

The bird collections of Cuba

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Although substantial collections of birds have been made from the many islands of the Caribbean, most specimens were acquired by visiting ornithologists or their collectors and now reside in foreign institutions. Further, many ornithologists who resided in the islands transferred their collections abroad; e.g. while at the College of Agriculture and Mechanical Arts at Mayagüez, Puerto Rico (1926–38), Stuart T. Danforth (1900–38) collected extensively in Puerto Rico and other West Indies. He amassed c.3,000 specimens, but only six remain in Puerto Rico, whereas the bulk went to the US National Museum of Natural History (USNMNH). Similarly, William T. March (c.1796–1872), a resident of Jamaica, contributed more than 1,100 specimens to the USNMNH alone; today, none remains in Jamaica. Raffaele Ciferri (1897–1964), who resided for many years in the Dominican Republic, sent 345 specimens to the Museo Civico di Storia Naturale in Milan, leaving none in country. Although a few collections were established in the islands, unfortunately several were lost to catastrophes, including the Haitian material of Michel Etienne Descourtilz (1775–1836) and Félix Louis l'Herminier's (1779–1833) Guadeloupe collection, both lost in fires.

Cuba was unusual in that several collections were established and maintained there. Felipe Poey y Aloy (1799–1891), the Cuban naturalist who established the first museum of natural history in Cuba (1839), stated that 'a modern city can not be considered culturally developed if it lacks a natural history museum.' He and other resident naturalists gathered specimens that were retained in Cuba, rather than sending them to institutions abroad. Notable amongst those naturalists was Juan (Johannes) Gundlach (1810–96), who spent 57 years collecting in Cuba. Despite incentives to disperse his material amongst foreign institutions, Gundlach's aspiration was to maintain his substantial collections in Cuba. He lived to see that wish fulfilled; in 1892, Spanish authorities authorised by Royal Decree in Madrid the payment of \$8,000 Pesos gold for the Gundlach collections, which contain many types, co-types and unique specimens. His birds, molluscs, insects and mammals were established in the museum of the Instituto de Segunda Enseñanza de La Habana. Though they moved among several institutions, the Gundlach material has been maintained largely intact in Cuba through the present, most recently in the Instituto de Ecología y Sistemática. Several other institutional and private collections of birds were developed, primarily from the late 19th to mid-20th centuries; e.g., Gaston S. Villalba (fl. 1930s), Stephen C. Bruner (1891–1953), Joaquín Fernando de la Vara (1893–1981) and José H. Bauzá (fl. 1920s to mid-1960s).

In addition to substantial historic collections, several new collections have been established. Most recently, Orlando H. Garrido (b. 1931) has added substantial numbers of bird specimens, primarily to the Museo Nacional de Historia Natural de Cuba. Subsequent to the Cuban Revolution (1959), specimens from some historic collections were distributed among newly developed institutions (e.g., Museo de Historia Natural 'Tranquilino Sandalio de Noda' in Pinar del Río). At other post-Revolution museums (e.g., Museo Provincial 'Arcadio Leyte Vidal Delgado' in Mayarí), representative specimens of Cuban birds were collected. Many of these collections, recent and old, have been maintained in several institutions and privately within Cuba.

We examined extant collections throughout Cuba and Isla de Pinos (now Isla de la Juventud), with the objective of developing an electronic catalogue of specimens as the ini-

tial step in improving communication and resource-sharing among Cuban collection managers and to facilitate international exchange. Here we report on the nature of these collections, their holdings, condition and importance to our understanding of Cuba's biodiversity.

Methods

From 1995 through 2006, Wiley visited 18 collections in Cuba (Table 1). Through the text, we abbreviate the names of institutions and individual collections. Full titles of institutions and collections owned by individuals are presented in Table 1. Working with local curators, Wiley examined catalogues and other written records for specimens in those collections. Data were entered into standardised database files (Claris FileMaker Pro) for each collection. Further data available on specimen labels were added to the database. Specimens in most collections were examined to confirm existence and to assess their condition.

Some catalogue entries for eggs include multiple clutches (e.g., 32 eggs under one catalogue number). Where possible, such combinations were identified as multiple clutches. Otherwise, the catalogue sets were not divided into individual clutches in the summary, but were maintained as one data entry.

Many collections included foreign specimens obtained by local curators or private collectors through purchase or exchange. We present data for all specimens (including foreign-obtained individuals) in our analysis of total collection holdings. In our analysis of Cuban specimens, we have excluded foreign specimens, as well as individuals for which no locality data were available, and for which the origin could have been other than Cuba; e.g., Greater Antillean Grackle *Quiscalus niger*, a West Indian endemic, but occurring outside Cuba. Where locality data were not found but evidence was available to determine that the specimen was collected in Cuba, we assigned the specimen to that country; e.g., date and collector information gave verification of origin, although no locality data were available in the catalogue or specimen label. Those specimens for which no evidence of origin was determined were excluded from our tabulations.

Condition was assessed for all examined specimens and individuals were assigned to one of three categories: Good—no or minor deterioration, specimen intact, with good plumage, and with no more than light mould or slightly soiled; Fair—specimen with some problems, but retaining all parts, though some (e.g., tail or wing) may be partially detached from body, and plumage may have moderate mould or dirt; Poor—specimen missing body parts (e.g., leg, head), is heavily soiled, or has substantial mould.

Nomenclature follows the American Ornithologists' Union *Check-list* (1998) and subsequent supplements (Banks *et al.* 2000–06) or, where the *Check-list* did not cover the species, we referred to Howard & Moore (1991). We followed BirdLife International (2000) for species status, but also relied on González Alonso (2002) for a local appraisal. All categories of threat follow the criteria of BirdLife International (2000).

Because of space limitations, several tables describing specimens in the Cuban collections are not included here, but are available from the corresponding author.

Results

After completing acquisition and cleaning of data, they were transferred into two additional software realms: MS Excel (spreadsheet) and MS Access (database) for greater flexibility in use by local curators. These files were provided to all collection curators and are available for other interested workers in Cuba.

TABLE 1
Names of 18 examined Cuban collections, with their locations, abbreviations, and curators.

Name of collection	Location	Abbreviation	Curator
José H. Bauzá Collection	Museo Nacional de Historia Natural de Cuba, La Habana	Bauzá	Arturo Kirkconnell
Museo Tomás Romay	Santiago de Cuba	BioEco	Omar Melián
Museo Provincial Ignacio Agramonte	Camagüey	Camagüey	Leonardo Pareta
Carlos Wotzkow Private Collection	In home, La Habana	Wotzkow	Carlos Wotzkow (in exile)
Museo de Historia Natural 'Felipe Poey'	Universidad de La Habana, La Habana	Felipe Poey	Martín Acosta Cruz
Museo de Historia Natural 'Joaquín Fernández de la Vera'	Gibara	Gibara	Antonio Ortega Piferrer
Museo de Historia Natural 'Carlos de la Torre y Huerta'	Holguín	Holguín	Alfredo Rams Beceña
Instituto de Ecología y Sistemática	La Habana	IES	Rafaela Aguilera Román
Instituto de Segunda Enseñanza 'Cuqui Bosch'	Santiago de Cuba	Instituto Segunda Enseñanza	Ana Nydia Álvarez
Museo de Historia Natural 'Dr. Antonio Nuñez Jiménez'	Nueva Gerona, Isla de Pinos	Isla de Pinos	Lissett Macia
Museo Provincial 'Arcadio Leyte Vidal Delgado'	Mayarí	Mayarí	Teresa García Guerrero
Museo Nacional de Historia Natural de Cuba	La Habana	MNHNC	Arturo Kirkconnell
Colección Didáctica – Pedro Regalado – INDAF	Camagüey	Regalado	Pedro Regalado
Museo de Historia Natural 'Tranquilino Sandalio de Noda'	Pinar del Río	Pinar del Río	Alexis Plasencia
Museo de Historia Natural 'Charles T. Ramsden'	Santiago de Cuba	Ramsden	Gerardo Hechevarría
Museo de Historia Natural de Sancti Spíritus	Sancti Spíritus	Sancti Spíritus	José M. Ramos Hernández
Museo General de Caimito ¹	Caimito, La Habana	Caimito	William Suárez
Museo 'Oscar María de Rojas'	Cárdenas	Cárdenas	Lazaro Miranda

¹ In 2007, we learned that this collection was destroyed by Hurricane Dennis (2005).

Of the specimens determined from available records, including catalogues and specimen labels ($N=12,600$), we were able to examine (counting specimens verified by the Camagüey curator) 11,055 individuals, including foreign-obtained specimens (Table 2). Although we were not permitted to examine specimens in the Camagüey collection, the curator provided an assessment of specimen condition and status of 349 (202 Cuban specimens) of the 579 specimens, though he could not provide information on the means of preservation (mounts or study skins) for individuals.

TABLE 2
Numbers of bird specimens catalogued and examined in 18 Cuban collections, divided by preservation method and type of preserved material. Analysis includes foreign and Cuban-collected specimens.

Specimen type	Number (%)			
	Class of Cuban and foreign specimens		Cuban specimens	
	All specimens ¹	Examined ²	All specimens ¹	Examined ²
Undetermined ³	1,402	349 (3.2)	1,006	201 (1.9)
Study skins	6,138	5,931 (53.6)	6,008	5,795 (55.6)
Mounts	3,954	3,695 (33.4)	3,540	3,350 (32.2)
Eggs	1,032	1,006 (9.1)	1,019	1,000 (9.6)
Nests	44	44 (0.4)	41	40 (0.4)
Skeleton	3	3 (<0.1)	3	3 (<0.1)
Alcoholics	2	2 (<0.1)	2	2 (<0.1)
Fossils	25	25 (0.2)	25	25 (0.2)
Totals	12,600	11,055 (100)	11,644	10,416 (100.0)

¹ Includes specimens examined, as well as those listed in recent catalogues but not located or discarded before we completed our survey.
² Excludes specimens listed in recent catalogues but not found, or examined in our early visits to collections but discarded before completion of the survey.
³ Undetermined category includes specimens listed in recent collection catalogues and not found by us, as well as specimens in the Camagüey museum, where we unable to examine the birds (see main text).

The collections of all specimens, Cuban and foreign, contain representatives of 25 orders and 80 families, and a total 485 species. Among those specimens collected in Cuba, 21 orders, 63 families and 352 species are represented. A total of 10,416 extant specimens collected in Cuba was tallied (Table 2), including 19 holotypes and 30 paratypes. The majority (57.5%) of specimens was collected in the latter half of the 20th century, whereas 36.5% were collected in the first half, and 6% in 1850–99 (96% of these by Gundlach) (Fig. 1). Few specimens have been collected since the 20th century, in part due to economic constraints that limit field work by local scientists, but also because of a shift in interest to other aspects of ornithology, especially ecological studies.

The largest collection is in the Instituto de Ecología y Sistemática in La Habana (31.0% of all specimens), which houses the original Gundlach ‘Historic’ collection (565 specimens) and ‘Basic’ (more-recently acquired) collection. The other major collections are the Museo de Historia Natural ‘Felipe Poey’ of the Universidad de La Habana (23.4%), Museo Nacional de Historia Natural de Cuba in La Habana (11.3%) and Museo de Historia Natural ‘Charles T. Ramsden’ (Santiago de Cuba; 9.4%). Specimens are preserved primarily as study skins (56.6%) and mounts (33.3%), though substantial numbers of egg sets are also held in the Ramsden and Instituto de Ecología y Sistemática collections. Several collections, meant primarily for public display, consist solely of mounted specimens (e.g., Bauzá and Isla de Pinos).

Several collections contain substantial numbers of foreign specimens (Σ =4.8%, overall), obtained through trades and donations, including Holguín (19.5%), Pinar del Río (37.2%) and Camagüey (42.4%). As additional public museums were created in Cuba after the Revolution, many of the foreign specimens in pre-established collections were distributed

to the new institutions for display. Most recent collections have concentrated on acquiring native species.

All species of special concern with Cuban ranges (residents and visitors) are represented in the island's collections, including two species (Passenger Pigeon *Ectopistes migratorius*, Cuban Macaw *Ara tricolor*) that have become extinct recently (Table 3). Among species represented, four are considered Critically Endangered (Adams *et al.* 2003, González Alonso 2002), 12 are Endangered and 23 are Vulnerable (Table 3).

Our evaluation of specimen condition yielded an overall 83.4% of specimens in Good condition, whereas 10.0% were judged in Fair and 6.8% in Poor condition. Unfortunately, a substantial number of specimens in most collections lack critical data, with a mean 22.4% of specimens lacking locality data, 30.4% missing collection dates, and 22.5% lacking name of the collector.

Discussion

Natural history museums, including their research collections, have been characterised as functional biological libraries, but without easy access for researchers, they only serve as storehouses for specimens (Winker 1996, Peterson *et al.* 2005). Several workers have emphasised the importance of user-friendly access to collections (Reaka-Kudla *et al.* 1997, Krishtalka & Humphrey 2000). Scientific museums are starting to be considered an important tool for cataloguing biodiversity (Beolchini 2002), so their role in providing easy access to specimen data has greatly increased (Alberch 1993, Cooper & Steinheimer 2003, Peterson *et al.* 2005, Watkins & Donnelly 2005). Storing scientific catalogues in electronic archives, remotely accessible through electronic websites, is valuable in making distant (particularly

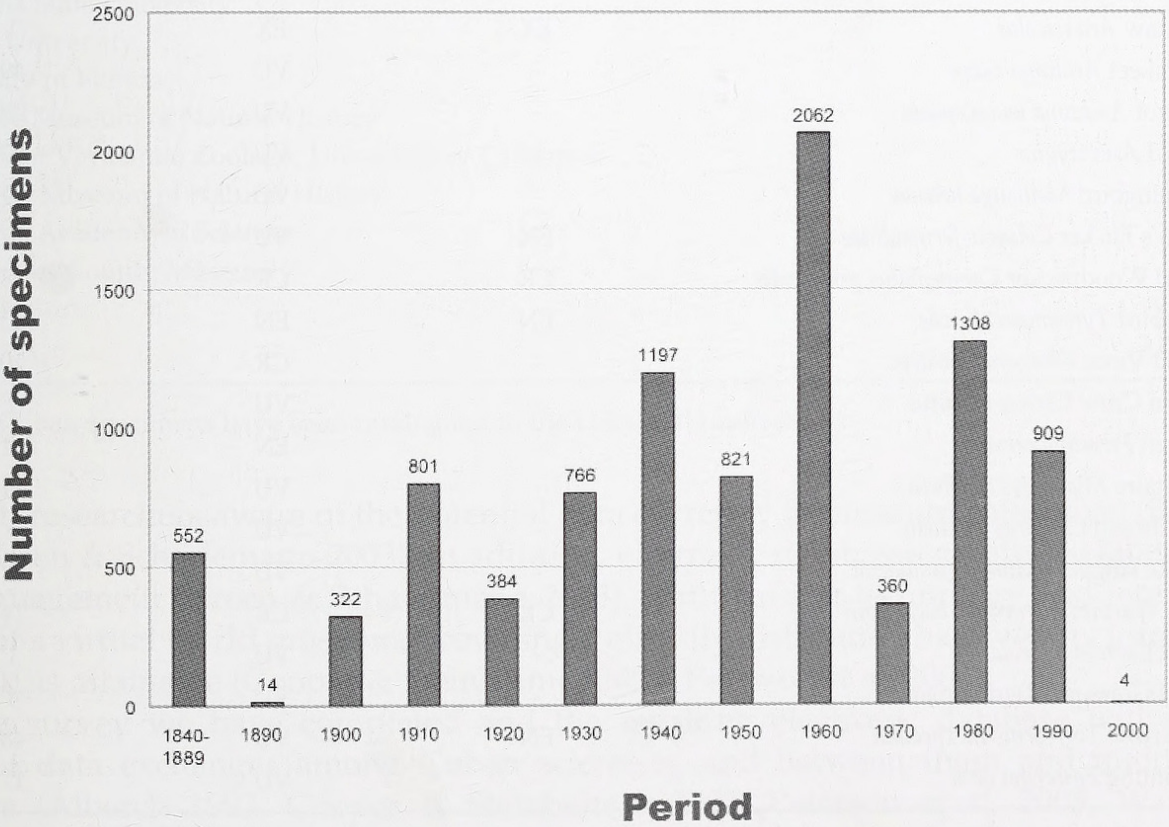


Figure 1. Number of bird specimens in 18 Cuban collections by period of collection, 1840–2003. The period 1840–89 includes 442 specimens collected by Juan Gundlach and eight specimens by others. These are grouped into the 50-year period because none of the Gundlach specimens has year data. The specimens from 1890–2000 are grouped by decade.

TABLE 3

Numbers of specimens of Cuban bird species considered of special concern, following Adams *et al.* (2003) and González Alonso (2002), in 18 Cuban collections.

Species	Adams <i>et al.</i> (2003)	Status ¹ González Alonso (2002)	Number of specimens
Black-capped Petrel <i>Pterodroma hasitata</i>	-	EN	2
White-tailed Tropicbird <i>Phaethon lepturus</i>	-	EN	9
Scarlet Ibis <i>Eudocimus ruber</i>	-	VU	2
West Indian Whistling Duck <i>Dendrocygna arborea</i>	-	VU	39
White-cheeked Pintail <i>Anas bahamensis</i>	-	VU	31
Masked Duck <i>Nomonyx dominica</i>	-	VU	51
Hook-billed Kite <i>Chondrohierax uncinatus wilsonii</i>	CR	CR	11
Sharp-shinned Hawk <i>Accipiter striatus</i>	-	EN	33
Gundlach's Hawk <i>Accipiter gundlachi</i>	EN	VU	34
Zapata Rail <i>Cyanolimnas cerverai</i>	EN	EN	4
Sandhill Crane <i>Grus canadensis nesiotis</i>	-	EN	12
Snowy Plover <i>Charadrius alexandrinus</i>	-	EN	2
Piping Plover <i>Charadrius melodus</i>	-	VU	11
Roseate Tern <i>Sterna dougallii</i>	-	VU	13
White-crowned Pigeon <i>Patagioenas leucocephala</i>	-	VU	33
Plain Pigeon <i>Patagioenas inornata</i>	-	EN	33
Passenger Pigeon <i>Ectopistes migratorius</i>	EX	EX	5
Grey-fronted Quail-Dove <i>Geotrygon caniceps</i>	-	VU	23
Blue-headed Quail-Dove <i>Starnoenas cyanocephala</i>	-	VU	22
Cuban Macaw <i>Ara tricolor</i>	EX	EX	1
Cuban Parakeet <i>Aratinga euops</i>	-	VU	49
Cuban Parrot <i>Amazona leucocephala</i>	-	VU	126
Stygian Owl <i>Asio stygius</i>	-	VU	27
Bee Hummingbird <i>Mellisuga helenae</i>	-	VU	42
Fernandina's Flicker <i>Colaptes fernandinae</i>	EN	VU	32
Ivory-billed Woodpecker <i>Campephilus principalis</i>	CR	CR	15
Giant Kingbird <i>Tyrannus cubensis</i>	EN	EN	43
Thick-billed Vireo <i>Vireo crassirostris</i>	-	CR	10
Cuban Palm Crow <i>Corvus minutus</i>	-	VU	2
Zapata Wren <i>Merminia cerverai</i>	-	EN	11
Cuban Solitaire <i>Myadestes elisabeth</i>	-	VU	41
Bicknell's Thrush <i>Catharus bicknelli</i>	-	VU	5
Bahama Mockingbird <i>Mimus gundlachi</i>	-	VU	5
Bachman's Warbler <i>Vermivora bachmanii</i>	CR	CR	14
Bananaquit <i>Coereba flaveola</i>	-	VU	1
Black-faced Grassquit <i>Tiaris bicolor</i>	-	VU	4
Zapata Sparrow <i>Torreornis inexpectata</i>	EN	VU	48
Painted Bunting <i>Passerina ciris</i>	-	VU	17

¹Status: EX = Extinct, CR = Critically Endangered, EN = Endangered, VU = Vulnerable. Categories follow BirdLife International (2000).

TABLE 4
Cuban bird specimens in collections in several European and US institutions.

Name of collection	No. of Cuban specimens
EUROPE	
Institut für Zoologie, Halle	657
Natural History Museum, Tring	414
Muséum National d'Histoire Naturelle, Paris	360
Musée d'Histoire Naturelle de Neuchâtel	158
Staatliches Museum für Naturkunde, Karlsruhe	56
Liverpool Museum	23
Musée d'Histoire Naturelle, Geneva	16
Zoologisches Museum, Universität Hamburg	13
Natural History Museum Bern	8
Natural History Museum of St Gallen, Switzerland	4
The Manchester Museum	2
Universiteit van Amsterdam	1
Subtotal	1,712
UNITED STATES OF AMERICA	
US National Museum of Natural History ¹	3,227
American Museum of Natural History	1,312
Field Museum of Natural History	1,044
Carnegie Museum	1,008
Museum of Comparative Zoology	858
Peabody Museum, Yale University	676
University of Michigan	274
Academy of Natural Sciences of Philadelphia	235
Louisiana State University	231
Cornell University	208
University of Florida	165
Delaware Museum of Natural History	75
Museum of Vertebrate Zoology, University of California	18
San Diego Museum of Natural History	6
California Academy of Sciences	5
Los Angeles County Museum	1
Subtotals	9,343
Total	11,055

¹ Not all Cuban specimens have been catalogued in the USNMNH collection.

isolated) researchers aware of the potential data currently in museum collections (Beolchini 2002, Green & Scharlemann 2003). In addition, electronic databases greatly facilitate collection management (Green & Scharlemann 2003). With current technology and interest, the vision of a virtual world museum, providing a globally distributed biodiversity information network, is attainable (Cooper & Steinheimer 2003, Peterson *et al.* 2003).

The survey we have completed and the resulting electronic database will serve to improve data exchanges among Cuban scientists, and between them and international workers (Alberch 1993, Cooper & Steinheimer 2003, Peterson *et al.* 2005, Watkins & Donnelly 2005). Due to past communication difficulties in Cuba, there has been little inter-institutional interaction or resource-sharing. In fact, some collections have gone essentially unknown in recent years; e.g., the Instituto de Segunda Enseñanza, which contains several

specimens of special concern in Cuba, was unknown to curators of the other Cuban collections until 2006 when we 'rediscovered' it.

Cuban collections have many national and international values. Collections are a rich source of information on the natural history, ecology, systematics and conservation of birds (Fitzpatrick 1985, Remsen 1995). Specimen collections are important depositories of the biodiversity of regions and nations, providing information on spatial and temporal variation in species, and thereby serving as a vital tool for inventorying biological diversity (Alberch 1993, Davis 1996, Mehrhoff 1996, Stork *et al.* 1996, Winker 1996, Shaffer *et al.* 1998, Taub 1998, Brooke 2000, Krishtalka & Humphrey 2000, Roselaar 2003, Watkins & Donnelly 2005), a process that has been initiated in Cuba recently. Collar & Rudyanto (2003) noted that museums also hold contentious specimens that require re-evaluation. Moreover, Cuban collections have an important role in the natural and national heritage of the island.

The bird collections in Cuba are substantial, totalling 10,415 Cuban specimens. A cursory survey of several European and US collections with Cuban specimens yielded a total of 11,055 skins, mounts and eggs (Table 4), slightly greater than the number of Cuban specimens in the island. Most avian collections have acquired few new specimens in recent decades relative to the rates of the late 19th and early 20th centuries (Remsen 1995, Winker 1996, Green & Scharlemann 2003). Thus, the specimens that exist now in museums are largely irreplaceable (Rasmussen & Pr  ys-Jones 2003). The value of the present collections in Cuba is considerable, especially given the unlikely prospect of adding substantial numbers of specimens in the future.

Unfortunately, the specimens in Cuban collections often are missing complete or, indeed, any data. Specimens lacking data certainly are not unusual in collections and do possess value (Rasmussen & Pr  ys-Jones 2003). As often the case (Rasmussen & Pr  ys-Jones 2003), older specimens in Cuban collections (all of those from Gundlach) have few or no associated data. Gundlach, like other early collectors, was apparently unaware of the importance of date and specific locality data, and, regrettably, no field journals are known from his work. Nevertheless, Olson (1986) demonstrated that a specimen without data may turn out to be something as valuable as a unique type, even if it takes 160 years for someone to recognise the fact.

Many of the Cuban collections included here are quite small, yet several hold specimens important to our understanding of species' status and distribution; e.g., the Mayar   museum, with just 46 specimens, contains one the country's two specimens of Tundra Swan *Cygnus columbianus* and one of the three specimens of Black-headed Gull *Larus ridibundus*. Small provincial institutions can play an important conservation role in Cuba. As suggested by Hromada *et al.* (2003) and Cheke (2003), even small regional museums may have local expertise, ability to respond quickly to local issues and collect significant conservation data.

In our inventory, we found that several collections contained specimens of species ($n=36$) of local or international concern. Adams *et al.* (2003) emphasised the importance of publishing museum holdings of extinct and endangered species, which they considered a valuable contribution to conservation information.

Although the Gundlach collection has remained mostly intact within Cuba, many of the specimens formerly housed in Cuban institutions were dispersed outside the country. For example, the important Charles T. Ramsden (1876–1951) collection, which contained the best representation of forms from the Oriente (P. Bartsch *in litt.* to A. Wetmore, 25 November 1952), was given to USNMNH by Ramsden's widow, Emereciana Cristina Ferrer Joli de Ramsden, shortly after his death. Some 1,773 bird skins, 75 skeletons and 243 eggs were retained by USNMNH, whereas 476 specimens were returned to Cuba because they lacked complete data. The residual collection was donated to the Universidad de Oriente by

Ramsden's widow and Concepción Ramsden Ferrer de Bueno, where it was initially well curated by Manuel Díaz-Piferrer, a biology professor. After Díaz-Piferrer left the university, and until recently, however, the collection received little attention. Sadly, many bird specimens suffered substantial deterioration and were discarded, as was the bulk of the precious egg collection.

Fortunately for Cuban biologists, several important collections have been maintained in Cuba because access to foreign collections, particularly in the US, where 43.5% of Cuban specimens are housed, has been limited due to political tensions. Still, the Cuban collections have not been widely used, or indeed known, among Cuban workers. We trust that present efforts will help to correct that situation.

Conservation needs

In the current period of economic hardship, all Cuban natural history institutions and collections require international assistance in improving facilities for the maintenance of specimens. Whereas the MNHNC has received good cabinets through a donation from North American institutions and the collection facility is climate controlled, this is a unique situation. All other collections are in need of improved storage facilities and climate control. All require regular pest control, which has not been available in the island in recent years. Additionally, many Cuban collections are unorganised or only poorly arranged and managed, and only a few have a dedicated computer and associated software for use in managing the collections. Furthermore, most collections are in need of a thorough survey to properly identify specimens and to standardise nomenclature.

Several collections examined have been neglected for long periods. The practice of discarding damaged or 'useless' specimens continues in some collections, although such specimens and their associated data are still valuable as vouchers and to the assessment of the country's biodiversity. The specimens forming the bird collection in the Museo 'Tomás Romay' were salvaged from a trash bin after being discarded by another institution! Even more tragically, some important collections have already been lost; e.g., Wiley arrived at the Escuela 'Rafael María Mendive' (Colegio Dolores) collection in May 2006 only to learn that it had been destroyed (except for four severely damaged specimens) during renovations the year before. Sadly, that collection reportedly had contained several important specimens, including an example of the extinct Cuban Macaw and Critically Endangered Cuban race of Ivory-billed Woodpecker *Campephilus principalis bairdii*. Only 19 specimens of the macaw are known, with the only individual in Cuba held in the Instituto de Ecología y Sistemática. We appeal to the international community for assistance in ensuring that the avian collections of Cuba survive.

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