

Juan Cristóbal Gundlach's collections of Puerto Rican birds with special regard to types

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Abstract

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The German naturalist Juan Cristóbal Gundlach (1810–1896) conducted, while a resident of Cuba, two expeditions to Puerto Rico in 1873 and 1875–6, where he explored the southwestern, western, and northeastern regions of this island. Gundlach made representative collections of the island's fauna, which formed the nucleus of the first natural history museums in Puerto Rico. When the natural history museums closed, only a few specimens were passed to other institutions, including foreign museums. None of Gundlach's and few of his contemporaries' specimens have survived in Puerto Rico. We located 191 bird specimens (43 species) collected there by Gundlach, all of which are in foreign institutions, especially Museum für Naturkunde Berlin. Here we list all located specimens and include data associated with them. Six new species were described out of the Gundlach collections from Puerto Rico, three of which are still taxonomically recognized today. Information about the types of those taxa is given.

Zusammenfassung

Der deutsche Naturforscher Johann Christoph Gundlach (1810–1896), auf Kuba lebend, führte 2 Expeditionen (1873 und 1875–6) nach Puerto Rico durch, auf denen er die südwestlichen, westlichen und nordöstlichen Regionen dieser Insel erforschte. Gundlach fertigte repräsentative Sammlungen der Fauna an, welche den Kristallisationskern des ersten naturkundlichen Museums Puerto Ricos bildeten. Die naturkundlichen Museen wurden später geschlossen und nur wenige Präparate wurden an andere Einrichtungen einschließlich ausländischen Museen übergeben. Kein Präparat von Gundlach und nur wenige aus dieser Zeit überdauerten auf Puerto Rico. Wir lokalisierten 191 von Gundlach gesammelte Vogelpräparate (43 Arten), welche sich heute alle an ausländischen Institutionen, insbesondere am Museum für Naturkunde Berlin, befinden. Eine Liste gibt Übersicht über alle nachgewiesenen Präparate. Aus der ornithologischen Sammlung Gundlachs von Puerto Rico wurden 6 Arten neu beschrieben, von denen 3 heute noch taxonomisch relevant sind. Informationen zu den Typen für diese Taxa werden angegeben.

Introduction

Dr. Juan Cristóbal (Johann Christoph) Gundlach (1810–1896) arrived in Cuba from his native Germany in January 1839, intending to stay only a short time. Instead, he

remained in Cuba until the end of his long and productive life, with the exception of short trips to exhibit his collections and visit family and colleagues in Europe, and two extended expeditions to Puerto Rico from June to December 1873 and from September 1875 to July 1876. Starting

from the western part he explored the northern region to San Juan, as well as the south western region of Puerto Rico. Additionally he made two trips to the central parts of the island (Lares and Gaguana/Jayuya).

His zoological interests were manifold, and he published his observations widely, not only within Cuba, but also in several international journals, in Spanish, German, and English. Gundlach amassed superb representative collections especially insects, molluscs, reptiles, mammals, and birds. He maintained an active exchange of specimens with foreign institutions and friends, so a considerable part of his collection was dispersed among different countries from the very beginning. This resulted in single specimens collected by Gundlach housed in several diverse collections today. Our purpose here is to list those vouchers of the avifauna of Puerto Rico available for research on this island as well as for international taxonomists. We also hope to stimulate interest of museum curators to search for additional specimens in their collections.

A summary of Gundlach's lifework, especially of his two expeditions (including a map) as well as his influence on the development of natural history in Puerto Rico is presented in Wiley et al. (2014).

Collections of Puerto Rican Birds made by Gundlach and his colleagues

Even as a boy, Gundlach was interested in studying animals and got his introduction to taxidermy by helping his older brother preserve anatomical and biological specimens. After his university studies, Gundlach decided to make an expedition to Suriname. To finance the travel, Robert Wilhelm Bunsen (1811–1899), second director of the “Verein für Naturwissenschaften Kassel”, initiated an arrangement wherein shares were issued to support Gundlach's 1838 expedition to Suriname. Some 105 shareholders subscribed for 203 shares with a value of 1218 Thaler (Dathe and Gonzales Lopez 2002). This financial support of Gundlach's expedition was made on the condition that he sends scientific objects back to Germany to reimburse the travel expenses. Although Gundlach made it only as far as Cuba, he sent large shipments of scientific material to Germany (Anonymous 2011; Dathe and Gonzales Lopez 2002). Eduard Sezekorn (1796–1869), managing director of the Verein für Naturwissenschaften Kassel, organized the sale of the collected materials.

This was the start of Gundlach's intensive long-term collecting activities in the Caribbean. The specimens gathered there were widely distributed from the very beginning. But Gundlach also retained extensive collected materials for his own museums of natural history in Cuba. In his autobiography, Gundlach (1896) wrote that one specimen of *Mellisuga helenae* which he collected in 1844 was the first specimen of his personal collection. He realized that the hummingbird was an unknown species and therefore he decided to keep it rather than to send it

to Germany. Thereafter, Gundlach kept one specimen of each species, except of fish and large reptiles, for his own collection (Gundlach 1896). A third part of his collected specimens was sent to his friends and colleagues in Cuba as well as all over the world for exchange or to serve as the basis for scientific discussions (e.g. Ramón M. Forns (La Habana, fl. 1858), Tomas Blanco (San Juan), Agustin Stahl (Mayagüez), George N. Lawrence (New York), and Wilhelm Peters and Jean-Luis Cabanis (Berlin)). In principle, the specimens which Gundlach collected in Puerto Rico were intended for comparison with the specimens from his Cuba collecting and suffered the same fate as the specimens from Cuba. By the 1870s, Gundlach's travel expenses should have been recouped by his investors, so the Puerto Rican specimens remained in Gundlach's collection or were sent only to friends and scientific colleagues, and none should have been sent to Germany to settle his 1838 account. Finally, in gratitude for their patronage and benefaction over the years, Gundlach gave many of his bird specimens to friends as salon decorations.

Today, Gundlach's personal collection is housed in the Instituto de Ecología y Sistemática (IES, La Habana, Cuba). The IES collections have received little evaluation since the catalogues of Gundlach (1895) and Valdes Ragués (1914), with the exception of recent reviews of Cuban birds (Aguilera Román and Garrido 2000; Aguilera Román et al. 2002; Wiley et al. 2008), reptiles and amphibians (Moreno García et al. 2002), and Noctuoidea (Lepidoptera) (Becker 2002). We examined 18 Cuban collections (Wiley et al. 2008), but found bird specimens from Gundlach's Puerto Rican expeditions only at the IES, although several of his Cuban bird specimens were dispersed among other Cuban institutions. Most of the specimens collected in Puerto Rico by Gundlach were sent to institutions in the United States and Europe, especially Germany. We found Puerto Rican specimens collected by him in seven institutions (Table 1; see Suppl. material 1 for names of all institutions we visited or queried regarding holdings of Gundlach's Puerto Rican bird specimens). Most of these specimens were direct donations from Gundlach, whereas a few arrived at those institutions as part of the collections of others, such as the Henry W. Bryant collection containing specimens given by Gundlach to G. N. Lawrence.

Most of the Gundlach specimens received by the U. S. National Museum of Natural History (USNM) came as direct donations (~12 separate acquisitions) from him. There was one accession in 1868 of ten specimens from Puerto Rico, and an accession in 1877 of 9–10 birds from the West Indies (in litt. James Dean to JWW; 10 November 2006; USNM).

Today, the most comprehensive collection of Gundlach's specimens from Puerto Rico is housed in the Museum für Naturkunde Berlin. Once he settled in Cuba, Gundlach sent his ornithological observations to Eduard Sezekorn, who transformed Gundlach's notes into manuscripts and sent them to Jean Louis Cabanis (1816–1906), the bird curator of the Zoological Museum Berlin (ZMB, today Museum für Naturkunde). Cabanis published the

Table 1. Numbers of bird specimens (skins and mounts) collected by Juan Gundlach in Puerto Rico.

| Institution [†] | No. of specimens | Acquisition (source) |
|--------------------------|------------------|----------------------|
| MfN | 102 [‡] | Gundlach |
| IES | 44 | Gundlach |
| AMNH | 18 | Lawrence |
| FMNH | 14 | - |
| USNM | 11 | Gundlach, Lawrence |
| BMNH | 1 | - |
| MCZ | 1 | AMNH |
| Total | 191 | |

[†]Full museum names: MfN = Museum für Naturkunde Berlin; IES = Instituto de Ecología y Sistemática, La Habana; AMNH = American Museum of Natural History, New York; FMNH = Field Museum of Natural History, Chicago; USNM = US National Museum of Natural History, Washington; BMNH = The Natural History Museum, Tring; MCZ = Museum of Comparative Zoology, Cambridge.

[‡]Gundlach collected 95 specimens; another 7 were collected by Agustín Stahl and presented to MfN by Gundlach.

articles with remarks in his *Journal für Ornithologie*. The first specimens from Cuba arrived at ZMB in 1862 through Sezekorn and were most probably part of the remuneration of Gundlach's travel expenses to the "Verein für Naturwissenschaften Kassel". A direct relation between the ZMB (Wilhelm Peters, Jean-Louis Cabanis) and Gundlach was established in 1861 (Peters) and 1862 (Cabanis) at the latest, more than 10 years before his first trip to Puerto Rico (Museum für Naturkunde, Historische Bild- u. Schriftgutsammlungen, Zool. Mus. [hereafter MfNHBSZM], Signatur ZMB S I, Gundlach, I.). Following his participation in the Exposition Universelle in Paris, Gundlach visited the ZMB in 1867 for a week, where he met with the museum's curator Wilhelm Peters (1815–1883). Further specimen donations to the ZMB followed (MfNHBSZM Signatur ZMB S I, Gundlach, I.)

The material collected by Gundlach in Puerto Rico was sent in three shipments to the ZMB (arrival dates March 1874, June 1874, October 1876). Birds from other collectors (Blanco, Krug) in Puerto Rico were included in those shipments to the ZMB (in litt. JCG to Wilhelm Peters [hereafter WP]; 15 February 1874; from Fermina, Cuba; MfNHBSZM, Signatur ZMB S I, Gundlach, I., p. 219a). All, however, were registered with Gundlach as collector, and the determination of the actual collector is difficult or impossible today because the original labels were not conserved. Further, it seems that not all specimens Gundlach sent were maintained in the Berlin collection. Thus, a hummingbird mentioned by Gundlach in a letter to Peters dated 15 February 1874 is not available today and could not be traced in museum catalogues (MfNHBSZM, Signatur ZMB S I, Gundlach, I., p. 129a). This, and other specimens, may have been lost, destroyed, or exchanged with other collections.

The first of Gundlach's three shipments included 34 bird specimens that arrived at ZMB in March 1874. A second shipment, with 28 birds (according to the cata-

logue) arrived in June 1874. All of those birds were collected during Gundlach's 1873 expedition to Puerto Rico. The month of collection was recorded for most birds in the second shipment, whereas it was not for most specimens in the first shipment.

A third shipment of three boxes (including one of birds) of specimens collected during Gundlach's 1875–76 expedition to Puerto Rico arrived at ZMB in October 1876. Gundlach mentioned that among these birds were specimens from Krug's collection (in litt. JCG to WP; 17 August 1876; from Mayagüez, Puerto Rico; MfNHBSZM, Signatur ZMB S I, Gundlach, I., p. 259.). Cabanis confirmed that 30 stuffed birds, 67 eggs, and 7 nests arrived in October 1876 (MfNHBSZM, Signatur ZMB S I, Gundlach, I., p. 266). Twenty-eight of those birds were catalogued in October 1876. After this date seven additional specimens from Puerto Rico arrived in June 1878, January 1879, December 1880, and June 1881. Those specimens were probably part of Stahl's collection, which Gundlach had received at that time (in litt. JCG to Jean Louis Cabanis; 29 September 1878; MfNHBSZM, Signatur ZMB S I, Gundlach, I., p. 294). It cannot be excluded, however, that Gundlach sent some specimens of his own expeditions which had been maintained in his personal collection.

Upon their arrival in Berlin, the specimens were assigned entrance numbers (B-numbers) and, after preparation, inventory numbers. Only five specimens of the second shipment (1874) were inventoried later. All of Gundlach's specimens for the ZMB collection were mounted when received. Collectors labels were removed usually and new museum labels were created. Of the inventoried specimens, 70% have survived (98% of the eggs), and 85% of those have been transformed to skins. The transformation from mounts to skins was initiated by Erwin Stresemann (1889–1972) in the middle of the 20th century to better protect the specimens.

In general, Gundlach seemed to collect for taxonomical purposes only, and he used the specimens as vouchers and for determination. But the exact collecting locality and the collecting date are never mentioned. For some specimens a month is given on the label as Gundlach mentioned that several birds are to be found in different seasons only. The lack of more data is unfortunate, because locality and date data could provide a more useful baseline in assaying what has been the dramatic change of biodiversity that has occurred in Puerto Rico, including several species that have been extirpated from the island or are now extinct (Wiley 1985, Snyder et al. 1987).

Puerto Rican Bird Specimens Collected by Juan Gundlach

We present an annotated inventory of Gundlach's bird specimens (skins and mounts, as well as eggs and nests) from Puerto Rico in the two largest collections: the collection at the MfN, Berlin, and the collection at the IES, La Habana, with notes on Gundlach's Puerto Rican spec-

imens encountered in other institutions. Both the IES and MfN specimens have been unreported, except for Valdes Ragués' (1914) incomplete catalogue of the Museo cubano "Gundlach" when it was housed at the Instituto de Segunda Enseñanza, La Habana. The IES specimens were "discovered" among Gundlach's collection of Cuban skins, mounts, eggs, and nests during our recent inventory. The MfN specimens remained more or less unknown or international scientists had thought they had been destroyed in WWII. Our 2011 inventory, however, revealed that although the MfN collections were damaged during the Allied bombing of Berlin, many of Gundlach's specimens and their records survived. Figures 1 to 3 are examples of how the specimens appear today in the MfN.

The list, as well as the species names (Latin, English) including current subspecies names, follow Dickinson and Remsen (2013) and Dickinson and Christidis (2014). The scientific name used by Gundlach (1874, 1878a) is added in brackets. For each species, institution and catalogue number(s), sex, date(s) of collection, and locality, as available, are presented. As already written, none of the IES Puerto Rican specimens has detailed data. Nevertheless, some of the specimens can be matched to Gundlach's published accounts of his collecting activities, and thus further data were derived from interpretation. For specimens housed in MfN, we use the original institution name of ZMB. The ZMB specimens could generally be assigned to the different collecting expeditions due to the accession date. We present information included by Valdes Ragués in his 1914 catalogue of Gundlach's collection in the Instituto de Segunda Enseñanza. Puerto Rican specimens in the Instituto de Segunda Enseñanza museum were identified by a yellow label, but Valdes Ragués (1914) did not always mention that information in his catalogue. Full names and acronyms for institutions are presented in Table 1. Expanded specimen data are available from the authors.

Following the specimen list, we provide a list of the types belonging to the Gundlach collection from Puerto Rico. Six species were described from that collection. Except for *Asio portoricensis*, all of those species were detected by Gundlach himself, but in some cases they were "officially" (in the sense of the ICZN) published by other authors. This was true for G. N. Lawrence (New York), who received a bird collection from Gundlach and J. L. Cabanis (Berlin).

Localities

Mayagüez (Mayaguez: town on the west coast of Puerto Rico [18°12'03"N; 67°08'22"W (DMS)]; Gundlach collected there several times in both expeditions.

Lares: town in the mountains of western Puerto Rico [18°17'40"N; 66°52'37"W (DMS)]; Gundlach collected there from July to October 1873.

Cueva de Pajita: cave near Callejones Barrio, western Puerto Rico [18° 19'38"N; 66° 50'56"W (DMS)]; Gundlach collected there in June and July 1873.



Figure 1. ZMB 21494: *Melanerpes portoricensis*, female, collected by Gundlach on Puerto Rico in November 1873, mounted and labelled in ZMB (photo Hwa Ja Götz, MfN).

Quebradillas: town in western Puerto Rico [18°28'25"N; 66°56'18"W (DMS)]; Gundlach collected in the area in October and November 1873, and winter and spring 1876.

Vega Baja: town in north-central Puerto Rico [18°26'39" N; 66°23'15" W (DMS)].



Figure 2. ZMB 21632: *Mimus polyglottos*, female, collected by Gundlach on Puerto Rico in October 1873, mounted and labelled in ZMB, remounted in the 20th century (photo Hwa Ja Götz, MfN).



Figure 3. Original label of Gundlach of the holotype of *Chloristes gertrudis* ZMB 21628 (photo Hwa Ja Götz, MfN).

List of specimens

The following list summarizes the information on the specimens of Puerto Rico originally belonged to the collection of Gundlach (Gundlach mainly given as collector).

The catalogue is structured as follows:

Scientific species name, subspecies name, English name
[scientific name used by Gundlach]

Number of specimens: ♂ ♀ + unsexed. Registration number. Registered dates.

Number of eggs: Registration number. Registered dates.

Number of nests: Registration number. Registered dates.

Anatidae

***Dendrocygna arborea*, West Indian Whistling Duck**
[*Dendrocygna arborea*]

1 egg: ZMB 2000.30251 Date: 1875/1876.

***Oxyura jamaicensis jamaicensis*, Ruddy Duck** [*Eristomura rubida*]

4 eggs: ZMB 2000.30255–30257 (clutch?), ZMB 2000.30374. Dates: 1873, 1875/1876.

Columbidae

***Patagioenas inornata*, Plain Pigeon** [*Chloroenas inornata*]

1: ♀. ZMB 25226. Lares. Collector probably Stahl.

***Zenaida aurita zenaida*, Zenaida Dove** [*Zenaida amabilis*]

1: ♂. ZMB 22676. Date: 1875/1876.

2 eggs: ZMB 2000.30249–30250 (clutch?). Date: 1875/1876.

Phaethontidae

***Phaethon lepturus catesbyi*, White-tailed Tropicbird**
[*Phaethon flavirostris*]

1: ZMB 22677. Date: Aug 1876.

3 eggs: ZMB 2000.30268–30270 (3 clutches?). Date: 1875/1876.

Apodidae

***Cypseloides niger niger*, Black Swift** [*Nephocætes niger*]
3: 2♂ 1♀. ZMB 22657–22659. Dates: 1875/1876.

Trochilidae

***Anthracothonax dominicus aurulentus*, Antillean Mango**
[*Lampornis aurulentus*]

13: 8♂ 5♀. ZMB 21471–21473 (21471 missing), 21625 (missing), 21626, 27054, 27055; IES 2560, 2562, 2567; AMNH 46356, 46360; USNM 353410. Dates: Mar, Apr, Sep, Oct; 1873, 1876.

***Anthracothonax viridis*, Green Mango** [*Lampornis viridis*]

9: 9♂. ZMB 21474, 21627, 22668–22671; IES 2563; FMNH 42399; USNM 087706. Dates: Sep, Oct; 1873, 1875, 1876.

***Chlorostilbon maugæus*, Puerto Rican Emerald**
[*Chlorolampis Maugæus*]

6: 3♂ 1♀ + 2. ZMB 21628 (Holotype for *Chlorestes gertudis* Gundlach 1874), 22672–22674; IES 2578; AMNH 38784. Dates: Nov; 1873, 1875/1876.

Cuculidae

***Crotophaga ani*, Smooth-billed Ani** [*Crotophaga ani*]

1 egg: ZMB 2000.30296 (missing). Date: 1875/1876.

***Coccyzus americanus americanus*, Yellow-billed Cuckoo**
[*Coccyzus americanus*]

1: ♂. ZMB 21496. Date: 1873 (missing).

***Coccyzus minor*, Mangrove Cuckoo** [*Coccyzus minor*]

1: ♂. ZMB 21497. Date: Jul 1873.

***Coccyzus vieilloti*, Puerto Rican Lizard Cuckoo**
[*Saurothera Vieilloti*]

Valdes Ragués (1914) listed one specimen in his catalogue of the Gundlach collection.

5: 5♂. ZMB 21495, 21600; IES 2569, FMNH 41320, 41321. Dates (4): Feb, Sep, Nov; 1873, 1876; “5 March 1892” [likely the date of acquisition].

1 egg: ZMB 2000.30295. Date: 1875/1876.

Rallidae

***Rallus longirostris caribæus*, Clapper Rail** [*Rallus crepitans*]

1: ZMB 22679. Date: 1875/1876.

***Gallinula galeata cercheris*, Common Gallinule** [*Gallinula galeata*]

1 egg: ZMB 2000.30376. Date: 1873.

***Fulica americana americana*, American Coot** [*Fulica americana*]

6 eggs: ZMB 2000.30259–30263 (clutch?), ZMB 2000.30375 (missing). Dates: 1873, 1875/1876.

Procellariidae

***Puffinus lherminieri lherminieri*, Audubon's Shearwater**

Valdes Ragués (1914) noted inexplicably “15 exemplars de Puerto Rico” under *Puffinus auduboni*, but Gundlach made no mention of the species elsewhere. We did not find specimens in any collection.

Ardeidae

***Ixobrychus exilis exilis*, Least Bittern** [*Ardetta exilis*]

2 eggs: ZMB 2000.30253–30254 (clutch?). Date: 1875/1876.

***Nycticorax nycticorax hoactli*, Black-crowned Night Heron** [*Nyctiardea Gardeni*]

1 egg: ZMB 2000.30252. Date: 1875/1876.

Strigidae

***Asio flammeus portoricensis*, Short-eared Owl**
[*Brachyotus Cassinii*]

4: 2♂ + 2. AMNH 44768, 44769; USNM 086039; MCZ 96647 (Syntypes for *Asio portoricensis* Ridgway 1882). Date (3): 1873–1876 (if really collected by Gundlach).

***Megascops nudipes nudipes*, Puerto Rican Screech Owl** [*Gymnoglaux nudipes*]

In his 1874 catalogue, Gundlach listed this species as “*Gymnoglaux Krugii* Gundl. n. sp.” (in honor of Krug), but as “*Gymnoglaux nudipes (Strix)* Daud.” in his 1878(b) publication. The Valdes Ragués (1914) catalogue lists two specimens, so one is now missing from the IES collection.

11: 8♂ 3♀. ZMB 21596, 21597 (Syntypes for *Gymnoglaux Krugii* Gundlach 1874); ZMB 22654, 22655 (missing), 25223 (collected by Stahl), 25224 (collected by Stahl); IES 2584; AMNH 44792–44795. Dates: Jan, May, Nov; 1873, 1875/1876, 1877.

1 egg: ZMB 2000.30245. Date: 1875/1876.

Picidae

***Melanerpes portoricensis*, Puerto Rican Woodpecker**
[*Melanerpes portoricensis*]

6: 4♂ 2♀. ZMB 21493, 21494, 21601; IES 2559, 2591; AMNH 44132. Dates: Oct, Nov; 1873, 1876.

Todidae

***Todus mexicanus*, Puerto Rican Tody** [*Todus hypochondriacus*]

5: 2♂ 1♀ + 2. ZMB 21490 (missing), IES 2222, AMNH 43105, FMNH 41736, USNM 055110. Date: Sep; 1873.

4 eggs: ZMB 2000.30281 (missing)–30283 (clutch?), ZMB 2000.30365. Dates: 1873, 1875/1876.

Falconidae***Falco sparverius caribaeorum*, American Kestrel** [*Tinnunculus dominicensis*]

Gundlach was particularly interested in the variation in color among kestrels and collected a good series of specimens of *F. s. dominicensis* and *sparverioides* from Cuba, as well as at least 14 specimens of *F. s. caribaeorum* from Puerto Rico. Valdes Ragués (1914) listed two kestrel specimens from Puerto Rico in the ISE collection, so one is now missing.

13: 7♂ 6♀. ZMB 21498–21501, 22652, 22653, 2000.17994; IES 2561, AMNH 45001–45005. Dates: 1873, 1875/1876.

2 eggs: ZMB 2000.30246–20347 (clutch?). Date: 1875/1876

Psittacidae***Amazona vittata vittata*, Puerto Rican Parrot** [*Chrysotis vittatus*]

Gundlach collected parrots near Lares in 1873, noting that he was able to retrieve three of four shot (in litt. JCG to Felipe Poey; 1 August 1873; from Mayagüez, Puerto Rico; AhULH). He must have collected at least a fourth specimen at some point in 1876 (see below). Valdes Ragués (1914) listed *Chrysotis leucocephala* [Cuban Parrot *Amazona leucocephala*] among the Gundlach specimens, but noted it had a yellow tag, which designated a bird collected in Puerto Rico. The specimen was identified by IES staff as *A. vittata*. It was stolen from the collection c. 1990. The parrot disappeared from western Puerto Rico within 50 years of Gundlach's visit, surviving only in the easternmost part of the island (Snyder et al. 1987). The parrot is currently considered to be Critically Endangered (IUCN 2014).

4: 1♂ 1♀ + 2. ZMB 22675; IES 2589 (missing); FMNH 40353, 40354. Dates: Jul; 1873, 1875/76.

***Psittacara chloropterus maugei*, Hispaniolan Parakeet**

2: 2 wings: ZMB 2000.35468–35469 (missing)(Syn-types of *Conurus Gundlachi* Cabanis 1881a), collected by C. F. Block on Mona Island.

Tyrannidae***Tyrannus dominicensis dominicensis*, Gray Kingbird** [*Melittarchus griseus*]

1: USNM 055109.

***Tyrannus caudifasciatus taylori*, Loggerhead Kingbird** [*Tyrannus Taylori*]

4: 3♂ 1♀. ZMB 21638, 21639, 22656; IES 2587. Dates (4): Feb, Jun, Sep; 1873, 1876.

1 egg: ZMB 2000.30273. Date: 1875/1876.

***Myiarchus antillarum*, Puerto Rican Flycatcher** [*Myiarchus antillarum*]

2: 2♂. ZMB 21491 (missing); FMNH 31069. Date (1): 1873.

2 eggs: ZMB 2000.30271–30272 (clutch?). Date: 1875/1876.

***Contopus latirostris blancoi*, Lesser Antillean Pewee** [*Blacius Blancoi*]

Cabanis (1875) described the endemic Puerto Rico subspecies as *Blacius blancoi* in 1875 from a specimen sent by Gundlach, but probably collected by Tomás Blanco.

2: 1♂ 1♀. ZMB 21492 (Holotype for *Blacius blancoi* Cabanis 1875); IES 2576; Date: Dec; 1873.

Vireonidae***Vireo latimeri*, Puerto Rican Vireo** [*Vireo Latimeri*]

1: ♂. ZMB 21629. Date: Oct 1873.

2 eggs: ZMB 2000.30358 (missing), ZMB 2000.30359 (clutch?). Date: 1875/76.

1 nest ZMB 2000.30312 (missing). Date: 1875/76.

***Vireo altiloquus altiloquus*, Black-whiskered Vireo** [*Phyllomanes calidris*]

1: ♂. ZMB 21480. Date: 1873.

2 nests ZMB 2000.30310–30311 (missing). Date: 1875/76.

Corvidae***Corvus leucognaphalus*, White-necked Crow** [*Corvus leucognaphalus*]

Gundlach shot eight crows at Cueva de Pajita, Lares, where he found large numbers, in July 1873 (in litt. JCG to Felipe Poey; 1 August 1873; from Mayagüez, Puerto Rico; AhULH). Gundlach also saw the crow at Utuado, and south of Quebradillas. He was told that the crow was more abundant in the island's interior than in the east. Despite its abundance during Gundlach's visit, the crow was extirpated from Puerto Rico by the 1960s (Raffaele 1989; Wiley 2006). The specimen listed as “cuervo” in the catalogue of Valdes Ragués (1914) is probably the IES individual, because it has a yellow label, indicating a specimen collected in Puerto Rico.

5: 1♂ 2♀ + 2. ZMB 22666, 23347 (collected by Stahl), 25225 (collected by Stahl), 2000.736; IES – without number in the actual catalogue: (O.C.#6140; “E190”). Dates: Jul (JCG in litt., see above); 1873, 1875/76.

Estrildidae***Estrilda melpoda*, Orange-cheeked Waxbill** [*Habropyga melpoda*]

Gundlach was the first naturalist to record the species in Puerto Rico; he noted (1878a) it was living free near Mayagüez, Añasco, and Cabo Rojo. Wetmore (1927) believed it had become established in Puerto Rico during the period of slave trade, whereas Raffaele (1983) suggested it arrived at the end of that period, in the mid-19th century.

3: 1♂ 1♀ + 1. ZMB 21486 (Mayagüez), 2000.19661; IES 2577. Dates: Jan; 1873, 1876.

***Spermestes cucullata*, Bronze Mannikin [*Spermestes cucullatus*]**

The mannikin is thought to have been introduced to Puerto Rico during the era of slave trafficking (Wetmore 1927; Danforth 1936), well before Gundlach's visits. Gundlach (1878a) reported it as very abundant in several locations, including Mayagüez, Lares, Quebradillas, and Vega Baja.

6: 2♂ 3♀. ZMB 21484 (missing), 21485, 21635; IES 2573, 2579, 2583. Dates (6): Feb, Mar, Jul, Aug; 1873, 1876.

Fringillidae***Euphonia musica sclateri*, Antillean Euphonia [*Euphonia Sclateri*]**

8: 5♂ 2♀ + 1. ZMB 21475 (missing), 21476 (missing), 22678; IES 2564, 2558; AMNH 40514; FMNH 27047; USNM 054929. Dates: Jul, Dec; 1873, 1876.

Phaenicophilidae***Nesospingus speculiferus*, Puerto Rican Tanager [*Chlorospingus speculiferus*]**

2: 1♂ + 1. ZMB 24887 (collected by Stahl); USNM 075331 (Holotype of *Chlorospingus speculiferus* Lawrence 1875) [given to Gundlach by Blanco].

***Spindalis portoricensis*, Puerto Rican Spindalis [*Spindalis portoricensis*]**

7: 3♂ 4♀. ZMB 21477, 21615 (missing), 21616; IES 2555, 2572; FMNH 27622, 27623. Dates : Mar, Sep; 1873, 1876.

Parulidae***Setophaga petechia bartholemica*, Yellow Warbler [*Dendroica petechia*]**

4: 3♂ 1♀. ZMB 21482, 21614 (missing); USNM 54924, 54925. Dates : Aug, Sep; 1873.

2 eggs: ZMB 2000.30354 (missing), ZMB 2000.30355 (clutch?). Date: 1875/1876.

1 nest: ZMB 2000.30308. Date: 1875/1876.

***Setophaga adelaidae*, Adelaide's Warbler [*Dendroica Adelaidae*]**

Both IES specimens were included in the catalogue of Valdes Ragués (1914).

5: 3♂ 2♀. ZMB 21469, 21470; IES 2565, 2568; FMNH 26119. Dates : 1873.

Icteridae***Icterus icterus ridgwayi*, Venezuelan Troupial [*Icterus vulgaris*]**

Gundlach noted (on label), "Es de costa firma — introducida," whereas Danforth (1936: 163) suggested it was indigenous to Puerto Rico. Raffaele (1989) and Raffaele and Kepler (1992) considered it introduced to the island.

1: IES 2336. Date: Oct.

***Icterus portoricensis*, Puerto Rican Oriole [*Xanthornus portoricensis*]**

8: 4♂ 2♀ + 2. ZMB 21487, 21488 (missing), 21623, 21624 (missing), 22661 (missing); IES 2429, 2588, 2571. Dates: Feb, Mar, Aug, Sep, Oct; 1873, 1875/1876.

1 egg: ZMB 2000.30291 (missing). Date: 1875/1876.

***Agelaius xanthomus xanthomus*, Yellow-shouldered Blackbird [*Agelaius chrysopus*]**

The Yellow-shouldered Blackbird is now considered endangered and decreasing (IUCN 2014), in large part because of the activities of the Shiny Cowbird (*Molothrus bonariensis*), a brood parasite, which arrived in Puerto Rico some 75 years after Gundlach's visits (Post and Wiley 1976, Wiley et al. 1991). The blackbird's range has been greatly reduced since Gundlach's time (Post and Wiley 1977, Post 1981).

6: 3♂ 2♀ + 1. ZMB 21489, 22662, 22663; IES 2570; USNM 106119, 106120. Dates: Feb; 1873, 1875/1876.

3 eggs: ZMB 2000.30292–30393 (missing), ZMB 2000.30294. Date: 1875/1876.

1 nest: ZMB 2000.30313 (missing). Date: 1875/1876.

***Quiscalus niger brachypterus*, Greater Antillean Grackle [*Chalcophanes brachypterus*]**

5: 1♂ 3♀ + 1. ZMB 21636 (missing), 21637, 22664 (missing), 22665; IES 2585. Dates: Jan, Aug; 1873, 1875/1876.

7 eggs: ZMB 2000.30284–30290 (clutch?). Date: 1875/1876.

Thraupidae***Coereba flaveola portoricensis*, Bananaquit [*Certhiola portoricensis*]**

Valdes Ragués (1914) listed two specimens in his catalogue of the ISE collection.

7: 3♂ 2♀ + 2. ZMB 21478, 21479, 21633, 22667 (all missing); IES 2554, 2556; FMNH 9762. Dates: Feb, May, Oct; 1873, 1875/1876.

5 eggs: ZMB 2000.30360, ZMB 2000.30361–30364 (missing) (clutch?). Date: 1875/1876.

1 nest: ZMB 2000.30309. Date: 1875/1876.

***Melopyrrha portoricensis portoricensis*, Puerto Rican Bullfinch [*Pyrrhulagra portoricensis*]**

3: 1♂ + 2. ZMB 22660 (missing); IES 2557; FMNH 23988. Dates (2): Jul; 1875/76.

***Melanospiza bicolor omissa*, Black-faced Grassquit [*Euethia bicolor*]**

5: 3♂ 1♀ + 1. ZMB 21483 (missing), 21634; IES 2580, 2582; AMNH 41310. Dates: Feb, Mar, Jul; 1873, 1876.

7 eggs: ZMB 2000.30323–30324, ZMB 2000.30389 (missing) (clutch?), ZMB 2000.30331–30332 (clutch?), ZMB 2000.30352–30353 (missing) (clutch?). Date: 1875/1876.

Hirundinidae

***Petrochelidon fulva puertoricensis*, Cave Swallow** [*Petrochelidon fulva*]

3: 1♂ 1♀ + 1. ZMB 21481 (missing), 21618; IES 2151. Dates: Mar, Sep; 1873, 1876.

1 egg: ZMB 2000.30274. Date: 1875/1876.

***Progne dominicensis*, Caribbean Martin** [*Progne dominicensis*]

5: 3♂ 2♀. ZMB 21617; IES 2566, 2574, 2575; BMNH 84.11.21.119. Date: Aug 1873.

5 eggs: ZMB 2000.30275–30279 (clutch?). Date: 1875/1876.

Mimidae

***Margarops fuscatus fuscatus*, Pearly-eyed Thrasher** [*Margarops fuscatus*]

It is remarkable that this now-abundant and obvious species (Snyder et al. 1987; Arendt 2006) was rare in Puerto Rico during Gundlach's time. He wrote (1878a): “Solamente en dos ocasiones he observado esta especie, y la creo poco común, porque pocas personas la conocían.” He collected one in a coffee plantation, and observed a pair near Utuado in July.

2: 1♂ 1♀. ZMB 23642 (collected by Stahl); IES 2411. Quebradillas. Dates: July, Nov (both in Gundlach 1878a).

***Mimus polyglottos orpheus*, Northern Mockingbird** [*Mimus polyglottos*]

3: 2♂ 1♀. ZMB 21630–21632. Dates (3): Oct, Nov; 1873.

2 eggs: ZMB 2000.30298–30299 (clutch?). Date: 1875/1876.

Turdidae

***Turdus plumbeus ardosiaceus*, Red-legged Thrush** [*Mimocichla ardosacea*]

5: 4♂ + 1. ZMB 21468, 21598, 21599; IES 2586; FMNH 26782. Dates (4): Mar, Sep; 1873, 1876.

2 eggs: ZMB 2000.30356–30357 (clutch?). Date: 1873.

List of type specimens of the collection of Gundlach from Puerto Rico

***Chlorospingus speculiferus* Lawrence**

Chlorospingus speculiferus Lawrence 1875: 383.

Now. *Nesospingus speculiferus* (Lawrence 1875): 383. See Cory (1889: 86).

Type series. Lawrence (1875) described this species and attributed its discovery to Gundlach, but Gundlach (1878b) corrected this, stating that the specimen was col-

lected by Tomás Blanco y González in Puerto Rico. Gundlach most probably received the specimen from Blanco in 1868. He later transferred it to the Smithsonian Institution in Washington, D. C. (today USNM) and there Gundlach was given as collector. As Lawrence (1875) wrote “Type in National Museum, Washington”, the type series consists of only one specimen which is the only available specimen of that species at the USNM “collected by Gundlach” and is therefore the holotype. An additional specimen of this species from the Gundlach collection is housed at the ZMB (ZMB 24887), but it was collected by Stahl between 1878 and 1880 and was sent directly from Gundlach to Berlin. It is therefore not part of the type series. LeCroy (2012) noted that a further specimen at the American Museum of Natural History (AMNH 3262) has a type label for *Chlorospingus speculiferus*. But she did not consider it as a type specimen because it is not dated and Gundlach is not indicated clearly as the collector. We follow this argument. It appears that Gundlach never collected this species himself.

Holotype. USNM 75331, skin, unsexed, collected by Tomás Blanco y González on Puerto Rico [in the period 1863–1868].

Type locality. Porto Rico [today Puerto Rico], no further details available.

Remarks. The specimen was catalogued at the USNM on 18 October 1878, but Lawrence previously wrote in the description in 1875 that the specimen was housed in the National Museum, Washington. We do not know when the specimen arrived at the USNM. It may be that it remained there uncatalogued until the discussion about the type with Gundlach started in 1877. As it is the only specimen of this species collected by “Gundlach” at the USNM, we believe that USNM 75331 should be the type specimen.

***Blacius blancoi* Cabanis**

Blacius blancoi Cabanis 1875: 244.

Now. *Contopus latirostris blancoi* (Cabanis 1875): 224. See Cory (1889: 129), Sclater (1888: 243), Traylor (1979: 135).

Type series. Not specified by Cabanis (1875). There is only one specimen noted in the inventory catalogue of the ZMB (ZMB 21492). But because the species was discovered and named by Gundlach all the specimens collected during the first expedition to Puerto Rico should be regarded as types according the ICZN (1999). Another specimen collected by Gundlach is housed at the IES (IES 2576). The date is given as “December” on the label. As Gundlach left Puerto Rico on 4 December 1873 after his first expedition to Puerto Rico it is more likely that he collected this specimen during his second expedition

(December 1875). Thus, this specimen cannot be included in the type series because the description of Cabanis was published in April 1875.

Syntype. ZMB 21492, skin, adult male, collected by J. C. Gundlach in Portorico [Puerto Rico] [in the period 06.–12.1873].

Type locality. Portorico [today Puerto Rico], no further details available.

Remarks. Gundlach discovered this new species and named it in honor of his friend Tomás Blanco y González (1840–1892), living in Puerto Rico. Gundlach (1874) included the species in his published list without description. Cabanis (1875) added the missing description, so he is officially the author of this species, following the ICZN (1999).

***Gymnoglaux Krugii* Gundlach**

Gymnoglaux Krugii Gundlach 1874: 310, 315.

Now. *Megascops nudipes nudipes* (Gundlach 1874): 310, 315. See Gundlach (1878b: 164/165), Cory (1889: 192).

Type series. Not specified by Gundlach (1874). There are two specimens noted in the inventory catalogue of the ZMB. Therefore these are syntypes.

Syntype. ZMB 21596, skin, male, collected by J. C. Gundlach in Portorico [Puerto Rico] [in the period 06.–12.1873].

Syntype. ZMB 21597, skin, female, collected by J. C. Gundlach in Portorico [Puerto Rico] [in the period 06.–12.1873].

Type locality. Portorico [today Puerto Rico], no further details available.

Remarks. Gundlach discovered this new species and named it in honor of his patron Carl Wilhelm Leopold Krug (1833–1898), who served as the German and British Vice-consul in Mayagüez. In his 1878(b) publication, Gundlach synonymized it with “*Gymnoglaux nudipes* (*Strix*) Daud”.

There are further specimens of this species from the Gundlach collection in the ZMB (ZMB 22654, 22655 [missing], 25223 [collected by Stahl], 25224 [collected by Stahl]), the IES (IES 2584 and without number [missing, fide Valdes Ragués (1914)]) and the AMNH (AMNH 44792–44795) which were (most probable for the IES and two of the AMNH specimens) collected during Gundlach's second expedition to Puerto Rico or even later by Agustin Stahl (1842–1917). Thus, due to missing exact information we do not regard any of these specimens as types.

***Asio portoricensis* Ridgway**

Asio portoricensis Ridgway 1882: 366.

Now. *Asio flammeus portoricensis* (Cory 1889: 191; Peters 1940: 170).

Type series. Ridgway (1882) attributed the discovery of this species to Baird et al. (1874) when the existence of a new species of this genus from Puerto Rico was determined. Lacking further material for comparison, this species remained unnamed in 1874. In his description, Ridgway (1882) wrote that he had studied 4 specimens from Puerto Rico, one specimen in the USNM (USNM 39643 which was illustrated and described as aberrant by Baird et al. (1874) and three specimens which were collected by Gundlach and received for determination from George Newbold Lawrence. Ridgway reported that all four specimens were very similar and described the new species. Therefore, all four specimens are syntypes. Some of Gundlach's specimens passed to Lawrence. The specimen USNM 086039 came with the Lawrence collection to the USNM where it was catalogued in 1882 (in litt. James Dean to JWW, 3 June 2009). Two other specimens of *Asio flammeus* of the Lawrence collection came to the AMNH (AMNH 44768, AMNH 44769) in 1887 (in litt. Mary LeCroy 27 September 2013). One of them (AMNH 44768) was later (c. 1920, in litt. Jeremiah Trimble 25 October 2013) given to the MCZ, where it is housed today (MCZ 96674).

Syntype. USNM 086039, skin, adult male, collected by J. C. Gundlach in Portorico [Puerto Rico].

Syntype. USNM 39643, skin, adult, collected by G. Latimer on the north side of Portorico [Puerto Rico] [in 1864/65 according to catalogue USNM], catalogued at the USNM on 10 November 1865.

Syntype. AMNH 44769, skin, male, collected by J. C. Gundlach in Portorico [Puerto Rico].

Syntype. MCZ 96674 (former AMNH 44768), skin, collected by J. C. Gundlach in Portorico [Puerto Rico].

Type locality. Porto Rico [today Puerto Rico], no further details available.

***Chlorestes gertrudis* Gundlach**

Chlorestes gertrudis Gundlach 1874: 312, 315.

Now. *Chlorostilbon maugaeus* (Gundlach 1878b, Cory 1889: 154, Salvin 1892: 58, Peters 1955: 39).

Type series. Not specified by Gundlach (1874). In 1878, Gundlach (1878b) wrote that he collected one male of this new species which was sent to Berlin later and so it is the holotype.

Holotype. ZMB 21628, skin, adult male, collected by J. C. Gundlach in Portorico [Puerto Rico] in November [1873].

Type locality. Porto Rico [today Puerto Rico, western part (Wiley et al. 2014)].

Remarks. Gundlach was not aware of the description of *Sporadinus maugaeus* Viell. 1817 when he described *Chlorestes gertrudis*. In his second publication on the birds of Puerto Rico (1878b), Gundlach suspected synonymy with this species but he was uncertain.

Gundlach (1874) named *Chlorestes gertrudis*, a synonym of *Chlorostilbon maugaeus*, as a new species, in honor of Gertrud Krug, wife of his friend Leopold Krug (Gundlach 1878a: 182; in litt. JCG to Felipe Poey; 1 August 1873; from Mayagüez, Puerto Rico; AhULH). Blanco (1969), however, claimed it was named in recognition of doña Gertrudis Gonzalez de la Parte, mother of Tomás Blanco. Valdes Ragués (1914) listed five unnamed specimens of “zumbador” in his catalogue, probably a combination of Antillean mango (3 specimens), green mango (1), and Puerto Rican emerald (1).

Five additional specimens of this species were collected by Gundlach (ZMB 22672–22674; IES 2578; AMNH 38784), but all have been collected during his second expedition to Puerto Rico and, therefore, we do not regard them as types.

Conurus gundlachi Cabanis

Conurus gundlachi Cabanis 1881a: 5.

Now. *Psittacara chloropterus maugei* (Souancé 1856: 59, Cory 1889: 180, Salvadori 1891: 189, Ridgway 1916: 155, Peters 1937: 188, Wiley et al. 2014: 257, Olson 2015).

Type series. Cabanis mentioned in his description as well as in Cabanis (1881b) that he described the species based on two left wings, which means his description is based on two specimens.

Syntype (lost). ZMB 2000.35468, wing, [collected by Dr. Claudio Federico Block on Isla de Mona, Portorico [Puerto Rico] before 1874].

Syntype (lost). ZMB 2000/35469, wing, [collected by Dr. Claudio Federico Block on Isla de Mona, Portorico [Puerto Rico] before 1874].

Type locality. Insel Mona near Portorico [today Isla de Mona, Puerto Rico].

Remarks. Three wings of a parakeet from Isla de Mona were collected by Dr. Claudio Federico Block (or Bloch), a Danish physician and hunter from Mayagüez, who gave the wings to Gundlach probably in 1875. Two of the wings

arrived in Berlin in October 1876 (B 14144). But they did not get inventory numbers and the whereabouts of the wings are unclear, so they are apparently lost. The whereabouts of the third wing is unknown, too (Olson 2015).

Summary

In summary, we can account for 191 bird skin and mount specimens collected by Gundlach in Puerto Rico, representing 43 species. An additional 69 eggs (19 species) and 6 nests (5 species) were located, including eggs of 7 species not represented by skins. A total of 147 skin and mount specimens collected by Gundlach in Puerto Rico were found in foreign institutions, with the Museum fuer Naturkunde holding the largest number (102), including two holotypes and two syntypes (Table 1). The MfN collection contains 53.4% of all specimens, and 93.0% of the species in all collections examined. Further, MfN specimens represent 26.1% of the 153 species Gundlach reported from Puerto Rico (Gundlach 1878a, 1878b).

We found 44 specimens (41 extant), representing 28 species, collected by Gundlach in Puerto Rico in the IES collection. Valdes Ragués (1914) listed 18 Puerto Rican specimens by name or group in his analysis of Gundlach’s collection, with another improbable 15 Audubon’s Shearwaters. The IES collection contains 23.0% of all specimens, and 65.1% of the species in all examined collections (Gundlach 1878a, 1878b; Table 1). Further, the IES specimens represent 18.3% of the 153 species Gundlach reported from Puerto Rico.

Conspicuously missing from all collections of Gundlach’s bird skins from Puerto Rico are specimens of shorebirds, waterfowl, and waders, even though he actively collected in several coastal and wetland areas and did take several eggs of waterbirds.

Unfortunately, none of Juan Gundlach’s journals or field notes has been found. Such material might provide much-desired additional data on Gundlach’s collected specimens, much of which would be valuable in further determination of types. Some information may be available in Gundlach’s correspondence, and we urge others to search for all such materials.

Concluding remarks

The theft of the Puerto Rican Parrot specimen, sadly, was not the last of Gundlach’s bird specimens to have been stolen from the IES collection. In 2007, thieves again raided the collection, this time making off with several Gundlach-collected birds. Tragically, the only Cuban Macaw (*Ara tricolor*) specimen in Cuba (and one of 19 known specimens worldwide; Wiley and Kirwan 2013) was taken by the thieves, who also stole air conditioners and other valuable items essential for maintaining the collections. The specimens were most likely taken not

for their scientific value or for their value to rogue private collectors, but rather for use in local spiritual rituals. Although substantial improvements have been made in security, the IES collections are still vulnerable to future raids. The IES collection of birds and other natural history specimens is an important record of Cuban and Puerto Rican biodiversity, but is threatened by a lack of funding to maintain the collections. Such funding is desperately needed to prevent the further degradation or loss of these important treasures.

We hope to stimulate interest of museum curators to search for additional specimens in their collections.

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References

- Aguilera Román R, García ME, OLCHA MA (2002) La colección histórica de aves Juan Cristóbal Gundlach. In: Dathe W, González López RM (Eds) Johann Christoph Gundlach (1810–1896). Un naturalista en Cuba. Basilisk Press, Marburg, 151–169.
- Aguilera Román R, Garrido OH (2000) Tipos de la colección de aves del Instituto de Ecología y Sistemática, Cuba. *Pitirre* 13: 1–4.
- Arendt WJ (2006) Adaptations of an avian supertramp: distribution, ecology, and life history of the Pearly-eyed Thrasher (*Margarops fuscatus*). General Technical Report 27. U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry, San Juan, Puerto Rico.
- Baird SF, Brewer TM, Ridgway R (1874) A history of North American birds. Land birds. Vol. 3. Little, Brown, and Company, Boston, Massachusetts.
- Becker VO (2002) The Noctuoidea (Lepidoptera) from Cuba described by Herrich-Schäffer and Gundlach in the Gundlach Collection, Havana. *Revista bras. Zool.* 19: 349–391. doi: 10.1590/S0101-81752002000200006
- Blanco ET (1969) Apuntes para la historia de la fauna ornitológica de Puerto Rico. In: Colón EM (Ed.) Editorial Coquí, San Juan.
- Cabanis J (1875) Protokoll der LXVIII. Monats-Sitzung. Verhandelt Berlin, den 7. December 1874. (Cabanis: Ueber 3 von Dr. Gundlach auf Portorico entdeckte Vögel.) *Journal für Ornithologie* 23(2): 223–22.
- Cabanis J (1881a) Nachrichten und Neuigkeiten. Allgemeine Deutsche ornithologische Gesellschaft. *Ornithologisches Centralblatt* 6: 5.
- Cabanis J (1881b) Bericht über die December-Sitzung. [*Conurus Gundlachi* from Isla de Mona]. *Journal für Ornithologie* 29: 107–108. doi: 10.1007/BF02002216
- Cory CB (1889) The birds of the West Indies. Including all species known to occur in the Bahama Islands, the Greater Antilles, the Caymans, and the Lesser Antilles, excepting the islands of Tobago and Trinidad, Estes & Lauriat, Boston.
- Danforth ST (1936) Los pájaros de Puerto Rico. Rand McNally & Company, New York.
- Dathe W, González López RM (2002) Johann Christoph Gundlach (1810–1896). Un naturalista en Cuba. Basilisk Press, Marburg/Lahn.
- Dickinson EC, Christidis L (Eds) (2014) The Howard & Moore complete checklist of the birds of the world. 4th edition. Vol. 2. Passerines. Aves Press, Eastbourne.
- Dickinson EC, Remsen JV Jr (Eds) (2013) The Howard & Moore complete checklist of the birds of the world. 4th edition. Vol. 1, Non-Passerines. Aves Press, Eastbourne.
- Gundlach J (1874) Beitrag zur Ornithologie der Insel Portorico. *Journal für Ornithologie* 22(127): 304–315. doi: 10.1007/BF02004754
- Gundlach J (1878a) Apuntes para la fauna Puerto-riqueña. (Aves). *Anales de la Sociedad Española de Historia Natural*, Madrid 7: 135–234 (Parte I); 343–422 (Parte II).
- Gundlach J (1878b) Neue Beiträge zur Ornithologie der Insel Portorico. *Journal für Ornithologie* 26(142): 157–194. doi: 10.1007/BF02004185
- Gundlach J (1895) Catálogo numérico de las especies del Museo Zoológico Cubano de Gundlach. Instituto de Segunda Enseñanza a A. Alvarez, La Habana.
- Gundlach J (1896) Autobiografía inédita. La Ilustración de Cuba 4: 256–259, 274–278, 307–310, 339–343, 373–374, 402–403.
- ICZN (International Commission on Zoological Nomenclature) (1999) International Code of Zoological Nomenclature. Fourth edition. International Trust for Zoological Nomenclature, London.
- IUCN (2014) The IUCN Red List of threatened species. Version 2014.2. <http://www.iucnredlist.org>
- Lawrence GN (1875) Descriptions of five new species of American birds. *Ibis* 3, 5(19): 383–387. doi: 10.1111/j.1474-919x.1875.tb05985.x
- LeCroy M (2012) Type specimens of birds in the American Museum of Natural History, Part 10. Passeriformes: Emberizidae. *Bull. Am. Mus. Nat. Hist.* 333(3): 1–178.
- Moreno García LV, Rivalta V, Martínez M (2002) La colección Herpetológica Gundlach del Instituto de Ecología y Sistemática, La Habana, Cuba. In: Dathe W, González López RM (Eds) Johann Christoph Gundlach (1810–1896). Un naturalista en Cuba. Basilisk Press, Marburg, 151–169.
- Olson SL (2015) History, morphology, and fossil record of the extinct Puerto Rican Parakeet *Psittacara maugei* Souancé. *Wilson Journal of Ornithology* 127: 1–12. doi: 10.1676/14-020.1
- Peters JL (1937) Check-List of Birds of the World. Vol. 3. Harvard University Press, Cambridge, MA.
- Peters JL (1940) Check-List of Birds of the World. Vol. 4. Harvard University Press, Cambridge, MA.
- Peters JL (1955) Check-List of Birds of the World. Vol. 5. Harvard University Press, Cambridge, MA.

- Post W (1981) Biology of the Yellow-shouldered Blackbird – *Agelaius* on a tropical island. *Bulletin of the Florida State Museum, Biological Science* 26: 125–202.
- Post W, Wiley JW (1976) The Yellow-shouldered Blackbird — present and future. *American Birds* 30: 13–20.
- Post W, Wiley JW (1977) Reproductive interactions of the Shiny Cowbird and the Yellow-shouldered Blackbird. *Condor* 79: 176–184. doi: 10.2307/1367160
- Raffaele HA (1983) Native and introduced seed eating birds: measurement bias and community structure. Unpublished doctoral thesis, State University of New York, Stony Brook, USA.
- Raffaele HA (1989) A guide to the birds of Puerto Rico and the Virgin Islands. Revised edition. Princeton University Press, New Jersey.
- Raffaele HA, Kepler CB (1992) Earliest records of the recently introduced avifauna of Puerto Rico. *Ornitología Caribeña* 3: 20–29.
- Ridgway R (1882) Description of a new owl from Porto Rico. *Proceedings of the U.S. National Museum* 4: 366–371. doi: 10.5479/si.00963801.238.366
- Ridgway R (1916) Birds of North and Middle America: a descriptive catalogue of the higher groups, genera, species, and subspecies of birds known to occur in North America, from the Arctic lands to the Isthmus of Panama, the West Indies and other islands of the Caribbean Sea, and the Galapagos Archipelago. *Bulletin of the U. S. National Museum*, No. 50, Part VII. Washington, D. C.
- Roselaar CS (2003) An inventory of major European bird collections. *Bull. B.O.C.* 123A: 253–337.
- Salvadori T (1891) Catalogue of the Psittaci, or Parrots in the collection of the British Museum. In: *Catalogue of birds in the British Museum Vol. 20*. London.
- Salvin O (1892) Catalogue of the Picariae in the collection of the British Museum. *Upupae & Trochili*. In: *Catalogue of birds in the British Museum Vol. 16*. London.
- Sammlerglossar: Gundlach, Dr. Johannes (1810–1886) <http://www.naturkundemuseum-kassel.de/wissenschaft/sammlerglossar.php#-Gundlach>
- Sclater PL (1888) Catalogue of the Passeriformes or perching birds, in the collection of the British Museum. *Oligomyodae*, or the families Tyrannidae, Oxyrhamphidae, Pipridae, Cotingidae, Phytotomiæ, Philepittidae, Pittidae, Xenicidae, and Eurylæmidæ. In: *Catalogue of birds in the British Museum Vol. 14*. London.
- Snyder NFR, Wiley JW, Kepler CB (1987) The parrots of Luquillo: the natural history of the Puerto Rican Parrot. Western Foundation of Vertebrate Zoology, Los Angeles.
- Souancé C de (1856) Catalogue des perroquets de la collection du prince Masséna d’Essling, duc de Rivoli, et observations sur quelques espèces nouvelles ou peu connues de Psittacides. *Revue et magasin de zoologie* 8, 2: 56–64.
- Traylor MA (1979) Check-List of Birds of the World – A continuation of the work of James L. Peters. Vol. 8. Harvard University Press, Cambridge, MA.
- Valdes Ragués P (1914) Museo Cubano “Gundlach”. Catálogo general Museo. Imprenta “Cuba Intelectual”, La Habana.
- Wetmore A (1927) The birds of Porto Rico and the Virgin Islands. Scientific survey of Porto Rico and the Virgin Islands 9 (part 3). New York, 245–406.
- Wiley JW (1985) Bird conservation in the United States Caribbean. In: Temple SA (Ed.) *Bird Conservation 2*. University of Wisconsin Press for International Council for Bird Preservation, Madison, 107–159.
- Wiley JW (2006) The ecology, behavior, and conservation of a West Indian corvid, the White-necked Crow (*Corvus leucognaphalus*). *Ornitología Neotropical* 17: 105–146.
- Wiley JW, Aguilera Román R, Rams Beceña A, Peña Rodríguez C, Kirkconnell A, Ortega Piferrer A, Acosta Cruz M (2008) The bird collections of Cuba. *Bulletin of the British Ornithologists’ Club* 128: 17–27.
- Wiley JW, Frahnert S, Aguilera Román R, Eckhoff P (2014) Juan Cristóbal Gundlach’s contributions to the knowledge of Puerto Rican birds and his influence on the development of natural history in Puerto Rico. *Archives of natural history* 41, 2: 251–269. doi: 10.3366/anh.2014.0246
- Wiley JW, Kirwan GM (2013) The extinct macaws of the West Indies, with special reference to Cuban Macaw *Ara tricolor*. *Bulletin of the British Ornithologists’ Club* 133: 125–156.
- Wiley JW, Post W, Cruz A (1991) Conservation of the Yellow-shouldered Blackbird *Agelaius xanthomus*, an endangered West Indian species. *Biol. Conserv.* 55: 119–138. doi: 10.1016/0006-3207(91)90052-B

Supplementary material 1

List of consulted collections

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Data type: Microsoft Word file (docx)

Explanation note: Collections in Europe, United Kingdom, United States of America, and Caribbean queried or inventoried for presence of Puerto Rican bird specimens collected by Juan Gundlach. Where available, institution abbreviations follow standards set in AVECOL (<http://www.museum.lsu.edu/~Remsen/AVECOLlections.html>).

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