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**Abstract** West Indian Whistling-Ducks (*Dendrocygna arborea*) are endemic to the West Indies and have been declining in recent decades. Previous research has estimated 100 individuals on the island of Puerto Rico. We conducted ten 8-hr night observations at Laguna Cartagena National Wildlife Refuge between 19 January 2016 and 8 April 2016, resulting in a nightly average of 131.8 (SE = 4.5) individuals with a high count of 153. West Indian Whistling-Ducks used the lagoon at night with the average arriving flock size being 4.7 (SE = 0.8). The ducks routinely approached from the west 2–67 min after sunset and departed to the west before sunrise. It is likely that these West Indian Whistling-Ducks spent their days roosting in the mangroves of Refugio de Aves de Boquerón and their nights feeding at Laguna Cartagena National Wildlife Refuge. Our counts indicate that the population of West Indian Whistling-Ducks in Puerto Rico is larger than previously estimated.

**Keywords** *Dendrocygna arborea*, flock size, population, Puerto Rico, West Indian Whistling-Duck

**Resumen** Tamaño de los bandos de Chiriría Caribeña (*Dendrocygna arborea*) en Puerto Rico—La Chiriría Caribeña (*Dendrocygna arborea*) es una especie de pato endémica del Caribe Insular y en declive en las últimas décadas. Investigaciones anteriores han estimado que existen 100 individuos en la isla de Puerto Rico. Llevamos a cabo 10 observaciones nocturnas de 8 h de duración en el Refugio Nacional de Vida Silvestre Laguna de Cartagena entre el 19 de enero de 2016 y el 8 de abril del mismo año, lo que resultó en un promedio por noche de 131,8 (ES = 4,5) individuos con un máximo de 153. Las Chirirías Caribeñas usaron la laguna durante la noche con un promedio de tamaño de bando de 4,7 (ES = 0,8). Los patos se aproximaron rutinariamente desde el oeste de 2 a 67 min después del atardecer partiendo hacia el oeste antes del amanecer. Es probable que estos patos pasaron los días descansando en el Refugio de Aves de Boquerón y las noches alimentándose en el Refugio Nacional de Vida Silvestre Laguna de Cartagena. Nuestros conteos indican que la población de Chiriría Caribeña en Puerto Rico es mayor de lo que se había estimado previamente.

**Palabras clave** Chiriría Caribeña, *Dendrocygna arborea*, población, Puerto Rico, tamaño de bando

**Résumé** Taille des groupes de Dendrocygnes des Antilles (*Dendrocygna arborea*) à Porto Rico—Le Dendrocygne des Antilles (*Dendrocygna arborea*) est endémique des Antilles et sa population a diminué au cours des dernières décennies. Des recherches antérieures ont estimé à 100 le nombre d'individus présents sur l'île de Porto Rico. Entre le 19 janvier et le 8 avril 2016, nous avons effectué dix relevés nocturnes de 8 h sur le refuge national de Laguna Cartagena. Nous avons observé une moyenne de 131,8 (erreur type = 4,5) individus par nuit avec un maximum de 153. Les oiseaux utilisaient la lagune la nuit, la taille moyenne des groupes à l'arrivée étant de 4,7 (erreur type = 0,8). Ils arrivaient régulièrement de l'ouest 2 à 67 min après le coucher du soleil, et partaient dans cette même direction avant le lever du soleil. Ces oiseaux passaient probablement la journée en remise dans les mangroves du Refugio de Aves de Boquerón et la nuit à se nourrir au refuge national de Laguna Cartagena. Les effectifs observés indiquent que la population de Dendrocygne des Antilles à Porto Rico est plus importante qu'indiqué précédemment.

**Mots clés** *Dendrocygna arborea*, Dendrocygne des Antilles, population, Porto Rico, taille des groupes

West Indian Whistling-Ducks (*Dendrocygna arborea*) are a Vulnerable species endemic to the West Indies (BirdLife International

2016). They rely on freshwater, brackish, and marine wetlands for feeding and roosting (Sorenson *et al.* 2004). The range of the West Indian Whistling-Duck was historically over 1,900 km<sup>2</sup>, but the species has been extirpated from several islands, and the overall population has undergone strong declines in recent decades (Collar *et al.* 1992, Staus and Sorenson 1997, Raffaele *et al.* 1998, Staus 1998). The West Indian Whistling-Duck is listed as Vulnerable by the International Union for Conservation

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of Nature because of its small and severely fragmented range; threats limiting the population include hunting, habitat degradation, and the introduction of predators (BirdLife International 2016). Resident populations of at least 1,500 West Indian Whistling-Ducks have been reported for the Bahamas and the Turks and Caicos Islands combined, while an estimated 14,000 occur in Cuba, 800–1,200 in the Cayman Islands, 500 in Jamaica, an unknown number of individuals in six populations in the Dominican Republic, 500 in Antigua, and 50 in Barbuda (BirdLife International 2018). On the island of Puerto Rico, Sorenson *et al.* (2004) and BirdLife International (2016) reported there to be 100 West Indian Whistling-Ducks; however, maximum total counts of up to 116 West Indian Whistling-Ducks from Laguna Cartagena were reported in 2010 by Schaffner and Sánchez-Colón (2011). Basic life-history data are unknown for many aspects of West Indian Whistling-Duck ecology, including no previous data on flock size. In this paper, we report on average flock size and provide updated numbers on West Indian Whistling-Ducks in Puerto Rico.

### Methods

This study was conducted in the 422-ha Laguna Cartagena National Wildlife Refuge (NWR) in Lajas, Puerto Rico (18°01'N, 67°06'W; Fig. 1). The refuge's 80-ha lagoon, which has a dike going partway through it, is a remainder of what was once a large open expanse of water (U.S. Fish and Wildlife Service 2011). About half of the lagoon is covered by cattail (*Typha domingensis*). The remainder of the lagoon is open water with small patches of sedges (*Cyperus* spp.) and floating vascular plants (water lettuce [*Pistia stratiotes*] and water hyacinth [*Eichhornia crassipes*]) (Sánchez-Colón 2012, 2015). Water depth ranges from 0 cm to about 200 cm. It is one of Puerto Rico's few freshwater lagoons and is officially classified as a freshwater marsh (Deliz-Quñones 2005). It is an important freshwater habitat for migrating waterfowl and aquatic birds; historically, about half the species of breeding birds in Puerto Rico have been observed in the area (U.S. Fish and Wildlife Service 2011).

Beginning on 19 January 2016 and continuing through 8 April

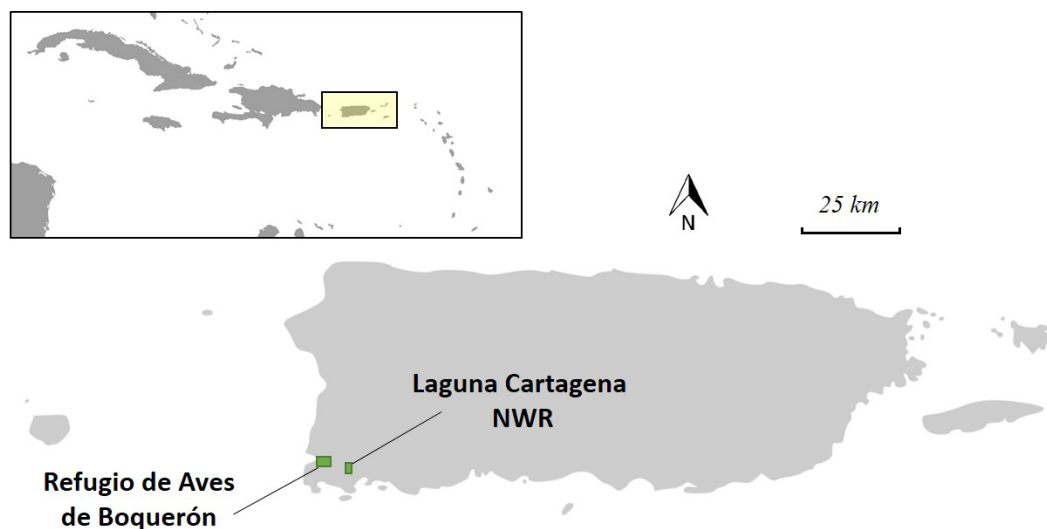
**Table 1.** Observations of West Indian Whistling-Ducks in Laguna Cartagena NWR, Puerto Rico, during 2016. All times are in Atlantic Standard Time.

Date	Sunset	Arrival Time of First Flock	Total # of Individuals	Mean Flock Size (SE)	Flock Size Range
19 Jan	1815		124		
20 Jan	1816		153		
22 Jan	1817		138		
24 Jan	1818	1905	141		
25 Jan	1819	1913	137		
29 Feb	1834	1910	145	6.9 (1.4)	1–23
10 Mar	1837	1905	106	4.6 (0.9)	1–17
19 Mar	1839	1925	119	3.1 (0.4)	1–11
29 Mar	1841	1915	118	4.4 (0.7)	1–13
8 Apr	1843	1925	137	4.3 (0.6)	1–11
<b>Mean</b>	<b>1828</b>	<b>1914</b>	<b>131.8</b>	<b>4.7 (0.8)</b>	<b>1–15</b>

2016, ten 8-hr nights were spent observing West Indian Whistling-Ducks at Laguna Cartagena NWR lagoon. The West Indian Whistling-Ducks would fly in from the west after sunset and depart to the west before sunrise. The total number of West Indian Whistling-Ducks was counted from an 8-m observation platform using an Exelis Night Enforcer PVS-14® (Harris Corporation, Melbourne, FL, USA) monocular night vision device. West Indian Whistling-Ducks were counted as they flew into the lagoon and landed on the water to feed.

### Results

The largest count of West Indian Whistling-Ducks was 153 and the lowest count was 106, with the average total number being 131.8 (SE = 4.5; Table 1). Average flock size was 4.7 (SE = 0.8) with flocks ranging from 1 to 23 birds (Table 1). The average largest flock each evening was 15.0 (SE = 2.3), while the average smallest flock was 1.0 (Table 1). The average arrival time of



**Fig. 1.** Map of Puerto Rico showing Laguna Cartagena NWR with Refugio de Aves de Boquerón to the west.

the first bird was 1914 Atlantic Standard Time (SE = 12 min). The first birds arrived 2–67 min (mean = 32.1; SE = 9.0) after sunset. The observed West Indian Whistling-Ducks presumably traveled back and forth from daytime roosting sites, which were likely in the mangroves of Refugio de Aves de Boquerón almost directly to the west of Laguna Cartagena NWR (Fig. 1).

### Discussion

We provide the first reports of flock size in the West Indian Whistling-Duck. The flock sizes we observed varied from 1 to 23 with the average being 4.7 (SE = 0.8). This wide range with a low average is a result of there having been many small flocks (68% had < 5 birds) and few large flocks. Perhaps if the West Indian Whistling-Ducks were moving from a commonly occupied day roosting site to the same night feeding area, they did not need to form large flocks to successfully locate either destination.

The total number of West Indian Whistling-Ducks in Puerto Rico based on prior published data was estimated to be 100 (Sorenson et al. 2004), but we counted more than 150 individuals in just one location in southwestern Puerto Rico. Therefore, the population of the West Indian Whistling-Duck is larger in Puerto Rico than previously thought. Estimating numbers of the West Indian Whistling-Duck is difficult because the members of this species are more active at night and typically roost in mangroves during the day (Staus 1998). However, we found that counting them at night as they arrive at their feeding site improves the accuracy of the counts.

Laguna Cartagena NWR is likely used as the main feeding site for the West Indian Whistling-Duck in southwestern Puerto Rico. At some times of year, the lagoon dries out and foraging habitat for the West Indian Whistling-Duck disappears. To keep the West Indian Whistling-Duck year round, we recommend completing the dike so water levels can be managed to maintain foraging habitat for this species.

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