	78
Probable	46	23	112	56	41	21	0	0	199
Possible	20	16	76	62	27	22	0	0	123
<b>Total</b>	<b>85</b>	<b>21</b>	<b>234</b>	<b>59</b>	<b>80</b>	<b>20</b>	<b>1</b>	<b>&lt;1</b>	<b>400</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Black-faced Grassquit records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# Puerto Rican Bullfinch/Comeñame

## *Melopyrrha portoricensis*



Photo by Pedro W. Santana

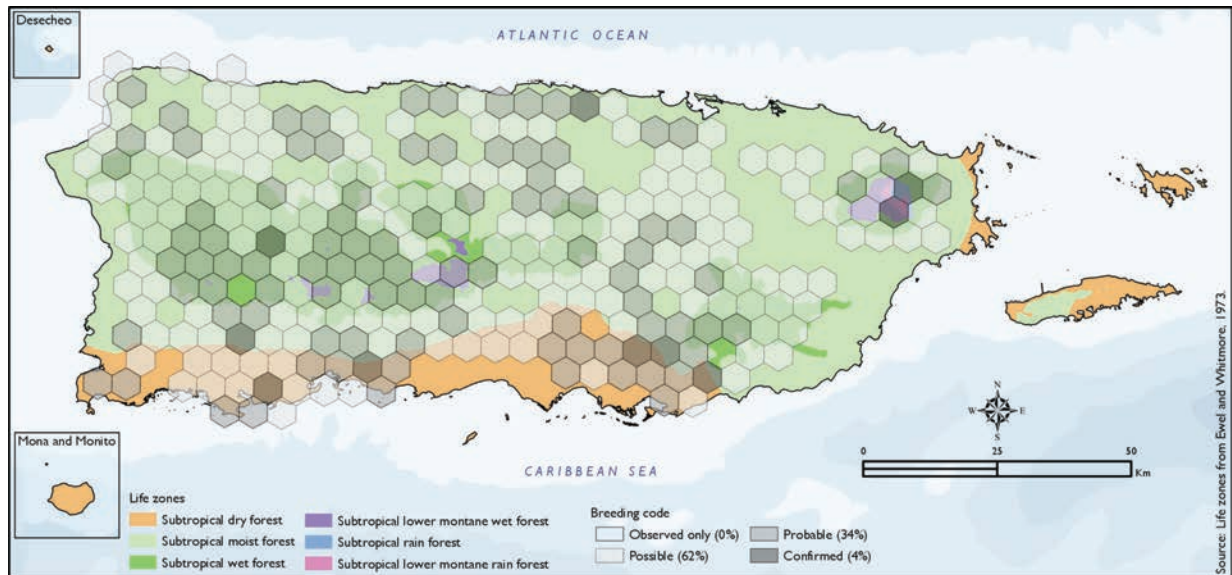
### Distribution and Habitat

The Puerto Rican Bullfinch is endemic to Puerto Rico (Raffaele and others 1998), but it is absent from the far eastern end of the main island and Vieques (Gemmill 2015, Oberle 2018). The bullfinch is common in forests at all elevations and coffee plantations as well as dry coastal thickets, but it is rare in mangroves (Oberle 2018, Raffaele 1989a). The atlas fieldwork yielded a total of 548 records within 269 hexagons or 56 percent of the total 479 hexagons (see map). Of the 269 hexagons where this species

was found, breeding met the atlas definition of confirmed in 4 percent (10) of the hexagons, probable in 34 percent (92), and possible in 62 percent (167). Atlas results confirm the bullfinch's absence in at least the lowlands of eastern Puerto Rico and on Vieques and Culebra (see map).

### Breeding Ecology

Previously published reports indicate that the Puerto Rican Bullfinch mainly breeds from March to June (Raffaele and others 1998). This species usually



Puerto Rican Bullfinch distribution. The map shows the highest breeding code by hexagon and overlaying the ecological life zones in Puerto Rico. Note: percentages may not total 100 due to rounding.



places its nest on trees or shrubs, close to the ground (Biaggi 1997). Atlas findings support the breeding information found in the literature, including evidence that breeding may occur outside of the peak March–June period (see chart). Results show that this species mostly breeds within the subtropical moist forest life zone (54 percent of the hexagons) and subtropical wet and lower montane wet forest life zones (31 percent of the hexagons).

Although this species seems to be widely distributed across the central mountains of the main island, there is only one confirmed breeding record in the subtropical rain and lower montane rain forest life zones (see table and map).

**Population Status and Conservation**

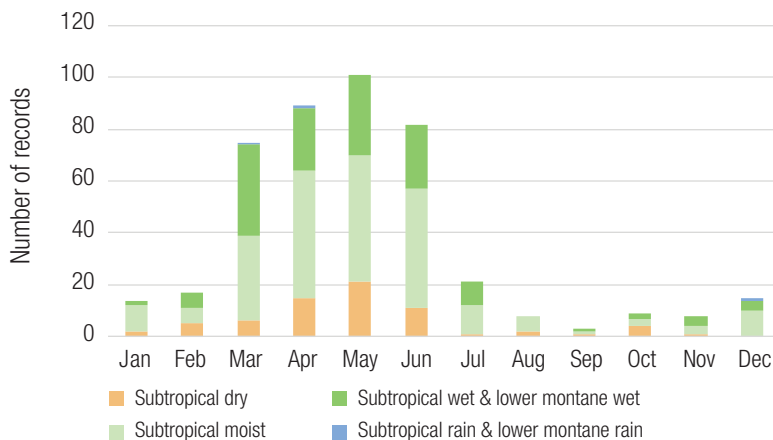
The Puerto Rican Bullfinch is listed as a species of least concern by the IUCN (BirdLife

International 2016). Locally, this species was listed as Data Deficient in 2005, but more recent assessments categorize it as Low Risk (PRDNER 2015). In Puerto Rico, the Puerto Rican Bullfinch has a protected habitat in land of 15 percent or 959 km<sup>2</sup> of the total area covered by the hexagons where evidence of breeding was found for this species (6437 km<sup>2</sup>).

Number of hexagons by ecological life zone and percentage of the total number of hexagons where Puerto Rican Bullfinch breeds in Puerto Rico

Breeding code <sup>a</sup>	Subtropical dry forest		Subtropical moist forest		Subtropical/lower montane wet forest		Subtropical/lower montane rain forest		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
Confirmed	4	40	3	30	2	20	1	10	10
Probable	17	18	42	46	33	36	0	0	92
Possible	19	11	100	60	48	29	0	0	167
<b>Total</b>	<b>40</b>	<b>15</b>	<b>145</b>	<b>54</b>	<b>83</b>	<b>31</b>	<b>1</b>	<b>&lt;1</b>	<b>269</b>

<sup>a</sup> Only hexagons with highest breeding codes (confirmed, probable, and possible) were used for this analysis.



Number of Puerto Rican Bullfinch records with evidence of breeding activity (combined for confirmed, probable, and possible) by month and ecological life zone.

# *Appendices*

**Appendix A**—Full list of volunteers who contributed observations used in the atlas.

Acevedo, M.	Colón-López, S.A.	Gemmill, D.	Macres, P.	Pérez, R.	Saliva, J.
Albarracín, R.	Comas, R.	Gerbracht, J.	Maldonado, A.	Pérez, W.	Samalot-Roque, B.
Alers, L.	Conti, G.	Gibbons, B.	Maldonado, C.	Plust, S.	Sánchez, A.
Algarín, W.	Corven, J.	Goetz, J.	Maldonado, E.	Poalillo, D.	Sanders, I.
Anadón, J.	Crespo, L.	Goff, M.	Maldonado, V.	Prestby, T.	Sandlin, C.
Anadón, V.	Crespo, P.	Golden, L.	Manfredi, L.	Price, W.	Santiago, E.E.
Andersen, M.	Cruz, A.	Goyco, M.	Marrero, T.M.	Puente, A.	Santiago, J.
Anderson, M.	Cruz, E.M.	González, F.	Martin, J.	Pyhala, M.	Santiago, L.
Angleró, J.	Cruz, Manuel	González, Gerardo	Martínez, A.	Quintero, H.	Santos, D.
Aquino, M.	Cruz, Marta	González, Gustavo	Martínez, E.	Ramírez, J.L.	Scacchetti, L.
Archer, D.	Cruz-Burgos, J.A.	González, J.	Martínez, H.	Ramírez, L.	Schaffner, F.
Argüelles, A.	Cruz-Tirado, R.	González, L.	Martínez, J.	Ramos, C.	Sepúlveda, J.
Armistead, G.	Cruzado, H.	González, M.	Mckay, B.D.	Ramos, J.	Sepúlveda, M.
Axelrod, F.	Cuevas, E.	González, R.	McMurray, J.	Ramos, M.	Sharboneaux, P.
Ayala, E.	Cutten, D.	González, S.	Méndez, C.	Ramos, S.	Shaw, J.
Babic, G.	Dávila, C.	Grisa, Á.	Méndez, V.	Rapoza, B.	Silva, F.
Babic, M.	del Moral, R.	Guarnaccia, J.	Méndez, W.	Rebollo, E.	Silvestre, L.
Baerga, L.	Delannoy, C.	Guida, T.	Méndez-Román, J.	Rico, L.M.	Soldevila, Á.
Banchs, E.	Díaz, A.	Guzmán, B.	Mercado, Javier	Rincón, J.	Soler, W.
Banchs, J.P.	Díaz, H.J.	Haries, K.	Mercado, Joel	Ríos, E.	Solórzano, M.
Barandiaran, M.	Díaz, L.	Harwood, G.	Mercado, L.I.	Rios, J.M.	Sorrie, B.
Batista, C.	Díaz, O.	Hernández, B.	Merkord, C.	Rivera, I.	Sullivan, B.
Beers, B.	Díaz, S.	Hesselein, C.	Mojica, F.	Rivera, Marelisa	Sustache, J.A.
Beltrán, W.	Díaz-Casablanca, A.	Hilversum, K.	Molina, A.	Rivera, María L.	Thomlinson, J.
Benner, L.	Dilts, T.	Hubick, B.	Molinaris, A.	Rivera, Maricely	Toledo, G.
Bermúdez, E.	Douglas, R.	Hully, J.	Montalvo, Á	Rivera, Mayra	Torres, A.
Bonilla, A.	Drapeau, B.	Iliff, M.	Monzón, O.	Rivera, Myriam	Torres, J.
Brenner, B.	Echevarría, M.	Íñigo, A.	Morales, A.	Rivera, P.	Torres, N.
Brinkley, N.	Encarnación, L.	Irizarry, V.	Morales, Á.L.	Rivera-Lebrón, R.L.	Tossas, A.
Burgos, G.	Esteva, M.	Jiménez, A.	Morales, H.	Rodríguez, Eduardo	Traverso, F.
Camacho, J.	Estrada-Acosta, A.R.	Joglar, R.	Morales, J.	Rodríguez, Edwin O.	Tremblay, R.
Camacho, R.	Fagan, J.	Kavanaugh, M.	Morales, M.	Rodríguez, J.A.	Van Beirs, M.
Campbell, S.	Falcón, W.	Keaveney, A.	Morel, A.	Rodríguez, J.E.	Vando, V.
Canino, M.	Falto, A.V.	Keitt, B.	Morel, J.	Rodríguez, J.G.	Vargas, J.
Cano, F.	Faría, M.	Kelling, S.	Morel, M.J.	Rodríguez, M.	Vásquez, E.
Caraballo, M.	Feliciano, A.	Kerlinger, P.	Moreno, Y.	Rodríguez, Rafy	Vázquez, F.M.
Carlo-Joglar, T.A.	Feliciano, I.	Kuebel, B.	Mouakad, A.	Rodríguez, Ray D.	Vega, J.
Carmona, J.	Felix, G.	Kuepper, C.	Mueller, W.	Rodríguez, René	Vega, S.
Carrión, P.	Fernández, J.C.	Landry, E.	Muñoz, G.	Rodríguez, Ricardo	Velásquez, F.
Carrión, R.	Fernández, O.	Langhorne, E.	Muñoz, L.	Roig-Bachs, C.	Velázquez, J.F.
Castillo, L.	Figueroa, J.	Lantigua, C.	Murphy, C.	Román, A.	Ventosa, E.
Cauldwell, R.	Fisherman, G.	Larsen, L.	Nazario, J.M.	Román, M.	Villanueva-Rivera, L.J.
Charriez, M.	Fisherman, J.	Larsen, N.	Newman, J.	Román-García, P.A.	Vives-Heyliger, M.A.
Christen, R.	Font, E.	Lenz, T.	Neris, N.	Rosa, D.	Ware, C.
Churchill, J.B.	Forehand, M.	León, A.	Rosa, R.I.	Rosa, R.I.	Ware, D.
Cianchini, C.	Frabata, M.	León, R.	Rosado, K.	Rosado, K.	West, L.
Claudio, H.J.	Franqui, J.	Lewis, A.	Rosado, L.	Rosado, L.	West, R.L.
Coira, M.	Franqui, S.	Lister, L.	Rosas, J.	Rosas, J.	Whipple, D.
Coll, A.M.	Friedman, L.	Lizardi, A.	Ruiz, C.	Ruiz, C.	Wilder, J.
Collazo, C.	Galán, D.	Lloyd, J.	Ruiz, C.	Ruiz, C.	Wood, C.
Collazo, F.	Galán, J.	Lodge, D.J.	Ruiz, I.	Ruiz, I.	Woodhouse, M.
Collazo, J.	Gallisa, J.C.	López, A.	Rycenga, J.	Rycenga, J.	Wunderle, J.M.
Collins, M.	García, H.	López, G.	Salas, D.	Salas, D.	Zimmerman, J.K.
Colón, Á.	García, J.	López, J.M.	Salguero, A.	Salguero, A.	
Colón, I.	García, L.	López, M.	Salguero, G.	Salguero, G.	
Colón, J.	García-Rodríguez, J.	López-Ortiz, R.	Salguero, M.	Salguero, M.	
Colón-Álvarez, J.	Gardella, L.	Lugo, G.	Salguero-Roig, S.	Salguero-Roig, S.	
Colón-López, J.A.	Garvey, M.	Lutmerding, M.	Salguero-Farías, J.A.	Salguero-Farías, J.A.	

**Appendix B**—List of the 130 bird species in the atlas, including 73 native residents, 26 nonnative residents, 16 endemic species, 13 endemic subspecies, and 2 native migrant breeders.

Scientific name	Common name (English)	Common name (Spanish)	Status
<i>Dendrocygna arborea</i>	West Indian Whistling-Duck	Chiriría Caribeña	Native resident
<i>Anas bahamensis</i>	White-cheeked Pintail	Pato Quijada Colorada	Native resident
<i>Nomonyx dominicus</i>	Masked Duck	Pato Dominicó	Native resident
<i>Oxyura jamaicensis</i>	Ruddy Duck	Pato Chorizo	Native resident
<i>Tachybaptus dominicus</i>	Least Grebe	Tigua	Native resident
<i>Podilymbus podiceps</i>	Pied-billed Grebe	Zaramago	Native resident
<i>Columba livia</i>	Rock Pigeon	Paloma Doméstica (asilvestrada)	Nonnative resident
<i>Patagioenas squamosa</i>	Scaly-naped Pigeon	Paloma Turca	Native resident
<i>Patagioenas leucocephala</i>	White-crowned Pigeon	Paloma Cabeciblanca	Native resident
<i>Patagioenas inornata</i>	Plain Pigeon	Paloma Sabanera	Endemic subspecies
<i>Streptopelia decaocto</i>	Eurasian Collared-Dove	Tórtola Collarina	Native resident
<i>Streptopelia roseogrisea</i>	African Collared-Dove	Paloma Collarina Africana	Native resident
<i>Columbina passerina</i>	Common Ground-Dove	Rolita	Endemic subspecies
<i>Geotrygon montana</i>	Ruddy Quail-Dove	Paloma Perdiz Rojiza	Native resident
<i>Geotrygon chrysia</i>	Key West Quail-Dove	Paloma Perdiz Áurea	Native resident
<i>Geotrygon mystacea</i>	Bridled Quail-Dove	Paloma Perdiz de Martinica	Native resident
<i>Zenaida asiatica</i>	White-winged Dove	Tórtola Aliblanca	Native resident
<i>Zenaida aurita</i>	Zenaida Dove	Tórtola Cardosanterá	Native resident
<i>Zenaida macroura</i>	Mourning Dove	Tórtola Rabilarga	Native resident
<i>Crotophaga ani</i>	Smooth-billed Ani	Garrapatero o Judío	Native resident
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo	Pájaro Bobo Piquiamarillo	Native resident
<i>Coccyzus minor</i>	Mangrove Cuckoo	Pájaro Bobo Menor	Native resident
<i>Coccyzus vieilloti</i>	Puerto Rican Lizard-Cuckoo	Pájaro Bobo Mayor	Endemic species
<i>Chordeiles gundlachi</i>	Antillean Nighthawk	Querequequé	Native resident
<i>Antrostomus noctitherus</i>	Puerto Rican Nightjar	Guabairo	Endemic species
<i>Cypseloides niger</i>	Black Swift	Vencejo Negro	Native migrant breeder
<i>Anthracothorax dominicus</i>	Antillean Mango	Zumbador Dorado	Endemic subspecies
<i>Anthracothorax viridis</i>	Green Mango	Zumbador Verde	Endemic species
<i>Eulampis holosericeus</i>	Green-throated Carib	Zumbador Pechiazul	Native resident
<i>Riccordia maugaeus</i>	Puerto Rican Emerald	Zumbadorcito de Puerto Rico	Endemic species
<i>Orthorhyncus cristatus</i>	Antillean Crested Hummingbird	Zumbadorcito Crestado	Native resident
<i>Rallus longirostris</i>	Clapper Rail	Pollo de Mangle	Native resident
<i>Hapalocrex flaviventer</i>	Yellow-breasted Crake	Gallito Amarillo	Native resident
<i>Porphyrio martinicus</i>	Purple Gallinule	Gallareta Azul	Native resident
<i>Gallinula galeata</i>	Common Gallinule	Gallareta Común	Native resident
<i>Fulica americana</i>	American Coot	Gallinazo Americano	Native resident
<i>Himantopus mexicanus</i>	Black-necked Stilt	Viuda	Native resident
<i>Haematopus palliatus</i>	American Oystercatcher	Ostrero	Native resident

**Appendix B** (*continued*)—List of the 130 bird species in the atlas, including 73 native residents, 26 nonnative residents, 16 endemic species, 13 endemic subspecies, and 2 native migrant breeders.

Scientific name	Common name (English)	Common name (Spanish)	Status
<i>Charadrius vociferus</i>	Killdeer	Chorlito Sabanero	Native resident
<i>Charadrius wilsonia</i>	Wilson's Plover	Chorlito Marítimo	Native resident
<i>Charadrius nivosus</i>	Snowy Plover	Chorlito Blanco	Native resident
<i>Tringa semipalmata</i>	Willet	Playero Aliblanco	Native resident
<i>Leucophaeus atricilla</i>	Laughing Gull	Gaviota Gallega	Native resident
<i>Anous stolidus</i>	Brown Noddy	Cervera Parda	Native resident
<i>Onychoprion fuscatus</i>	Sooty Tern	Charrán Oscuro	Native resident
<i>Onychoprion anaethetus</i>	Bridled Tern	Charrán Monja	Native resident
<i>Sternula antillarum</i>	Least Tern	Charrancito	Native resident
<i>Sterna dougalli</i>	Roseate Tern	Palometa	Native resident
<i>Thalasseus maximus</i>	Royal Tern	Charrán Real	Native resident
<i>Thalasseus sandvicensis</i>	Sandwich Tern	Charrán Piquiagudo	Native resident
<i>Phaethon lepturus</i>	White-tailed Tropicbird	Chirre Coliblanco	Native resident
<i>Phaethon aethereus</i>	Red-billed Tropicbird	Chirre Piquirrojo	Native resident
<i>Puffinus lherminieri</i>	Audubon's Shearwater	Pampero de Audubon	Native resident
<i>Fregata magnificens</i>	Magnificent Frigatebird	Fragata Magnífica	Native resident
<i>Sula dactylatra</i>	Masked Booby	Boba Enmascarada	Native resident
<i>Sula leucogaster</i>	Brown Booby	Boba Parda	Native resident
<i>Sula sula</i>	Red-footed Booby	Boba Patirroja	Native resident
<i>Pelecanus occidentalis</i>	Brown Pelican	Pelicano Pardo	Native resident
<i>Ixobrychus exilis</i>	Least Bittern	Martinetito	Native resident
<i>Ardea alba</i>	Great Egret	Garza Real	Native resident
<i>Egretta thula</i>	Snowy Egret	Garza Blanca	Native resident
<i>Egretta caerulea</i>	Little Blue Heron	Garza Azul	Native resident
<i>Egretta tricolor</i>	Tricolored Heron	Garza Pechiblanca	Native resident
<i>Bubulcus ibis</i>	Cattle Egret	Garza Ganadera	Native resident
<i>Butorides virescens</i>	Green Heron	Martinete	Native resident
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	Yaboa Real	Native resident
<i>Nyctanassa violacea</i>	Yellow-crowned Night-Heron	Yaboa Común	Native resident
<i>Eudocimus albus</i>	White Ibis	Ibis Blanco	Native resident
<i>Plegadis falcinellus</i>	Glossy Ibis	Ibis Lustroso	Native resident
<i>Cathartes aura</i>	Turkey Vulture	Aura Tiñosa	Native resident
<i>Accipiter striatus</i>	Sharp-shinned Hawk	Halcón o Gavilán de Sierra	Endemic subspecies
<i>Buteo platypterus brunnescens</i>	Broad-winged Hawk	Guaraguao de Bosque	Endemic subspecies
<i>Buteo jamaicensis</i>	Red-tailed Hawk	Guaraguao Colirrojo	Native resident
<i>Gymnasio nudipes</i>	Puerto Rican Owl	Mucarito de Puerto Rico	Endemic species

**Appendix B** (*continued*)—List of the 130 bird species in the atlas, including 73 native residents, 26 nonnative residents, 16 endemic species, 13 endemic subspecies, and 2 native migrant breeders.

Scientific name	Common name (English)	Common name (Spanish)	Status
<i>Asio flammeus</i>	Short-eared Owl	Múcaro Real	Endemic subspecies
<i>Todus mexicanus</i>	Puerto Rican Tody	San Pedrito	Endemic species
<i>Melanerpes portoricensis</i>	Puerto Rican Woodpecker	Carpintero de Puerto Rico	Endemic species
<i>Falco sparverius</i>	American Kestrel	Falcón Común	Native resident
<i>Cacatua alba</i>	White Cockatoo	Cacatúa Blanca	Nonnative resident
<i>Myiopsitta monachus</i>	Monk Parakeet	Perico Monje	Nonnative resident
<i>Eupsittula canicularis</i>	Orange-fronted Parakeet	Periquito Frentianaranjado	Nonnative resident
<i>Ara ararauna</i>	Blue-and-yellow Macaw	Guacamayo Azuliamarillo	Nonnative resident
<i>Brotogetis versicolorus</i>	White-winged Parakeet	Periquito Aliblanco	Nonnative resident
<i>Psittacara erythrogenys</i>	Red-masked Parakeet	Perico Frentirrojo	Nonnative resident
<i>Amazona albifrons</i>	White-fronted Parrot	Cotorra Cabeciblanca	Nonnative resident
<i>Amazona amazonica</i>	Orange-winged Parrot	Cotorra Alianaranjada	Nonnative resident
<i>Amazona viridigenalis</i>	Red-crowned Parrot	Cotorra Coronirroja	Nonnative resident
<i>Amazona ventralis</i>	Hispaniolan Parrot	Cotorra de la Española	Nonnative resident
<i>Elaenia martinica</i>	Caribbean Elaenia	Juí Blanco	Native resident
<i>Myiarchus antillarum</i>	Puerto Rican Flycatcher	Juí de Puerto Rico	Endemic species
<i>Tyrannus dominicensis</i>	Gray Kingbird	Pitirre	Native resident
<i>Tyrannus caudifasciatus</i>	Loggerhead Kingbird	Clérigo	Endemic subspecies
<i>Contopus latirostris</i>	Lesser Antillean Pewee	Bobito	Endemic subspecies
<i>Vireo latimeri</i>	Puerto Rican Vireo	Bienteveo	Endemic species
<i>Vireo altiloquus</i>	Black-whiskered Vireo	Julián Chiví	Native migrant breeder
<i>Progne dominicensis</i>	Caribbean Martin	Golondrina de Iglesias	Native resident
<i>Petrochelidon fulva</i>	Cave Swallow	Golondrina de Cuevas	Endemic subspecies
<i>Acridotheres grandis</i>	Great Myna	Miná Grande	Nonnative resident
<i>Sturnus vulgaris</i>	European Starling	Estornino Pinto	Nonnative resident
<i>Turdus plumbeus</i>	Red-legged Thrush	Zorzal Patirrojo	Native resident
<i>Margarops fuscatus</i>	Pearly-eyed Thrasher	Zorzal Pardo	Native resident
<i>Mimus polyglottos</i>	Northern Mockingbird	Ruiseñor	Native resident
<i>Euplectes franciscanus</i>	Northern Red Bishop	Obispo Anaranjado	Nonnative resident
<i>Euplectes afer</i>	Yellow-crowned Bishop	Napoleón Tejedor	Nonnative resident
<i>Vidua macroura</i>	Pin-tailed Whydah	Viuda Colicinta	Nonnative resident
<i>Estrilda melpoda</i>	Orange-cheeked Waxbill	Veterano	Nonnative resident
<i>Amandava amandava</i>	Red Avadavat	Chamorro Fresa	Nonnative resident
<i>Lonchura cucullata</i>	Bronze Mannikin	Diablito	Nonnative resident
<i>Euodice malabarica</i>	Indian Silverbill	Gorrión Picoplata	Nonnative resident
<i>Lonchura oryzivora</i>	Java Sparrow	Gorrión de Java	Nonnative resident

**Appendix B** (*continued*)—List of the 130 bird species in the atlas, including 73 native residents, 26 nonnative residents, 16 endemic species, 13 endemic subspecies, and 2 native migrant breeders.

Scientific name	Common name (English)	Common name (Spanish)	Status
<i>Lonchura punctulata</i>	Scaly-breasted Munia	Gorrión Canela	Nonnative resident
<i>Lonchura malacca</i>	Tricolored Munia	Monjita Tricolor	Nonnative resident
<i>Passer domesticus</i>	House Sparrow	Gorrión Doméstico	Nonnative resident
<i>Euphonia musica</i>	Antillean Euphonia	Jilguero	Endemic subspecies
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	Gorrión Chicharra	Nonnative resident
<i>Nesospingus speculiferus</i>	Puerto Rican Tanager	Llorosa	Endemic species
<i>Spindalis portoricensis</i>	Puerto Rican Spindalis	Reinamora	Endemic species
<i>Icterus portoricensis</i>	Puerto Rican Oriole	Calandria de Puerto Rico	Endemic species
<i>Icterus icterus</i>	Venezuelan Troupial	Turpial Venezolano	Nonnative resident
<i>Agelaius xanthomus</i>	Yellow-shouldered Blackbird	Mariquita	Endemic species
<i>Molothrus bonariensis</i>	Shiny Cowbird	Tordo Lustroso	Native resident
<i>Quiscalus niger</i>	Greater Antillean Grackle	Mozambique	Endemic subspecies
<i>Setophaga angelae</i>	Elfin-woods Warbler	Reinita de Bosque Enano	Endemic species
<i>Setophaga petechia</i>	Yellow Warbler	Canario de Mangle	Native resident
<i>Setophaga adelaidae</i>	Adelaide's Warbler	Reinita Mariposera	Endemic species
<i>Sicalis flaveola</i>	Saffron Finch	Gorrión Azafrán	Native resident
<i>Coereba flaveola</i>	Bananaquit	Reinita Común	Endemic subspecies
<i>Tiaris olivaceus</i>	Yellow-faced Grassquit	Gorrión Barba Amarilla	Endemic subspecies
<i>Melanospiza bicolor</i>	Black-faced Grassquit	Gorrión Negro	Native resident
<i>Melopyrrha portoricensis</i>	Puerto Rican Bullfinch	Comeñame	Endemic species

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The Puerto Rico Breeding Bird Atlas (PRBBA) project collected and summarized information on the timing of breeding and geographic distribution of 130 breeding bird species on Puerto Rico, and its associated satellite islands and cays. Fieldwork coordinated by the Puerto Rican Ornithological Society (SOP) involved 344 volunteer observers who contributed to more than 45,500 individual observations of birds from 2004 through 2009. Following standard breeding bird atlas protocol, observers searched for breeding evidence in 479 hexagons while recording bird behavior. Each observed behavior was classified within a hierarchy of behaviors indicating increased likelihood of breeding from simply “observed” (i.e., no evidence for breeding), to “possible,” “probable,” or “confirmed” breeding evidence. Bird observations and breeding status were plotted in a geographic information system (GIS) layer with 479 hexagons (each 24 km<sup>2</sup>) covering Puerto Rico and its satellite islands and cays. For each species, the highest ranked breeding likelihood category (i.e., observed, possible, probable, or confirmed) was plotted for each hexagon to depict the species’ breeding distribution and probability of breeding in an area covered by the hexagon. In addition, breeding distribution and timing of breeding for each species were related to ecological life zones (or Holdridge life zones) on the islands and the protected areas to estimate the level of protection of the hexagons where the species breeds. Breeding distribution maps are depicted for terrestrial and aquatic birds including 73 native residents, 26 nonnative residents, 16 endemic species, 13 endemic subspecies, and 2 native migrant breeding species. The breeding distributions summarized in this atlas facilitate comparisons with earlier published descriptions of distribution for each species and will serve as a baseline for future studies of avian distributions and their responses to land use and climate change on Puerto Rico, satellite islands, and cays.

**Keywords:** Avian distribution, biogeography, Caribbean, citizen science, endemic bird species, geographic range, land use change, nonnative bird species, resident bird species, timing of breeding.



*The Puerto Rico* **Breeding Bird Atlas**

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