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Photo: Carlos M. Peguero

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Cover Page: Adult Stygian Owl (*Asio stygius siguapa*) in a pine tree in Las Terrazas, Sierra del Rosario Biosphere Reserve, Artemisa province, on 7 May 2022. Photograph: Carlos M. Peguero.

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Abstract
The Stygian Owl (*Asio stygius*) has a fragmented distribution from northern Mexico, Central America, and some West Indian islands down to northern Argentina. However, information about the ecology and breeding biology of this owl is scarce throughout its entire range, particularly in the West Indies. In October 2006, an adult Stygian Owl of the Cuban endemic subspecies (*Asio stygius siguapa*) was observed nesting on the ground in Sierra de la Cañada Managed Resource Protected Area, on Isla de la Juventud, Cuba. This record confirms that *A. s. siguapa* uses the ground for nesting in the Cuban archipelago, as has been reported in mainland America for other Stygian Owl subspecies. New prey items are also described in the diet of the Stygian Owl within this protected area, and the four new localities reported here confirm the distribution of this owl both south and north of Isla de la Juventud.

Keywords
Asio stygius, breeding biology, endemic subspecies, new localities, owl pellet, Strigidae

Resumen
Observaciones sobre la nidificación en el suelo, dieta y distribución del Búho Estigio (*Asio stygius siguapa*) en Isla de la Juventud, Cuba • El Búho Estigio (*Asio stygius*) tiene una distribución fragmentada desde el norte de México, Centroamérica y algunas islas de las Antillas hasta el norte de Argentina. Sin embargo, la información sobre la ecología y biología reproductiva del Búho Estigio es escasa en toda su área de distribución, particularmente en las Antillas. En octubre de 2006, se observó un adulto de la subespecie endémica cubana de Búho Estigio o Siguapa (*A. s. siguapa*) que nidificaba sobre el suelo en el Área Protegida de Recursos Manejados Sierra de la Cañada, en Isla de la Juventud, Cuba. Este registro confirma que *A. s. siguapa* utiliza el suelo para nidificar en el archipiélago cubano, como se ha reportado en América continental para otras subespecies de *A. stygius*. También se describen nuevas presas en la dieta del Búho Estigio dentro del área protegida, y las cuatro nuevas localidades reportadas confirman la distribución de esta especie, tanto al sur como al norte de Isla de la Juventud.

Palabras clave
Asio stygius, biología reproductiva, egagrópila, nuevas localidades, Strigidae, subespecie endémica

Résumé
Observations relatives à la nidification au sol, au régime alimentaire et à la répartition du Hibou maître-bois (*Asio stygius siguapa*) sur l'île de la Juventud (Cuba) • Le Hibou maître-bois (*Asio stygius*) présente une répartition fragmentée qui s'étend depuis le nord du Mexique, l'Amérique centrale, et certaines îles des Antilles jusqu'au nord de l'Argentine. Cependant, les informations sur l'écologie et la biologie de la reproduction de cette espèce sont rares dans l'ensemble de son aire de répartition, en particulier aux Antilles. En octobre 2006, un individu adulte, de la sous-espèce endémique cubaine (*Asio stygius siguapa*), a été observé nichant au sol dans l'aire protégée de ressources gérées de la Sierra de la Cañada, sur l'Isla de la Juventud (Cuba). Ce signalement confirme que *A. s. siguapa* niche au sol dans l'archipel cubain, comme cela a été mentionné en Amérique continentale pour d'autres sous-espèces de Hibou maître-bois. De nouvelles proies ont également été décrites, précisant le

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régime alimentaire de l'espèce dans cette aire protégée, et les quatre nouvelles localités signalées ont confirmé la répartition de ce hibou au sud et au nord de l'Isla de la Juventud.

Mots clés
Asio stygius, biologie de la reproduction, nouvelles localités, pelote de réjection de rapace nocturne, sous-espèce endémique, Strigidae

The Stygian Owl has a fragmented distribution from northern Mexico, Central America, and some West Indian islands to northern Argentina, and is a rare species across its distribution range (Bodrati *et al.* 2006, König and Weick 2008, Rodríguez-Ruíz and Herrera-Herrera 2009). Six subspecies have been described, including two subspecies endemic to the West Indies: *Asio stygius siguapa* from mainland Cuba, Isla de la Juventud, and three islands of the Sabana-Camagüey Archipelago—Cayo Fábrica, Cayo Guajaba, and Cayo Sabinal; and *A. s. noctipetens* from Hispaniola and Gonâve Island (Kirkconnell *et al.* 1999, 2020, Gallardo and Thorstrom 2019). Recently, another subspecies (*A. s. stygius*) was reported in the West Indies, on the island of Trinidad (Deo *et al.* 2020). Despite its status as Least Concern on a global level (BirdLife International 2023), this owl has been considered rare or threatened in Cuba and Hispaniola, mainly due to deforestation and habitat degradation; these threats have persisted for more than a century (Gundlach 1876, 1893, Wiley 1985, 1986, Raffaele *et al.* 1998, Gallardo and Thorstrom 2019). However, the Cuban subspecies is not currently considered threatened; its population in some localities is inferred to be stable (Kirwan and Price 2009, Amaro-Valdés 2012, Kirkconnell *et al.* 2020). In Cuba, the Stygian Owl is found in deciduous woodland, second growth, pine forest, mogote forest, and areas of scattered trees, from sea level to higher elevations (Kirkconnell *et al.* 1999, 2020).

Despite the widespread distribution of this owl, information on its reproduction is lacking throughout its area of occupancy, including its incubation period and extent of its breeding season (Lopes *et al.* 2004, Phillips *et al.* 2020), particularly in the West Indies (Kirkconnell *et al.* 1999, 2020, Thorstrom and Gallardo 2017). The first Stygian Owl nest reported in Cuba (and the first in the Americas) was observed on 1 December 1940, on the ground near Laguna La Deseada, south of San Cristóbal, Artemisa province (Bond 1942). The nest was located in the middle of a small clump of cana palms (*Sabal* sp.), it was made of palm fronds, and it contained two white eggs (Bond 1942). Based on this report, Bond (1947) concluded that the Stygian Owl in the West Indies has arboreal habits but nests on the ground, where it lays two eggs. The second nesting report of a Stygian Owl in Cuba was of two fledged juveniles nearly two months old, observed in a tree in the vicinity of Sagua la Grande, Villa Clara province, in late 1965 (Garrido in Bond 1966, Garrido 1992). Other reported nests of this owl subspecies were also in trees, on bulky platforms with small sticks, possibly nests abandoned by hawks (Bond 1971, Garrido 1992, Kirkconnell *et al.* 1999, 2020, Navarro Pacheco *et al.* 2023).

In the mainland Americas, the range of the Stygian Owl's prey included, in order of preference: birds, bats, insects, rodents, lizards, and frogs, with a predominance of birds in most reports and very low proportions of the three last groups (Lehmann 1957, Borrero 1967, Franz 1991, Motta-Junior and Taddei 1992, Lopes *et al.* 2004, Motta-Junior 2006, Phillips 2011, Cadena-Ortiz *et al.* 2018, Martínez and Echevarria 2018, Phillips *et al.* 2020, Restrepo-Cardona *et al.* 2021). Within birds, passerines and pigeons were the most important components of the diet (Motta-Junior 2006; Cadena-Ortiz *et al.* 2018, Phillips *et al.* 2020, Restrepo-Cardona *et al.* 2021).

The confirmed information on the diet of the Stygian Owl in the West Indies is relatively scarce; it is known to prey on birds, bats, and introduced murid rodents (Gundlach 1876, Wiley 1986, Kirkconnell *et al.* 1999). Gundlach (1876) mentioned that this owl could prey on reptiles and large insects, and years later, he included those prey items in the Stygian Owl diet (Gundlach 1893). Other authors (García Montaña 1987, Garrido 1992, Raffaele *et al.* 1998, Garrido and Kirkconnell 2011) have also included those prey groups (and also crabs) without confirming them in the Stygian Owl diet in the West Indies.

A. s. siguapa is widely distributed in the Cuban archipelago, with reports from almost all provinces (Kirkconnell *et al.* 2020). On Isla de la Juventud, it has been reported in both the north and the south of the island (Garrido and Kirkconnell 2011), but these reports have been scarce and separated by long periods of time. The first record of the species on Isla de la Juventud was a bird collected in 1892, but the location of collection was not specified (Cory 1892, Gundlach 1893). Only five records of the Stygian Owl have been reported on Isla de la Juventud in the 20th century. The first record was an adult male collected in La Vega (San Francisco de la Vega) on 25 May 1904 (Todd 1916). A juvenile female was collected on 28 May 1913 in Pasadita in the south of the island (Todd 1916). On 1 February 1919, Thomas Barbour collected an adult male in the vicinity of Nueva Gerona (Morris 2022). In addition, a female was collected on 25 January 1931, probably by James Bond (see Bond 1942), but without specifying the location of collection (ANSP/ORN 2014). The last known report of the Stygian Owl on this island was in Los Indios Ecological Reserve (Kirkconnell *et al.* 1999), where a pair was observed in 1998 (X. Gálvez pers. comm.). These observations include new information about breeding habits (including the first record of ground nesting), diet, and distribution of this poorly known species in Isla de la Juventud, Cuba.

Observations

Description of nest, nest area, and eggs

On 15 October 2006, I observed an adult, presumably female (due to behavior) Stygian Owl sitting on a single egg on the ground on a savannah with pine trees on white quartzite sands in the buffer zone of Sierra de la Cañada Managed Resource Protected Area, Isla de la Juventud (21°43'45"N, 82°54'38"W; c. 62.7 m above sea level [asl]). According to Simon and Pacheco's (2005) classification, the nest was of the simple unlined type,

Fig. 1. Stygian Owl nesting on the ground in Sierra de la Cañada Managed Resource Protected Area, Isla de la Juventud, Cuba: (A) nest with two eggs, (B) adult presumed female in a pine tree. Photographs taken on 23 October 2006 by Seriocha Amaro-Valdés.

with the eggs lying directly on the ground and surrounded by only a few dry leaves of *Trachypogon macroglossus*, the dominant (locally naturalized) herbaceous plant in the sandy savannah. The nest was in the shade of a clump of five paurotis palms (*Acoelorraphe wrightii*), four young individuals with a maximum height of 0.81 m and one mature individual with a height of 2.0 m. On one side of the palm clump, the visibility of the nest was limited due to high vegetation density of the following plant species: *Chamaecrista diphylla*, *Byrsonima crassifolia*, *Croton craspedotrichus*, and *Tabebuia lepidophylla*. Two pine tree species were also present in the vicinity of the nest (*Pinus tropicalis* and *P. caribaea*) as were other palm species (*Coccothrinax miraguama*, *Colpothrinax wrightii*).

I observed a second egg on the morning of 18 October 2006, three days after the first was detected (Fig. 1a). Both eggs were entirely white (like most owl eggs), elliptical, and measured (mm) 47.3 × 35.4 and 46.6 × 37.9, respectively. I made sporadic observations of this nest on October 15–19 and 23–26, 2 hr each morning (0930–1130) and 2 hr each afternoon (1430–1630) during the nesting season. The presumed female was observed on the nest in incubation posture during the daylight hours, except when disturbed for data collection during three visits to the nest, upon which the bird flew to the nearest pine tree (Fig. 1b). Upon my departure, it always returned immediately to the nest. At night (25 October, around 2045) the owl was observed on her usual perch, apparently hunting. I did not observe the nest again until 15 November 2006. However, a conservation worker, who resided in the biological station of Sierra de la Cañada Managed Resource Protected Area, visited the area frequently during the first two weeks of November 2006 and saw an owl sitting on the nest in incubation posture (A. Castro pers. comm.). No other owl was detected in the area of the nest during the observation periods (October 15–26, November 1–14).

On 15 November 2006 at 1520, I visited the nest area, and observed the adult Stygian Owl on the nest. At 2200, when I returned to check the nest contents, the owl was not present, one of the eggs was damaged (egg was cracked with no embryo present) and the other egg was missing. The nest was likely depredated, though this cannot be confirmed.

Diet

On 16 November 2006 at 0740, I found a pellet at the foot of the pine tree where the presumed female Stygian Owl usually perched. The pellet had eggshell fragments that appeared to be from one of its own eggs and avian bones (Fig. 2a, b). The pellet was 47 mm and I dissected it once dry. To determine the identity of the bones, two specialists compared them with specimens deposited in two reference collections. They detected bones of a Yellow-bellied Sapsucker (*Sphyrapicus varius*; Fig. 2c) and the skulls and bones of at least three specimens of warblers (Parulidae; Fig. 2d), belonging to two indeterminate genera and species.

Distribution

This report adds observations of the Stygian Owl in four new localities in Isla de la Juventud (Fig. 3). The owl I observed was from Sierra de la Cañada Managed Resource Protected Area, in the central-western part of the island (Fig. 3). An adult owl was observed in a pine tree in this protected area in 2018 (A. Castro pers. comm.). Three additional localities (Fig. 3) are now confirmed: (1) between the town of Cocodrilo and Punta Pedernales in the extreme south-west of the island, A. Vidal (pers. comm.) observed an adult in late 2007; (2) on the old road to Cayo de los Monos, bordering the town of San Pedro, M.A. Soto (pers. comm.) observed an adult in 2010; and (3) most recently, in March 2022, in the vicinity of the town Abel Santamaría, near Sierra de Casas, Nueva Gerona, M.A. Soto (pers. comm.) observed another adult.

Discussion

In Cuba, almost all reports of Stygian Owl nests document them in trees, with the owls using abandoned stick nests of other bird species (Kirkconnell *et al.* 1999; see Fig. 4). This is contrary to the mainland Americas, where ground nesting (Scherer-Neto 1985, Franz 1991, Lopes *et al.* 2004, Motta-Junior *et al.* 2010, Ruiz-Esparza *et al.* 2015, Gussoni 2017, Vanegas *et al.* 2018, Phillips *et al.* 2020, Gamez 2021) is reported more often than the use of abandoned nests in trees (Oliveira 1981, Albuquerque 1983, Holt *et al.* 2014, Cadena-Ortiz *et al.* 2018, Lammertink 2019, Molina 2021). Motta-Junior *et al.* (2010) considered the ground to be the most common place for this owl to nest. It has been suggested that Bond's (1942) record of ground nesting in Cuba may have been wrong, perhaps a confusion with another species of owl, because no additional records had been found in the Cuban archipelago (Kirkconnell *et al.* 1999, 2020). My observation, however, confirms that the Stygian Owl also nests on the ground in the Cuban archipelago, thus validating Bond's (1942) record.

This is the first documented report of a Stygian Owl nest on Isla de la Juventud, and the photograph of the eggs is the first illustration of the eggs of this species in the Cuban archipelago and the West Indies. Similar nests on the ground (structurally simple, with a fine layer of dry plants) and located under other plants that provide shade and shelter to the eggs and the adult are also documented (Bond 1942, Lopes *et al.* 2004, Motta-Junior *et al.* 2010, Vanegas *et al.* 2018, Phillips *et al.* 2020). The Stygian Owl commonly lays two white eggs (Bond 1942, Ruiz-Esparza *et al.* 2015, Vanegas *et al.* 2018, this study), with a record of three eggs in Brazil (Lopes *et al.* 2004). Measurements of the two eggs obtained in Isla de la Juventud are similar to the values reported in Brazil by Lopes *et al.* (2004). These authors also noted that, during the day, incubation was constant, which aligns with our observations.

In the mainland Americas, the breeding of Stygian Owls has been reported in September–May in Brazil (Oliveira 1981, Albuquerque 1983, Scherer-Neto 1985, Lopes *et al.* 2004, Motta-Junior *et al.* 2010, Ruiz-Esparza *et al.* 2015, Gussoni 2017) and Ecuador (Cadena-Ortiz *et al.* 2018, Molina 2021), May–December in Colombia (ABO 2000, Munera 2020), July in Peru (Flint 2022), November in Argentina (Lammertink 2019), and February–June north of the equator in Guatemala (Holt *et al.* 2014) and Belize (Franz 1991, Phillips *et al.* 2020, Gamez 2021). These records indicate that this species breeds throughout the year, depending on the latitude, climatic conditions (Lopes *et al.* 2004), and the abundance of food (Holt *et al.* 2014).

In Hispaniola, the breeding season has been estimated between the months of November and April (Stockton Dod 1983) or between April and June (Thorstrom and Gallardo 2017). Gundlach (1865) stated that this owl nests in February in Cuba, where the breeding season was determined to be from January to April (Kirkconnell *et al.* 1999, Garrido and Kirkconnell 2011), although Bond's (1942) report (above) was of a female nesting in December. Also, Bond (1942) described a bird in juvenile plumage collected from Cuba in January 1941. Similarly, on 1 January 2022, a nest with two nestling Stygian Owls was observed in a tree in El Recreo trail, Alejandro de Humboldt National Park, Baracoa, Guantánamo province (Navarro Pacheco *et al.* 2023). Most recently, on

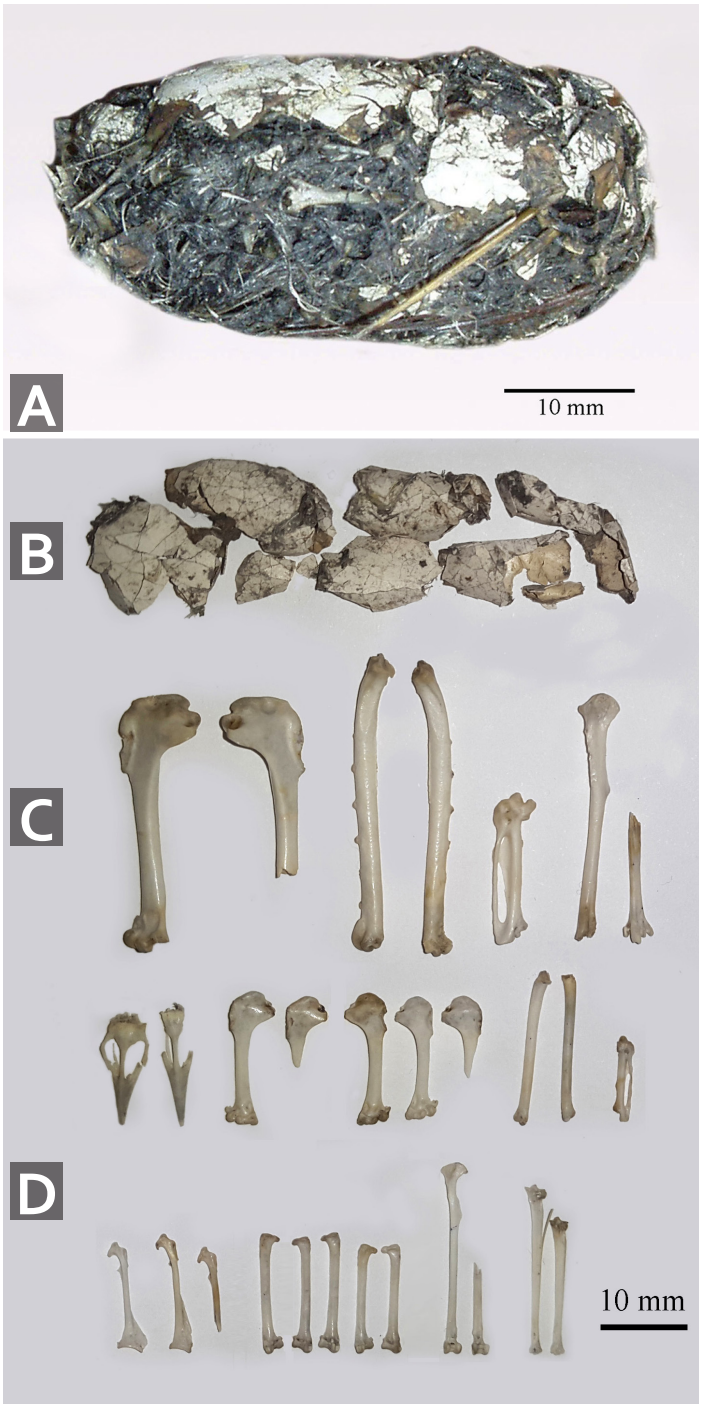

Fig. 2. (A) Pellet of the presumed female Stygian Owl, with contents outlined below: (B) shells of the egg, (C) bones of a Yellow-bellied Sapsucker, (D) skulls and bones of warblers. Photographs taken by Seriocha Amaro-Valdés.

6 January 2024, two fledged juveniles were reported in the National Botanic Garden of Cuba, La Habana province (Hernández-Peraza 2024). Sporadic observations of Stygian Owl nests and their nestlings have been made in Soplillar, Ciénaga de Zapata Biosphere Reserve, Matanzas province, in March 2002 (O. Martínez pers. comm.; Fig. 4a), in Botanic Garden of Cienfuegos (a fledged juvenile), Cienfuegos province, on 19 March 2017 (Ringer 2017), and Las Terrazas, Sierra del Rosario

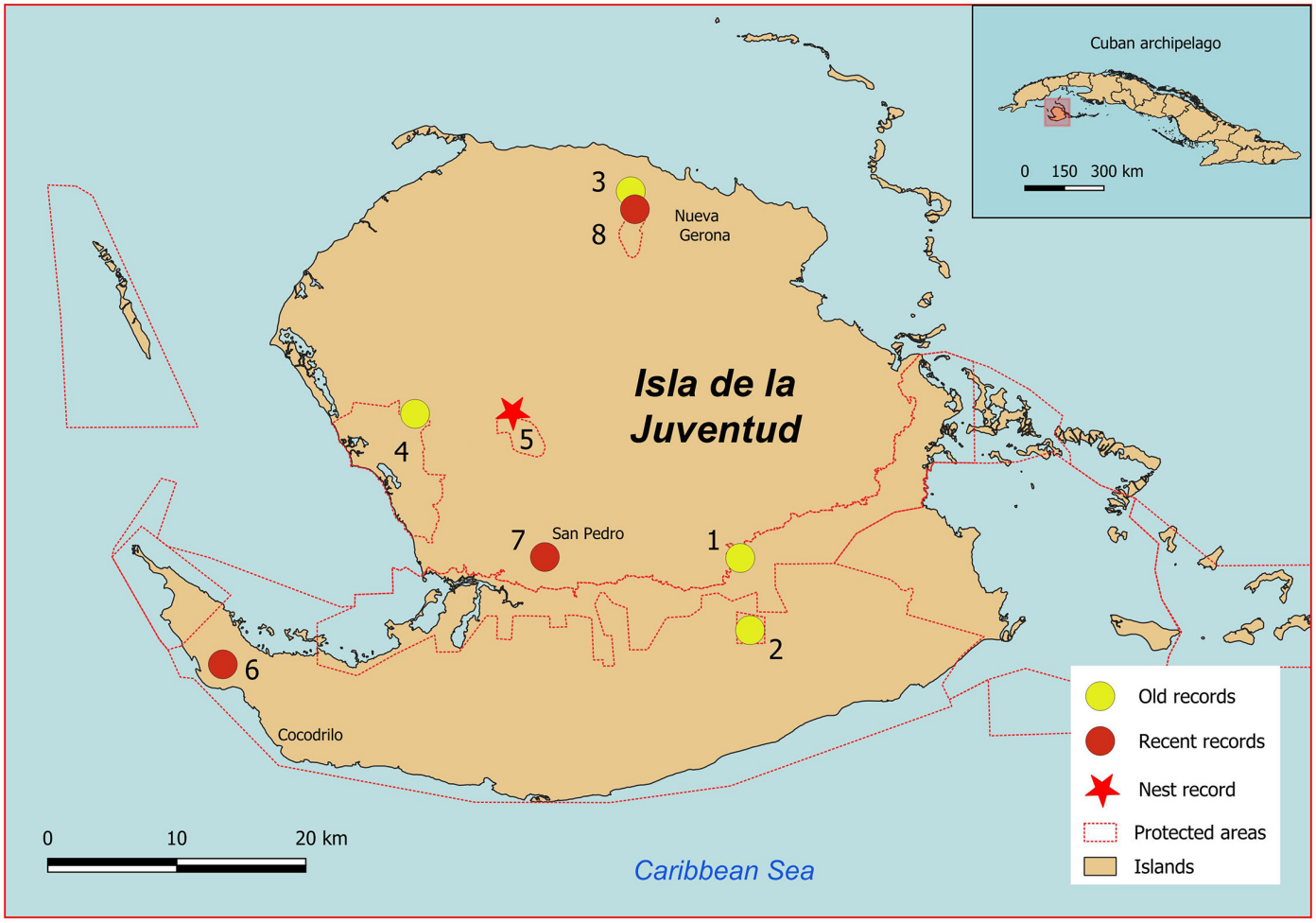

Fig. 3. Distribution records of the Stygian Owl on Isla de la Juventud, Cuba. Numbers refer to the following locations: (1) La Vega (= San Francisco de La Vega); (2) Pasadita; (3) unnamed location, near Nueva Gerona; (4) Los Indios Ecological Reserve; (5) Sierra de la Cañada Managed Resource Protected Area (nesting owl record); (6) unnamed location between the town of Cocodrilo and Punta Pedernales; (7) location on the old road to Cayo de los Monos, bordering the town of San Pedro; and (8) in the vicinity of the town Abel Santamaría, near Sierra de Casas. Data were obtained from published (Kirkconnell *et al.* 1999, online scientific museum collections) and unpublished data. Map credit: Joán Hernández.

Biosphere Reserve, Artemisa province, from 6 March to 14 May 2022 (F.L. Cámara and C.M. Peguero pers. comm.; Fig. 4b). However, our report of an incubating Stygian Owl in October on Isla de la Juventud allows us to estimate that the breeding season of this owl in the Cuban archipelago extends from the end of the rainy season (October) until the beginning of the next rainy season (May).

The cause of the loss of the eggs in this nest is unknown. Human disturbance is one potential cause. The fact that the owl was observed on her nest later in October and during the first half of November, after my visits, suggests that my observations did not cause this loss. Predation as a cause of egg loss has been reported for Stygian Owls. Bond (1942) reported that the nest and its eggs were probably destroyed by pigs in Cuba, and in Brazil domestic dogs were a possible predator of nestlings (Lopes *et al.* 2004). Known predators on Isla de la Juventud include domestic dogs and snakes (e.g., Cuban boa, *Chilabothrus angulifer*). Alternatively, the broken egg may have been infertile. In a Stygian Owl nest in Colombia, one egg out of two was infertile (Vanegas *et al.* 2018). In other owl species, e.g., Barn Owls (*Tyto alba*), many eggs do not hatch (Marti 1994). If one egg had hatched, it is possible that the incubating Stygian Owl consumed the eggshell because it supplies calcium, as has been reported in Eastern Screech-Owl (*Megascops asio*; Tekiela 2007) and in Great Gray Owl (*Strix nebulosa*; Explore Birds Bats Bees 2017). The inclusion of eggshell remains in the Stygian Owl pellet is also possible evidence of that. There have also been reported cases of filicide in Barn Owls and in Powerful Owls (*Ninox strenua*) in which one or both of the adult owls killed and consumed one of their newly hatched nestlings (BirdForum 2013, Allen 2020).

The prey items contained in the pellet from Isla de la Juventud increase the number of known bird species preyed upon by Stygian Owls in the West Indies to nine and possibly three unidentified species of warblers (Appendix 1). The Yellow-bellied Sapsucker is the second recorded species of woodpecker in the diet of the Stygian Owl in the Americas (the other being the Campo Flicker, *Colaptes campestris*; see Motta-Junior 2006).

The new distribution records of Stygian Owls on Isla de la

Fig. 4. Adult presumed female Stygian Owls and their nestlings in trees in Cuba: (A) nest on a black olive (*Terminalia buceras*) with a greater than 2-week-old nestling in Soplillar, Ciénaga de Zapata Biosphere Reserve, Matanzas province; photograph taken in March 2002 by Gilberto Forneris, courtesy of Orestes Martínez. (B) Nest in a Caribbean pine tree with two greater than 12-day-old nestlings in Las Terrazas, Sierra del Rosario Biosphere Reserve, Artemisa province; photograph taken on 6 March 2022 by Freddy L. Cámara.

Juventud show that the species is still found in both the northern and southern regions of the island (Fig. 3), and that it is not restricted to the northern region as reported by Kirkconnell *et al.* (2020). I found no reports from Isla de la Juventud in eBird (eBird 2024).

The reproduction biology of owls has received little attention in the Neotropics, and one of the little known species in this respect is the Stygian Owl (Enríquez and Vázquez-Pérez 2017, Motta-Junior *et al.* 2017, Phillips *et al.* 2020). It is therefore of great importance to increase the knowledge about the reproductive biology of this species throughout its distribution. Many unknown aspects of the ecology of the Stygian Owl remain to be researched in the Cuban archipelago, and these observations aid our understanding, and thus the conservation, of this unique subspecies.

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Appendix 1. List of known prey species of the Stygian Owl in the West Indies. ? = number of individuals not reported.

Country	Prey	Recorded Individuals	Reference
Cuba—*Asio stygius siguapa*			
	COLUMBIFORMES: Columbidae		
	White-crowned Pigeon (*Patagioenas leucocephala*)	1	Kirkconnell *et al.* 1999
	Ruddy Quail-Dove (*Geotrygon montana*)	1	Kirkconnell *et al.* 1999
	Mourning Dove (*Zenaida macroura*)	2	Kirkconnell *et al.* 1999
	TROGONIFORMES: Trogonidae		
	Cuban Trogon (*Priotelus temnurus*)	1	Kirkconnell *et al.* 1999
	PICIFORMES: Picidae		
	Yellow-bellied Sapsucker (*Sphyrapicus varius*)	1	This study
	PASSERIFORMES: Tyrannidae		
	Cuban Pewee (*Contopus caribaeus*)	3	Kirkconnell *et al.* 1999
	PASSERIFORMES: Icteridae		
	Cuban Oriole (*Icterus melanopsis*)	3	Kirkconnell *et al.* 1999
	Cuban Blackbird (*Ptiloxena atroviolacea*)	1	Kirkconnell *et al.* 1999
	PASSERIFORMES: Parulidae		
	Warbler (*Setophaga* sp.)	1	Kirkconnell *et al.* 1999
	Warbler (genus 1 and species 1)	1	This study
	Warbler (genus 2 and species 1)	2	This study
	PASSERIFORMES unidentified	?	Gundlach 1876
	CHIROPTERA: Phyllostomidae		
	Cuban flower bat (*Phyllonycteris poeyi*)	13	Kirkconnell *et al.* 1999
	Jamaican fruit-eating bat (*Artibeus jamaicensis*)	2	Kirkconnell *et al.* 1999
	Cuban fig-eating bat (*Phyllops falcatus*)	6	Kirkconnell *et al.* 1999
		1	Orihuela *et al.* 2020
	RODENTIA: Muridae		
	Black rat (*Rattus rattus*)	?	Gundlach 1876
Dominican Republic—*Asio stygius noctipetens*			
	COLUMBIFORMES: Columbidae		
	White-fronted Quail-Dove (*Geotrygon leucometopia*)	1	Wiley 1986
	RODENTIA: Muridae		
	Black rat (*Rattus rattus*)	6	Wiley 1986