Waterfowl in Cuba: current status and distribution

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Abstract

Cuba and its satellite islands represent the largest landmass in the Caribbean archipelago and a major repository of the region's biodiversity. Approximately 13.4% of the Cuban territory is covered by wetlands, encompassing approximately 1.48 million ha which includes mangroves, flooded savannas, peatlands, freshwater swamp forests and various types of managed wetlands. Here, we synthesise information on the distribution and abundance of waterfowl on the main island of Cuba, excluding the numerous surrounding cays and the Isla de la Juventud (Isle of Youth), and report on band recoveries from wintering waterfowl harvested in Cuba by species and location. Twenty-nine species of waterfowl occur in Cuba, 24 of which are North American migrants. Of the five resident Anatid species, three are of conservation concern: the West Indian Whistling-duck *Dendrocygna arborea* (globally vulnerable), White-cheeked Pintail *Anas bahamensis* (regional concern) and Masked Duck *Nomonyx dominicus* (regional concern). The most abundant species of waterfowl wintering in Cuba include Blue-winged Teal *A. discors*, Northern Pintail *A. acuta*, and Northern Shoveler *A. clypeata*. Waterfowl banded in Canada and the United States and recovered in Cuba included predominantly Blue-winged Teal, American Wigeon and Northern Pintail. Banding sites of recovered birds suggest that most of the waterfowl moving through and wintering in Cuba are from the Atlantic and Mississippi flyways. Threats to wetlands and waterfowl in Cuba include: 1) egg poaching of resident species, 2) illegal hunting of migratory and protected resident species, 3) mangrove deforestation, 4) reservoirs for irrigation, 5) periods of pronounced droughts, and 6) hurricanes. Wetland and waterfowl conservation efforts continue across Cuba's extensive system of protected areas. Expanding

collaborations with international conservation organisations, researchers and governments in North America will enhance protection of waterfowl and wetlands in Cuba.

Key words: Anatidae, Caribbean, Cuba, conservation, habitat, management.

The Caribbean islands are a priority area globally for biodiversity conservation because of the high rate of habitat loss in the region (Brooks *et al.* 2006; Shi *et al.* 2005). The archipelago straddles the boundary of the Neotropical and Nearctic regions with tropical and subtropical climates. Rainfall patterns in the insular Caribbean are highly variable, and on many islands precipitation exceeds potential evapotranspiration, a condition that provides ample water to sustain wetland environments (Lugo 2002). With a total land mass of 110,860 km^2 and over 1,600 offshore islands and cays, Cuba represents the largest and most diverse island group in the West Indies (Fig. 1). It harbours the greatest biological diversity and degree of endemism in the West Indies; over 50% of its flowering plants and 32% of its vertebrates are unique to the country (ACC-ICGC 1978; Woods 1989; González 2002; Rodríguez-Schettino 2003; Borroto & Mancina 2011). Despite its regional importance, very little published information on waterfowl in Cuba, including on their distribution and general ecology, has become available to scientists working on these species in other parts of their range (Scott & Carbonell 1986; Santana 1991). Given the scarcity of publications on Cuban waterfowl

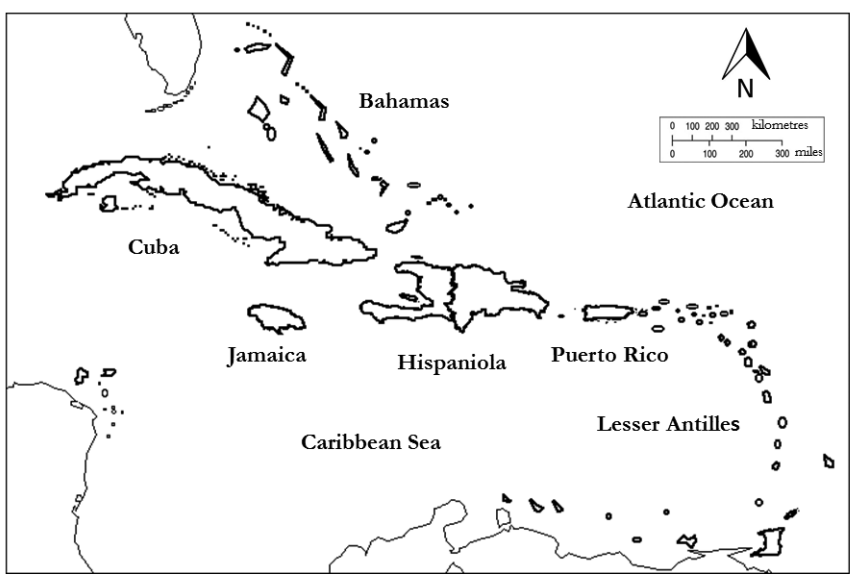

Figure 1. Map of the West Indies indicating major island groups.

and threats to wetland conservation in the region, it is important to summarise available information for the benefit of the broader scientific community. Furthermore, condensing the available literature on waterfowl and wetlands of Cuba into a single document may also be useful for researchers and managers interested in the region.

Wetland types in Cuba include mangrove forest (riparian and estuarine), freshwater marsh, seasonally flooded savanna, swamp forest, riverine wetlands and managed wetlands such as salt pans and rice fields (Borhidi *et al.* 1993). Coastal regions of Cuba feature large expanses of mangrove forest characterised by the four tree species common in the Caribbean (Red Mangrove *Rhyzophora mangle*, Black Mangrove *Avicennia germinans*, White Mangrove *Laguncularia racemosa* and Buttonwood Mangrove *Conocarpus erectus*). The interior regions of the main island of Cuba are characterised by flat topography where seasonally flooded savannas are found. These savannas represent the most floristically diverse wetlands of the Caribbean and include a great number of endemic palm species (Armenteros *et al.* 2007). Dominant species of savanna wetlands include *Eleocharris interstincta*, *Claudium jamaicense*, *Paspalum giganteum*, *Cyperus* sp., *Isoetes palustris*, *Erianthus giganteus*, *Thalia geniculata*, *Nymphaea odorata* and *Brasenia scheberi*. Swamp forests are characterised by arboreal elements and epiphytes with canopy heights of up to 20 m. Here the dominant species include *Tabebuia angustata*, *Fraxinus cubensis*, *Annona glabra*, *Gueltarda combiri*, *Bucida palustris*, *Hibiscus tiliaceus* and *Chrysobalanus icaco* (Armenteros *et al.* 2007).

Approximately 30% of the 1.48 million ha of Cuban wetlands are included in the national system of protected areas. Some of the most important wetlands include: the complex of lagoons south of Pinar del Río province, the Birama marshes in Granma province, the Río Máximo wildlife refuge in Camagüey province and the Lanier Swamp in the Isla de la Juventud. With a total area of 450 km^2, the Zapata Swamp (22°01'–22°40' N, 80°33'–82°09' W) is the largest and most complex drainage system in the Caribbean (Kirkconnell *et al.* 2005). Some 625,354 ha of this large wetland complex are protected as a Biosphere Reserve. Here we present information on the distribution and abundance of waterfowl on the main island of Cuba, excluding the numerous surrounding cays and the Isle of Youth. We also report on band recoveries, by species and location, for waterfowl caught and ringed in Canada and the United States that were harvested in mainland Cuba. There have been no formal waterfowl banding programmes to date within Cuba.

Methods

We reviewed and summarised information on abundance patterns and geographic distribution from a large number of unpublished reports and publications for the period 1975–2010 (most notably from Garrido & Schwartz 1968; Garrido 1980; Llanes *et al.* 1987; Sánchez *et al.* 1991; Torres & Solana 1994; Acosta & Mugica 1994; Goossen *et al.* 1994; Morales & Garrido 1996; Melián 2000, Rodríguez 2000; Peña *et al.* 2000; Wiley *et al.* 2002; Barrios *et al.* 2003). Presence of duck species and location coordinates were transferred to

118 cartographic quadrangles (37 × 18.5 km, scale 1:100,000) covering the entire main island. Residence categories for each species in Cuba followed Garrido and Kirkconnell (2000). For instance, bimodal resident (BR) refers to species (*e.g.* Wood Duck) that include both permanent breeding residents and also a small number of transient migrants; winter resident and transient (WR-T) refers to species that mostly winter in Cuba but with some individuals that occur as transients as they move through Cuba to and from wintering sites on the mainland (Central and South America); mostly transient winter residents (T-WR) are species that only occur as transients during migration peaks; introduced breeding residents (I-BR) are introduced species (e.g. the Muscovy Duck) known to breed in Cuba; and accidental (Ac) species occur only occasionally in Cuba.

Band recovery information of waterfowl harvested in Cuba from 1930–2010 was obtained from the U.S. Geological Survey's Bird Banding Laboratory and the Canadian Bird Banding Office (Blanco & Sánchez 2005). Location information from field surveys and band recoveries were georeferenced and incorporated in a Geographic Information System using ArcView 3.1 (ESRI 2001).

Results

Waterfowl in Cuba are represented by 29 species in 14 genera (Garrido & Kirkconnell 2011; Raffaele *et al.* 1998), of which 24 are migratory species with varying degrees of residence (Table 1). Species recorded in Cuba represent 93.5% (29 of 31) of waterfowl reported for the West Indies (Raffaele *et al.* 1998), highlighting the regional importance of Cuba for waterfowl in the Caribbean. North American migratory waterfowl contribute greatly to the widespread distribution of ducks in Cuba and were registered in 98 (83%) of the 118 topographic quadrangles (Fig. 2). The migratory species are almost exclusively from North America, with the possible exception of the White-faced Whistling Duck *Dendrocygna viduata* which comes from Central and/or South America and is considered an "accidental" species in Cuba. Migrant waterfowl most frequently recorded in topographic quadrangles included Blue-winged Teal *Anas discors*, American Wigeon *A. americana*, Northern Shoveler *A. clypeata*, Northern Pintail *A. acuta* and Fulvous Whistling-duck *Dendrocygna bicolor*. A total of 1,842 bands from 11 waterfowl species were recovered in Cuba during 1930–2010 (Table 2). Of these, 91.5% were recovered from Blue-winged Teal, 2.2% from American Wigeon and 2.1% from Northern Pintail. A small number of Wood Duck banded in Florida and Georgia were recovered in Cuba, suggesting that, in addition to the permanent breeding residents, occasional transient individuals arrive from North America; the species is therefore classed as a bimodal resident (Blanco & Sánchez 2005; Garrido & Kirkconnell 2011).

Arrival dates and presence of migratory waterfowl have been reported by various Cuban researchers working in natural wetlands and fields with rice *Oryza* sp. cultivation. Unfortunately, much of this information is only available in scientific journals published in Cuba or in regional

Table 1. Waterfowl species in Cuba by residence type according to Garrido and Kirkconnell (2011). Residence categories include: accidental (Ac), permanent resident (PR), bimodal resident (BR), bimodal resident and transient (BR-T) winter resident and transient (WR-T), mostly transient winter resident (T-WR), introduced breeding resident (I-BR).

Common name	Scientific name	Category of residence
White-faced Whistling-Duck	*Dendrocygna viduata*	Ac
Black-bellied Whistling-Duck	*Dendrocygna autumnalis*	PR
West Indian Whistling-Duck	*Dendrocygna arborea*	PR
Fulvous Whistling-Duck	*Dendrocygna bicolor*	I-BR
Greater White-fronted Goose	*Anser albifrons*	Ac
Snow Goose	*Chen caerulescens*	Ac
Canada Goose	*Branta canadensis*	Ac
Tundra Swan	*Cygnus columbianus*	Ac
Muscovy Duck	*Cairina moschata*	I-BR
Wood Duck	*Aix sponsa*	BR-T
Gadwall	*Anas strepera*	Ac
American Wigeon	*Anas americana*	WR-T
Mallard	*Anas platyrhynchos*	T-WR
Blue- winged Teal	*Anas discors*	WR-T
Cinnamon Teal	*Anas cyanoptera*	Ac
Northern Shoveler	*Anas clypeata*	WR-T
White-cheeked Pintail	*Anas bahamensis*	PR
Northern Pintail	*Anas acuta*	WR-T
Green-winged Teal	*Anas crecca*	WR-T
Canvasback	*Aythya valisineria*	Ac
Redhead	*Aythya americana*	Ac
Ring-necked Duck	*Aythya collaris*	WR-T
Greater Scaup	*Aythya marila*	Ac
Lesser Scaup	*Aythya affinis*	WR-T
Bufflehead	*Bucephala albeola*	Ac
Hooded Merganser	*Lophodytes cucullatus*	Ac
Red-breasted Merganser	*Mergus serrator*	WR-T
Masked Duck	*Nomonyx dominicus*	PR
Ruddy Duck	*Oxyura jamaicensis*	BR-T

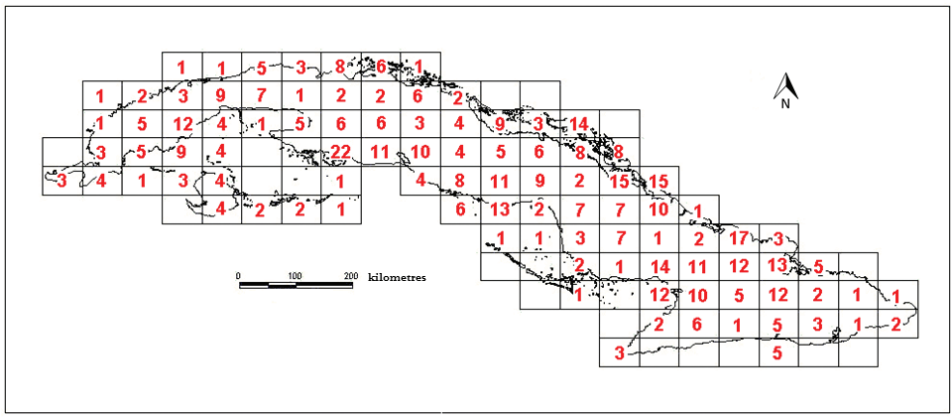

Figure 2. Number of waterfowl species recorded per topographic quadrangle in Cuba (2007–2013).

publications, which may be difficult to access by researchers outside the Caribbean (Acosta *et al.* 1992; Blanco 1996; Blanco *et al.* 1996; Sánchez & Rodríguez 2000; Sánchez *et al.* 2008). Published reports indicate the major entry points for migrant waterfowl include the Zapata Swamp lagoons, the Río Máximo refuge and mangrove wetlands in cays of the Sabana-Camagüey archipelago. Coastal lagoons in the south-central part of the island adjacent to the rice producing regions (*e.g.* Sur del Jíbaro) are also important arrival sites for the birds (Mugica 2000; Mugica *et al.* 2001; Acosta and Mugica 2006).

Band recovery data indicated that waterfowl recovered in Cuba originated in 10 Canadian provinces and 34 states of the USA. Overall, *c.* 84.6% of the 1,842 banded waterfowl recovered in Cuba originated from 24 U.S. states and Canadian provinces in the eastern and central regions of North America. The remaining recoveries include a small number of birds originating in states of the western United States (*e.g.* California and Idaho). The greatest number of duck species and individuals recovered in 10 of 15 Cuban provinces originated in three Canadian provinces (Manitoba, Saskatchewan and Ontario) as well as the states of Illinois, Iowa, Louisiana, Michigan, Minnesota, Missouri, North Dakota and South Dakota (Fig. 3). Bands were recovered mostly from September–April, coinciding with the months when migratory waterfowl are most commonly found in the Caribbean (Raffaele *et al.* 1998). These results suggest a prominent role for both the Mississippi and Atlantic Flyways in the stopover and migration patterns of waterfowl in Cuba.

Migratory waterfowl begin to arrive in Cuba during August and into early September. Small flocks comprised of Blue-winged Teal, Northern Pintail and Northern Shoveler containing 20–100 birds are common in coastal wetlands during this period. Numbers of these and other species gradually increase until they reach a peak in November, then decrease in coastal areas as wintering waterfowl move to interior wetlands on the island (Fong *et al.* 2005; Kirkconnell *et al.* 2005). During February and March, numbers of Blue-winged Teal

Table 2. Number of waterfowl in North America (U.S.A. and Canada) recovered in Cuba in the years 1930–2010. Cuban provinces include: Isla de la Juventud (IJ), Pinar del Río (PR), Habana (H), Ciudad de la Habana (CH), Matanzas (Mtz), Cienfuegos (Cfg), Villa Clara (VC), Sancti Spíritus (SSp), Ciego de Ávila (CAv), Camagüey (Cam), Las Tunas (Tun), Holguín (Hol), Granma (Gra), Santiago de Cuba (Stgo), Guantánamo (Gmo).

Species	IJ	PR	H	CH	Mtz	Cfg	VC	SSp	CAv	Cam	Tun	Hol	Gra	Stgo	Gmo
A. sponsa			1							1	2				
A. acuta	1	4	3	1	4	4	2	7	4	1	2	1	2	2	
A. Americana		4			3	3	3	2	4	5	3	6	5	1	1
A. clypeata	1	2						1	2		1				1
A. crecca			1					5	3						
A. cyanoptera										1					
A. discors	12	403	290	28	96	52	51	219	128	111	63	83	91	33	26
A. strepera	1														
A. affinis		1			1	1	3		1	3	1			1	
A. collaris		3	1		1	2	1	1	1	3		1	1		
D. bicolour	1	9			2		1	10	2	2			1		

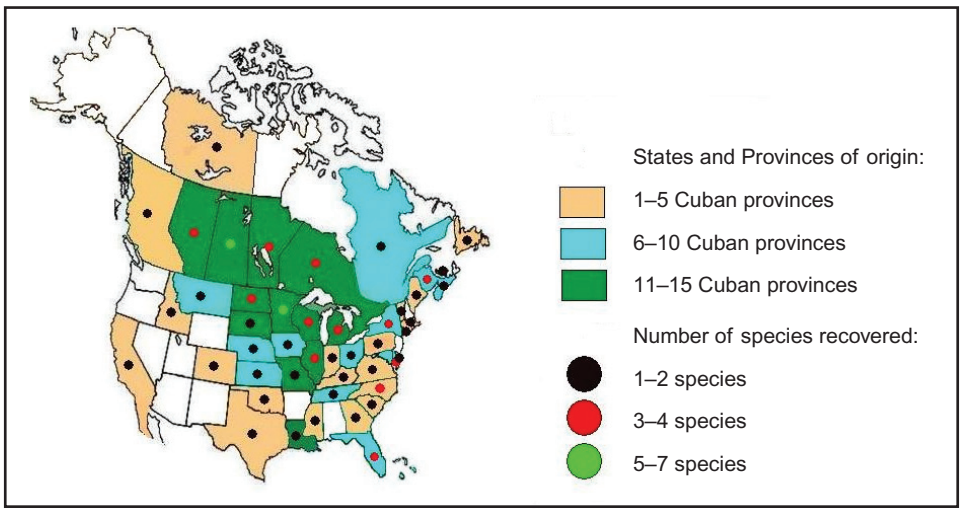

Figure 3. Origin of bands recovered in Cuba (1930–2010) indicating number of Cuban provinces represented and duck species recovered in US states and Canadian provinces. Information provided by the U.S. Geological Survey's Bird Banding Laboratory and the Canadian Bird Banding Office.

and Northern Pintail gradually increase in coastal wetlands as birds prepare for northern migration back to their breeding grounds (Blanco & Sánchez 2005).

Cuba harbours six species of resident waterfowl, including introduced breeding species. Nesting normally occurs from April–October though many species have extended nesting seasons (Garrido & Kirkconnell 2011). The Fulvous Whistling-duck was introduced to Cuba in 1931 and occurs at a limited number of sites on the island (Garrido & García 1975). The species nests in flooded forests surrounding some of Cuba's major reservoirs such as Mampostón (Mayabeque province) and Leonero (Granma province). Nests have been reported in cavities of various tree species including the Cuban Royal Palm *Roystonea regia*. Although information is available on the presence and distribution of waterfowl resident in Cuba (*e.g.* for White-cheeked Pintail *Anas bahamensis* and West Indian Whistling-duck *Dendrocygna arborea*; Fig. 4), less is known regarding their nesting ecology and productivity. Yet such data are important for species conservation, particularly as three resident species are classified as being of global and regional conservation concern (González *et al.* 2012; BirdLife International 2013): the West Indian Whistling-duck (globally vulnerable), White-cheeked Pintail (regional concern) and Masked Duck *Nomonyx dominicus* (regional concern). Moreover, while Cuba harbours the largest numbers of these resident species in the Caribbean (*e.g.* around 10,000 West Indian Whistling-ducks), information suggests that Cuban populations of resident ducks are declining (Acosta & Mugica 2006).

Cuba boasts a vast network of protected

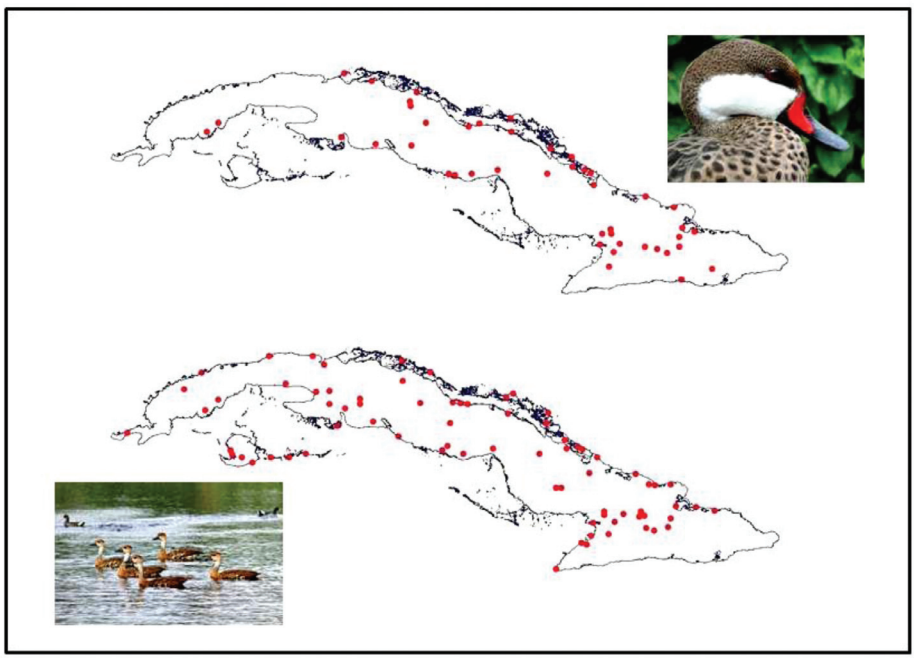

Figure 4. Location records for White-cheeked Pintail (top, photo: Alberto Puente) and West Indian Whistling-Duck (bottom, photo: Mike Morel) in Cuba and on the Isle of Youth.

areas including marine and terrestrial ecosystems. Approximately 16.9% of the terrestrial surface of Cuba (10.98 million ha) is protected by 253 different conservation units (CNAP 2009). Within this network of conservation sites, 27 of the protected areas harbour some of the most important locations for Cuba's threatened resident waterfowl (Fig. 5). These include: four biosphere reserves, five national parks, four ecological reserves, seven wildlife refuges and all six Ramsar sites designated within Cuba (CNAP 2009; Aguilar 2010).

Discussion

The broad geographic distribution of waterfowl across the main island of Cuba and their diverse taxonomic representation is largely due to the contribution of migratory species from North America. While Cuba is much larger in size than other Caribbean islands, the diversity of waterfowl present likely reflects the relatively undisturbed condition of most wetland ecosystems, including interior as well as coastal regions containing extensive areas of mangrove forest (Giri *et al.* 2011). Moreover, the proximity and interspersion of many of the principal wetlands of Cuba to rice production areas likely benefits not only resident but also migratory waterfowl.

Rice cultivation has long been a component of Cuban agriculture, and it currently represents the second most important crop (in terms both of the area planted and in yield) after sugarcane

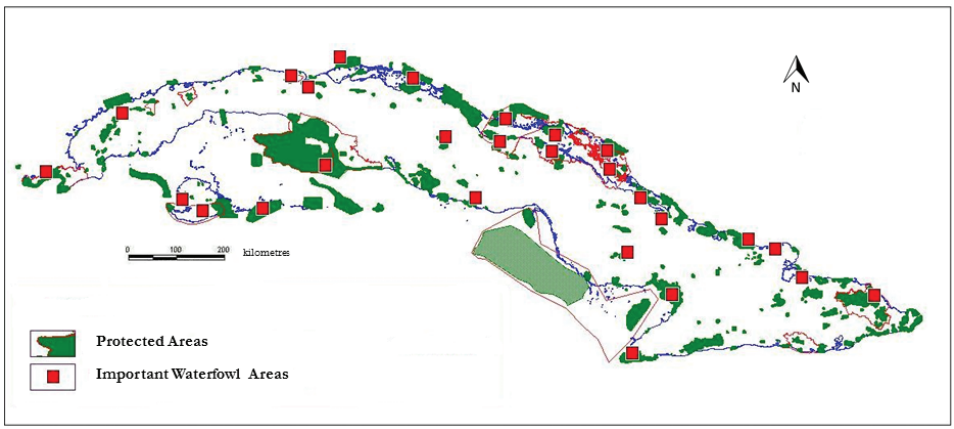

Figure 5. Important waterfowl areas and the protected areas network in Cuba (CNAP 2009).

Saccharum sp. Areas in rice production total *c.* 150,000 ha and are concentrated along the southern part of the island bordering coastal wetlands in the provinces of Pinar del Río, Matanzas, Sancti Spiritus, Camaguey and Granma. Following the dissolution of the Soviet Union in 1991, Cuba was faced with major economic challenges. The island nation responded with a large-scale food production programme and experimented with alternatives to industrialised farming due to lack of chemical fertilisers and pesticides (FAO 2002). At present, the most extensive rice production regions are in close proximity to natural wetlands, facilitating the waterbirds' use of the rice fields as feeding areas. Further, the general lack of pesticide and herbicide use promotes high levels of vertebrate and invertebrate biodiversity (Mugica *et al.* 2006). Consequently, waterbird populations thrive in the rice-producing areas of Cuba. Waterbirds are an important biotic component of the rice agro-ecosystem. Most waterbirds feed on invertebrates and weed seeds rather than rice seeds, and their waste adds nutrients to the soil, promoting an energy flow between the rice paddies and the nearby wetlands (Elphick 2000; Mugica *et al.* 2006). Ongoing research and outreach by the avian ecology group of the University of Havana has helped greatly in changing attitudes of farmers, and has encouraged them to manage rice fields to support biodiversity at these sites (Mugica *et al.* 2006).

Band recoveries suggest that the Mississippi and Atlantic Flyways contribute greatly to the diversity of waterfowl species wintering in and migrating through Cuba (Fig. 3). Recent advances in the study of migratory strategies for terrestrial birds suggest that North American warblers *Parulidae* sp. exhibit similar overwintering patterns. For instance, stable isotope analysis indicated that warblers wintering in western Cuba originate from New England states, while some warblers which winter further east in Cuba and in the rest of the Caribbean are derived from southern Appalachians populations (Faaborg *et al.* 2010). These new

techniques may be useful to provide further insights into the biogeography of waterfowl in Cuba and the rest of the Caribbean, and would greatly enhance information derived from the banding data.

Efforts to increase communication between Cuban waterfowl biologists and banding laboratories in the United States and Canada should be expanded (Blanco & Sánchez 2005), not least because waterfowl species resident in the southeastern United States (*e.g.* Wood Duck and Fulvous Whistling-duck) may move regularly between Cuba and the continent (Turnbull *et al.* 1989). The links between mainland and insular populations of these species and the functional role of Cuban wetlands in their annual cycle are still unknown. Quantitative studies on population ecology and habitat relationships of breeding resident species are also considered a priority by Cuban biologists, for informing the conservation and management of waterfowl and wetlands in the region (Acosta & Mugica 2006).

Approximately 1.19 million ha of wetlands are currently protected under various conservation categories in Cuba (ACC-ICGC 1993; Aguilar 2010). Despite the extensive network of protected areas and environmental legislation aimed at expanding protection of mangrove forest, Cuban wetlands and waterfowl face numerous threats. Although Cuban legislation prohibits the harvest of duck species classified as threatened, subsistence hunting of resident waterfowl persists across several regions of Cuba. Similarly, illegal harvest of eggs from threatened waterfowl species and other waterbirds occurs in Cuba, as it does in other islands of the Caribbean (Erwin *et al.* 1984). Illegal harvest of mangrove for charcoal production continues in remote coastal regions of Cuba. Further, illegal logging is ongoing in areas of palm forest and swamp forest where resident species such as the West Indian Whistling-duck nest. Fires also degrade these savannas and seasonally flooded forests. In recent years Cuba has experienced periods of pronounced droughts resulting in lower water levels and, consequently, reduced productivity of wetlands (Sims & Vogelmann 2002). Finally, hurricanes can impact coastal wetlands due to storm timing, frequency and intensity, which in turn can alter coastal wetland hydrology, geomorphology, biotic structure, productivity and nutrient cycling (Michener *et al.* 1997). Hurricane impact on waterbirds highlights the importance of establishing long-term studies for identifying complex environmental and ecological interactions that may otherwise be dismissed as stochastic processes (Green *et al.* 2011).

Cuba is considered a high priority country for biodiversity conservation within the Caribbean basin region, yet it remains largely ignored by most conservation organisations in North America, and few long-term conservation programmes have been established by international NGOs. The state of U.S.-Cuba relations should not exclude the island-nation from regional conservation programmes (*e.g.* the Atlantic Coast Joint Venture), given the prominent role of Cuba's wetland resources compared to the rest of the Caribbean. International cooperation with Cuban scientists, universities and environmental organisations should be expanded if an integrated and

effective conservation strategy for wetlands and waterfowl in the Caribbean region is to be achieved (Margulis & Kunz 1984; Santana 1991).

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