Papéis Avulsos de Zoologia
Museu de Zoologia da Universidade de São Paulo

ARTICLE

The lost jewel of the Atlantic Forest: Kinglet Calyptura *Calyptura cristata* (Aves: Platyrinchidae) specimen inventory and plumage variation

Robson Silva e Silva[1,8]; José Fernando Pacheco[2,9]; Manuel Schweizer[3,4,10] & Guy M. Kirwan[5,6,7,11]

[1] Universidade Estadual Paulista "Júlio de Mesquita Filho" (UNESP), Instituto de Biociências (IB/CLP), Programa de Pós-Graduação em Biodiversidade de Ambientes Costeiros. São Vicente, SP, Brasil.
[2] Comitê Brasileiro de Registros Ornitológicos (CBRO). Rio de Janeiro, RJ, Brasil.
[3] Naturhistorisches Museum Bern. Bern, Switzerland.
[4] Universität Bern, Institut für Ökologie und Evolution. Bern, Switzerland.
[5] Natural History Museum, Bird Group. Tring, Hertfordshire, United Kingdom.
[6] Universidade Federal do Rio de Janeiro (UFRJ), Museu Nacional (MN), Depart. de Vertebrados, Setor de Ornitologia. Rio de Janeiro, RJ, Brasil.
[7] Field Museum of Natural History (FMNH). Chicago, IL, United States.
[8] ORCID: 0000-0002-4086-7106. E-mail: rsilvaesilva@uol.com.br
[9] ORCID: 0000-0002-2399-7662. E-mail: pacheco.jfe@gmail.com
[10] ORCID: 0000-0002-7555-8450. E-mail: manuel.schweizer@nmbe.ch
[11] ORCID: 0000-0002-6876-9452. E-mail: gmkirwan@aol.com

Abstract. Kinglet Calyptura *Calyptura cristata* is one of the great enigmas of the South American avifauna. Endemic to an apparently tiny area of south-eastern Brazil, in the Atlantic Forest biome, the species was not definitely seen between sometime in the second third of the 1800s and 1996, when it was briefly rediscovered in submontane forest north-west of Rio de Janeiro. Since then, *C. cristata* has been reported several times, but without documentation and always by single observers. It is currently considered Critically Endangered by BirdLife International, and various authors have speculated that the species might already be extinct. Given the extreme paucity of knowledge of this species, we provide a complete inventory of museum material for Kinglet Calyptura – more than 100 specimens are listed, the majority held in European collections, almost doubling previous estimates made in the literature. Several are held in relatively small institutions, thereby suggesting that yet more specimens might still be identified or found. In addition, with the benefit of this large sample of material, we discuss morphological variation in the species and we hypothesise particularly about the appearance of male, female and juvenile plumages.

Keywords. Atlantic Forest; Museum specimens; Endangered species; Collectors' history; Type specimen; Original description.

INTRODUCTION

The genus *Calyptura,* Swainson, 1832, comprises just a single species, Kinglet Calyptura *C. cristata,* whose phylogenetic relationships have taken until the 21st century to resolve. Traditionally, Kinglet Calyptura was treated as a member of the Cotingidae (Sclater, 1888; Hellmayr, 1929; Ames, 1971; Snow, 1973, 1979, 1982, 2004; Kirwan & Green, 2011), based on its tarsal scutellation (pycnaspidean, not exaspidean like manakins and tyrannids) and foot structure, with the toes free, not more or less united (as in manakins; *cf.,* Snow, 1982: 39). In contrast, Olalla (1943) suggested that *Iodopleura* (the purpletufts; now Tityridae) and *Calyptura* might form a family apart, but this proposal never acquired support, and much earlier Sclater (1888: 394) had argued that "I have little doubt that *Iodopleura* is not its remote ally", as well as noting, perspicaciously, that *Calyptura* has "Tyrannine plumage". In the light of accumulating evidence that several genera long considered to be cotingas actually belong in other families, especially the Tityridae (see, *e.g.,* Ericson *et al.,* 2006; Ohlson *et al.,* 2008; Tello *et al.,* 2009), Ohlson *et al.* (2012) finally demonstrated that *Calyptura cristata* is most closely related to the genera *Platyrinchus* and *Neopipo.* Furthermore, these three genera constitute a deep branch within the clade sometimes recognised as the family Rhynchocyclidae (tody-tyrants and flatbills). Ohlson *et al.* (2012) proposed to recognise the clade formed by

Pap. Avulsos Zool., 2023; v.63: e202363038
https://doi.org/10.11606/1807-0205/2023.63.038
https://www.revistas.usp.br/paz
https://www.scielo.br/paz
Edited by: Luís Fábio Silveira
Received: 04/07/2023
Accepted: 16/10/2023
Published: 06/11/2023

ISSN On-Line: 1807-0205
ISSN Printed: 0031-1049
ISNI: 0000-0004-0384-1825

Platyrinchus + *Neopipo* and *Calyptura* at family level, the Platyrinchidae. Nevertheless, most reference works have maintained all of these taxa within the Tyrannidae (Dickinson & Christidis, 2014; del Hoyo & Collar, 2016; Gill *et al.,* 2021; Remsen *et al.,* 2021). In other words, the size and structure of *Calyptura* – rather similar to *Platyrinchus* and *Neopipo* but abnormally small for a cotinga – while not necessarily taxonomically informative, provided better clues as to its relationships than might have been expected. The work of Ohlson *et al.* (2012) also reinforced knowledge that tarsal scutellation is not phylogenetically informative in respect of many Tyrannides.

Kinglet Calyptura is endemic to an ostensibly very restricted range just north of the city of Rio de Janeiro, in south-east Brazil; the type is stated to be from 'Rio de Janeiro' (Hellmayr, 1929), which has generally been interpreted as meaning the immediate environs of the city itself (*e.g.,* Pinto, 1944; Sick & Pabst, 1968; Snow, 1982). Ruschi (1953) listed the species for the state of Espírito Santo, but this was doubted by King (1978-1979) and rejected firmly by Collar *et al.* (1992) and Pacheco & Bauer (2001). A specimen, purported to have been collected somewhere in the state of São Paulo between May 1819 and April 1820, was discovered in the Museum für Naturkunde, Berlin, in 2007 (Stopiglia *et al.,* 2009); however, its true provenance has not been satisfactorily established (Rego *et al.,* 2013). Given the number of specimens mentioned in the previous literature, the species was not uncommon, even in secondary forested habitats, in the early to mid-19th century (Collar *et al.,* 1992; Kirwan & Green, 2011), but virtually the only available information concerning its habits/ecology is the testimony of Descourtilz (1852). The latter author mentioned *C. cristata* as feeding on fruit and insects, usually in pairs in the midstorey, maintaining contact with surprisingly loud vocalisations. A trickle of specimens continued to reach overseas museums with the last said to have been collected around 1890 (Snow, 2004: 88, repeated by Kirwan & Green, 2011), but as we show in this paper several were accessioned even later than this, although we generally lack robust knowledge of when they were actually collected. Thereafter the species went unrecorded until two individuals were seen in the Serra dos Órgãos, at Guapimirim, in the environs of Teresópolis, by multiple observers on several days in late October 1996 (Sick, 1997; Pacheco & Fonseca, 2000, 2001). Most of the few specimens with reasonably precise locality data come from this general region. There have been no reliable records since 1996 despite searches, mainly in Rio de Janeiro state, for example in the Reserva Ecológica Guapiaçu, the Teresópolis area, the foothills of the Serra do Mar, and between Nova Friburgo and Sumidouro, during September-November 2006 (Lambert & Kirwan, 2010) and in October 2016 (https://ebird.org/news/kingletcalyptura2016?tagId=128). Nevertheless, there have been several claimed records of the species, all by single observers and from the broad environs of Ubatuba in the state of São Paulo, in July 1990, March 1997, March 2006 and September 2008 (Sigrist, 2006; Lambert & Kirwan, 2010; Kirwan & Green, 2011). Earlier, D.F. Stotz (*in* Ridgely & Tudor, 1994) had speculated that the species might eventually be found in this region. Whilst BirdLife International (2023) currently treats the species as Critically Endangered, with a population expected to number fewer than 50 individuals, some authors have speculated that the lack of definite records in the last *c.* 25 years suggests that *C. cristata* is likely to be extinct (Lees & Pimm, 2015).

Given that virtually our entire knowledge of this species is based on the specimen record, it is pertinent to assemble a complete inventory of such material and its provenance. Various authors have commented on the number of specimens in natural history museums. For example, Snow (1982: 39) stated that "there exist only a handful of specimens in a few museums", whereas Collar *et al.* (1992: 726) mentioned that there were more than 45 specimens, preserved in AMNH, ANSP, NHMUK, RBINS, NML-VZ, MCZ, MNHN, NMW, UMZC, USNM, ZMB and ZMUC (for museum acronyms, see Methods). The figure of 45 was repeated by Pacheco & Fonseca (2000), but a year later the same authors stated that the total was approximately 50 (Pacheco & Fonseca, 2001). Presumably drawing on the latter, Snow (2004: 88) repeated the *c.* 50 assertion. Tobias *et al.* (2006) did not speculate on the actual number of specimens, but suggested that their number did provide a hint as to the species' former abundance; Krabbe (2007) also reported that there are "nearly 50 specimens". Subsequently, Lambert & Kirwan (2010), Kirwan & Green (2011: 578) and Ohlson *et al.* (2012) all mentioned the existence of *c.* 55 specimens; this revised total was based on work conducted by GMK's own studies in museums additional to those mentioned by Collar *et al.* (1992), as well as specific publications in the interim (*e.g.,* McGhie, 2005). Finally, Hume & Walters (2012: 354) noted the presence of specimens in various museums of which those in Florence (MZUF), in Italy and Kiel (ZMK), in Germany, were extra to the inventory of Collar *et al.* (1992) and those additional institutions visited by GMK.

Here, we report the existence of 104 specimens and provide as complete as possible an inventory of museum material, with details on its provenance and dating, based on research conducted by ourselves, separately and collaboratively. We also present a review of the species' morphological (sexual and age-related) variation based on photographs and personal examination of the specimens located to date. We also present photographs of all of these specimens, as well as historical information concerning their provenance.

MATERIAL AND METHODS

Building on the brief history concerning our collective knowledge of specimens in the world's museums outlined above, we used a combination of personal contacts and consultation, published information (*e.g.,* Fisher, 1981; Lima, 2005; McGhie, 2005; Ghiraldi & Aimassi, 2019), as well as web searches of online museum catalogues and broader compendia (*e.g.,* VertNet, GBIF, etc.), plus appeals on internet fora, *e.g.,* the eBEAC mailing list.

In particular, we sought information from smaller museums in France, Germany, Italy and Switzerland, given the evidence already furnished by Hume & Walters (2012) and Waldeck (2018) that such institutions harboured previously unnoticed specimens of *C. cristata*. Our requests for information were coupled with solicitations for photographs of any specimens in order to assess plumage variation in the species. These specimen images originated from many museums, each one of which produced their photographs in different ways, ranging from professional standard, with excellent quality artificial lighting and in high resolution, to photographs made with mobile phones under natural light conditions.

The acronyms of those museums wherein specimens of *Calyptura cristata* were located are as follows: **AMNH** = American Museum of Natural History, New York, USA; **ANSP** = Academy of Natural Sciences at Drexel University, Philadelphia, USA; **CCECL** = Centre de Conservation et d'étude des Collections, Musée des Confluences, Lyon, France; **CUMV** = Cornell University Museum of Vertebrates, Ithaca, USA; **IZH** = Institute für Zoologie, Martin-Luther-Universität, Halle-Wittenberg, Germany; **LMNM** = Landesmuseum Natur und Mensch, Oldenburg, Germany; **LUOMUS** = Finnish Museum of Natural History, Helsinki, Finland; **MAB** = Musée de l'Areuse Boudry, Neuchâtel, Switzerland; **MCZ** = Museum of Comparative Zoology, Harvard University, Cambridge, USA; **MHH** = Museum Heineanum, Halberstadt, Germany; **MHNC-UP** = Museu de História Natural e Ciências da Universidade do Porto, Portugal; **MHNGr** = Muséum d'Histoire Naturelle de Grenoble, France; **MHNMON** = Muséum d'Histoire Naturelle Victor Brun, Montauban, France; **MHNN** = Muséum d'Histoire Naturelle de Neuchâtel, Switzerland; **MHNVT** = Musée d'histoire Naturelle et Vivarium de Tournai, Belgium; **MM** = Manchester Museum, University of Manchester, UK; **MNHN** = Muséum National d'Histoire Naturelle, Paris, France; **MNRJ** = Museu Nacional, Rio de Janeiro, Brazil; **MPUW** = Muzeum Przyrodnicze, Uniwersytet Wroctawski, Poland; **MSNT** = Museo Civico di Storia Naturale, Trieste, Italy; **MSNTP** = Museo di Storia Naturale e del Territorio, Università di Pisa, Italy; **MWNH** = Landesmuseum Wiesbaden, Naturwissenschaftlichen Sammlung, Wiesbaden, Germany; **MZLU** = Zoologisk Museum, Universitet fran Lund, Sweden; **MZS** = Musée Zoologique de la ville de Strasbourg, France; **MZUF** = Museo di Storia Naturale dell'Università di Firenze, Italy; **MZUT** = Museo di Zoologia dell'Università di Torino, Italy; **NHMO** = Naturhistorisk Museum, Universitetet i Oslo, Norway; **NHMUK** = Natural History Museum, Tring, UK; **NLMH** = Niedersächsisches Landesmuseum, Naturkunde-Abteilung, Hannover, Germany; **NMB** = Naturhistorisches Museum Basel, Switzerland; **NMBE** = Naturhistorisches Museum Bern, Switzerland; **NML-VZ** = World Museum, National Museums Liverpool, UK; **NMSG** = Naturmuseum Sankt Gallen, Sankt Gallen, Switzerland; **NMW** = Naturhistorisches Museum Wien, Austria; **NRM** = Naturhistoriska Riksmuseet, Stockholm, Sweden; **RBINS** = Institut Royal des Sciences Naturelles de Belgique, Bruxelles, Belgium; **RMNH** = Naturalis Biodiversity Center, Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands; **SMF** = Senckenberg Naturmuseum Frankfurt, Germany; **SMNG** = Staatliches Museum für Naturkunde Görlitz, Germany; **SMNS** = Staatliches Museum für Naturkunde, Stuttgart, Germany; **UMMZ** = University of Michigan, Museum of Zoology, Ann Arbor, USA; **UMZC** = University Museum of Zoology Cambridge, UK; **USNM** = United States National Museum, Washington, USA; **ZIMG** = Zoologisches Museum, Institut für Zoologie und Anthropologie der Universität Göttingen, Göttingen, Germany; **ZISP** = Zoological Institute of the Russian Academy of Sciences, Saint Petersburg, Russia; **ZMB** = Museum für Naturkunde, Berlin, Germany; **ZMK** = Zoologisches Museum der Christian-Albrechts-Universität Kiel, Germany; **ZMMU** = Moscow Lomonosov State University, Russia; **ZMUC** = Zoologisk Museum i Københavns Universitet, Denmark; **ZMUL** = Aquarium-Muséum de l'Université de Liège, Belgium.

RESULTS

Inventory

To date 104 specimens of *C. cristata* have been identified in 47 museums, the majority in European collections (Tables 1 and 2). Of this material, 86 specimens are held in a total of 39 different European institutions, 17 at seven collections in the USA, and one specimen is held in Brazil (a second, currently ZMB 2000.12102, is due to be sent to MZUSP in the forseeable future; P. Eckhoff *in litt.*, 2023). Among the specimens listed herein, ten are in eight different smaller museums, considered part of the European 'B' list of institutions each harbouring fewer than *c.* 4,000 skins, or *c.* 5,000 bird items in total (Roselaar, 2003), or not mentioned in the latter inventory (*e.g.,* MAB). An additional 12-15 specimens (Table 3) are known or are currently believed to be lost (see footnotes 7 and 8 to Table 3, and note 45 to Table 2,

Table 1. Distribution of *Calyptura cristata* specimens by country.

Country	Museums	Specimens
Germany	8	18
USA	7	17
France	5	13
UK	4	12
Switzerland	5	7
Russia	2	6
The Netherlands	1	5
Italy	4	5
Belgium	2	3
Austria	1	3
Finland	1	3
Sweden	2	3
Danmark	1	2
Norway	1	2
Portugal	1	2
Brazil	1	1
Poland	1	1
TOTAL	**47**	**104**

Table 2. Extant specimens of Kinglet Calyptura *Calyptura cristata* in the world's museums, listed alphabetically by institutional acronyms. Listed are: **Institution** (museum acronyms are listed in Methods); **Registration** – number (of each institution); **Date** – associated with the specimen (A – on the label, C – museum acquisition or registration date, D – donation to the museum, I – estimated date by interpolation); **Locality** – verbatim per the specimens label/s; **Sex/Age** – based on label information (or our interpretation, in parentheses): ♂ = male, ♀ = female, U = unknown sex, ad = adult, imm = immature); **Name** – collector, donor or purchaser (and at least in one case taxidermist) on label; **Trade?** – 'Yes' = traded (exported) skins, 'No' = skins known to be obtained directly by a naturalist that visited Brazil; **SM** – indicates how the specimen is currently stored: Sk = skin, Ms = mounted specimen; **Source** – publication that mentioned the specimen; **Photo** – corresponding figure in the text.

No.	Institution	Registration	Date	Locality	Sex/Age	Name	Trade?	SM	Source (specimen or collection)	Photo
1	AMNH	5156	1870 (C)	Guiana, Suriname	U	Wied[1]	Yes	Sk	—	Fig. 3.1
2	AMNH	43795	21 August 1889 (C)	No locality	♂	Bode[2]	Yes	Sk	Foster (1892)	Fig. 3.5
3	AMNH	494719	None	Brazil	♂	Whitely[3]	Yes	Sk	Rothschild (2008)	Fig. 3.4
4	AMNH	494720	None	Brasilia/Brazil	♂	Boucard[4]	Yes	Sk	Boucard (1876), Rothschild (2008)	Fig. 3.3
5	AMNH	494721	None	Brasilia/Brazil	♂	Boucard[4]	Yes	Sk	Boucard (1876), Rothschild (2008)	Fig. 3.2
6	ANSP	8366	4 June 1844 (D)	Brazil	♂	Wilson[5]	Yes	Sk	Anonymous (1844)	Fig. 3.6
7	ANSP	8367	None	[Brazil]	U	Wilson[5]	Yes	Sk	—	Fig. 3.7
8	ANSP	8368	None	Brazil	♂	None	Yes	Sk	—	Fig. 3.8
9	CCECL	41007379	August 1875 (A, D)	Am. merid.	U	Malmazet[6]	Yes	Sk	—	Fig. 3.9
10	CUMV	48403	1860 (A)	Brazil	♂	Bryant[7]	Yes	Sk	—	Fig. 4.26
11	IZH	V 3260	1850-1852 (I)	Brasil, Nova Friburgo	[♂]	Burmeister[8]	No	Ms	Burmeister (1856)	Fig. 2.1
12	LMNM	5741	None	Brasilien	U	None	Yes	Ms	Waldeck (2018)	Fig. 2.18
13	LUOMUS	1573	None	Brasilia	U	None	Yes	Ms	—	Fig. 2.2
14	LUOMUS	4949	1849-1851 (I)	Brasilia	U	Sahlberg[9]	No	Sk	Palmgren (1936)	Fig. 3.13
15	LUOMUS	4950	1849-1851 (I)	Brasilia	U	Sahlberg[9]	No	Sk	Palmgren (1936)	Fig. 3.12
16	MAB	None	None	Amerique du Nord	U	None	Yes	Ms	—	Fig. 2.20
17	MCZ	75787	December 1838 (A)	Brazil, Rio de Janeiro	Ad	Peale[10]	No	Sk	Peale (1849)	Fig. 3.10
18	MCZ	85035	None	Brazil	Ad	None	Yes	Sk	—	Fig. 3.11
19	MHH	5665	None	Brasilien	♂	Brandt[11]	Yes	Sk	Cabanis & Heine (1860), Heine & Reichenow (1882-1890)	Fig. 3.16
20	MHH	5666	None	Brasilien	♂	None	Yes	Sk	Cabanis & Heine (1860), Heine & Reichenow (1882-1890)	Fig. 3.15
21	MHH	5667	None	Brasilien	♀	None	Yes	Sk	Cabanis & Heine (1860), Heine & Reichenow (1882-1890)	Fig. 3.14
22	MHNC-UP	AVE-001125	None	No locality	U	Braga Júnior[12]	Yes	Ms	—	Fig. 2.33
23	MHNC-UP	AVE-001126	None	Brésil	♂	Braga Júnior[12]	Yes	Ms	—	Fig. 2.34
24	MHNGr	OR.8050	None	No locality	Ad	None	Yes	Ms	—	Fig. 2.6
25	MHNMON	0.2426	None	No locality	U	Mathieu[13]	Yes	Ms	—	Fig. 2.16
26	MHNMON	0.2427	None	No locality	U	Mathieu[13]	Yes	Ms	—	Fig. 2.15
27	MHNN	92 6029	None	Brésil	U	Tschudi[14]	No	Ms	—	Fig. 2.3
28	MHNN	92 6030	None	Brésil	U	Tschudi[14]	No	Sk	—	Fig. 4.27
29	MHNVT	R1-E6-C151-0001	None	No locality	U	None	Yes	Ms	—	Fig. 2.7
30	MHNVT	R1-E6-C151-0002	1843 (C)	Amerique	U	None	Yes	Ms	—	Fig. 2.8
31	MM	B6327	1911 (C)	S.E. Brazil	♂	None	Yes	Sk	McGhie (2005)	Fig. 4.28

No.	Institution	Registration	Date	Locality	Sex/Age	Name	Trade?	SM	Source (specimen or collection)	Photo
32	MM	B6328	1868 (C)	South-East Brazil	♂	None	Yes	Sk	McGhie (2005)	Fig. 4.29
33	MNHN	ZO-MO-2004-300	1816 (I)	Brésil [Rio de Janeiro]	Ad	Delalande[15]	No	Sk	Vieillot (1818), Hellmayr (1929)	Fig. 1
34	MNHN	ZO-MO-2000-2154	1830 (A)	Brazil/Brésil	Ad	Leadbeater[16]	Yes	Sk	—	Fig. 3.19
35	MNHN	ZO-MO-2000-2155	1831-1851 (C)	Brasilia	♂ ad	Delattre[17]	Yes	Sk	—	Fig. 3.18
36	MNHN	ZO-MO-2002-661	1849 (A)	Brésil	Ad	Castelnau[18]	No	Sk	—	Fig. 3.17
37	MNHN	ZO-MO-1854-440	1854 (C)	Brésil, Rio de Janeiro	♂ ad	Peichoto[19]	No	Sk	—	Fig. 3.22
38	MNHN	ZO-MO-2000-2153	1905 (C)	Brasilia	♂ ad	Boucard[4]	Yes	Sk	—	Fig. 3.20
39	MNHN	ZO-MO-1931-1285	1931 (C)	Brésil	Ad	Bouvier[20]	Yes	Sk	—	Fig. 3.21
40	MNHN	3137	1824 (A)	Brésil, Rio de Janeiro	U	Ménestrier (*sic*)[21]	No	Ms	—	Fig. 2.4
41	MNRJ	33299	None	Brazil	Ad	Salvin & Godman[22]	Yes	Sk	Sclater (1888)	Fig. 4.15
42	MPUW	203024	None	No locality	U	None	Yes	Ms	—	Fig. 2.14
43	MSNT	None	1857	Rio di Janiero	U [♂]	Coll. Novara[23]	No	Ms	—	Fig. 2.10
44	MSNTP	AV3081	None	Nuova Olanda	♀	None	Yes	Ms	—	Fig. 2.28
45	MSNTP	AV3082	None	Brasile	♂	None	Yes	Ms	—	Fig. 2.26
46	MSNTP	AV3083	None	Nuova Olanda	[♂]	Biagini[24]	Yes	Ms	—	Fig. 2.27
47	MWNH	AV 5323	None	Brasilien	♂	None	Yes	Sk	—	Fig. 4.14
48	MZLU	Aves L848/6080	1848 (D)	No locality	♂ ad	Gyllenkrok[25]	Yes	Ms	—	Fig. 2.11
49	MZS	Ave 08286	1850 (C)	Brésil	U	None	Yes	Ms	—	Fig. 2.12
50	MZUT	AV16101	None	Brasile	U ad	None	Yes	Sk	Ghiraldi & Aimassi (2019)	Fig. 3.28
51	NHMO	BI-66671/1-P	1885 (C)	Brazil	U	None	Yes	Sk	From NHMUK (BM); see footnote 8 to Table 3	Fig. 4.16
52	NHMO	BI-66672/1-P	1890 (C)	Brazil	U	None	Yes	Sk	From NHMUK (BM)	Fig. 4.17
53	NHMUK	1881.5.1.3739	1881 (C)	Brazil	♂	Gould[26]	Yes	Sk	Sclater (1888)	Fig. 3.27
54	NHMUK	1888.1.13.1675	1881 (C)	Brazil	Ad	Argent[27]	Yes	Sk	Sclater (1862, 1888)	Fig. 3.26
55	NHMUK	1888.1.20.972	1888 (C)	Brazil, Novo Fribourgo	Ad	Youds[28]	Yes	Sk	Sclater (1888)	Fig. 3.25
56	NHMUK	1895.4.1.730	1895 (C)	Rio de Janeiro	♂	Fry[29]	No	Sk	—	Fig. 3.24
57	NHMUK	1895.4.1.731	1895 (C)	Rio de Janeiro	♀	Fry[29]	No	Sk	—	Fig. 3.23
58	NMB	2041	1857	Cantagalo	♂	Euler[30]	No	Ms	—	Fig. 2.30
59	NMB	2042	1857	Cantagalo	♀	Euler[30]	No	Ms	—	Fig. 2.29
60	NMBE	1033790	None[31]	Südost-Brasilien	U	None	Yes	Ms	—	Fig. 2.19
61	NML-VZ	1980-70a	None	No locality	U	None	Yes	Sk	Fisher (1981)	Fig. 3.33
62	NML-VZ	3029	15 June 1849 (A, C)	[Bogota]	U	Warwick[32]	Yes	Sk	Fisher (1981)	Fig. 3.32
63	NML-VZ	5055a	None	No locality	U	Derby[33]	Yes	Sk	Fisher (1981)	Fig. 3.31
64	NMSG	5741	1873 (D)	Neu Freiburg (Bras.)	♂	David[34]	No	Ms	Wartmann (1874)	Fig. 2.13
65	NMW	17349	1844 (A)	Brasilien	♀	Natterer[35]	Yes	Sk	Pelzeln (1870)	Fig. 3.30
66	NMW	17350	1840 (C)	Brasilien	♂	Brandt[36]	Yes	Ms	Pelzeln (1870)	Fig. 2.9
67	NMW	17351	1844 (A)	Brasilien	Ad	Natterer[35]	Yes	Sk	Pelzeln (1870)	Fig. 3.29

No.	Institution	Registration	Date	Locality	Sex/Age	Name	Trade?	SM	Source (specimen or collection)	Photo
68	NRM	535288	1849 (A)	Brasilien, Rio de Janeiro	U	Danckwardt[37]	No	Ms	—	Fig. 2.5
69	NRM	90127687	1864 (A)	S. Brasilien	U	Hyltén-Cavallius[38]	No	Sk	—	Fig. 4.30
70	RBINS	10126B	Before 1842 (I)	Brésil	♂	Selys[39]	Yes	Sk	Fraipont (1910)	Fig. 3.35
71	RMNH	AVES.172607	9 May 1842 (C)	Mexique	U	Temminck[40]	Yes	Ms	Purcell (1999)	Fig. 2.21
72	RMNH	AVES.172608	1883 (C)	Brésil	U	Frank[41]	Yes	Ms	Purcell (1999)	Fig. 2.25
73	RMNH	AVES.172609	None	Brésil	♂	Verreaux[42]	Yes	Ms	Purcell (1999)	Fig. 2.24
74	RMNH	AVES.172610	1863 (C)	Brésil	♂	Verreaux[42]	Yes	Ms	Purcell (1999)	Fig. 2.23
75	RMNH	AVES.172611	1863 (C)	Brésil	♂	Verreaux[42]	Yes	Ms	Purcell (1999)	Fig. 2.22
76	SMF	41364	February 1879 (C)	Südbrasilien	♂ ad	Schneider[43]	Yes	Sk	—	Fig. 3.34
77	SMNG	A07725a	1878-1879 (C)	Brasilien, Neu-Freiburg	♂	Schneider[43]	Yes	Ms	(Peck, 1878)	Fig. 2.31
78	SMNS	33477	None	SO Brasilien	♂	Stephan/Fischer[44]	Yes	Sk	—	Fig. 4.3
79	SMNS	33478	None	SO Brasilien	♀	Fischer[44]	Yes	Sk	—	Fig. 4.4
80	SMNS	38253	October 1856 (A)	Brasilien	♂	Douglas[45]	Yes	Sk	—	Fig. 4.2
81	SMNS	114246	1851 (C)	None	U	Verreaux[42]	Yes	Sk	—	Fig. 4.5
82	UMMZ	134367	Before 1913	Brazil	♂	None[46]	Yes	Sk	—	Fig. 4.6
83	UMZC	27/Cot/4/a/1	None	Brazil	U	None[47]	Yes	Sk	—	Fig. 4.31
84	UMZC	27/Cot/4/a/2	1838 (A)	Brazil	U	Strickland[47]	Yes	Sk	Salvin (1882)	Fig. 4.1
85	USNM	A15195	None	Brazil	U	None[48]	Yes	Sk	—	Fig. 4.10
86	USNM	A15224	None	Brazil	U	None[48]	Yes	Sk	—	Fig. 4.11
87	USNM	33161	None	Brazil	♂	None[48]	Yes	Sk	—	Fig. 4.8
88	USNM	33162	None	Brazil	U	None[48]	Yes	Sk	—	Fig. 4.9
89	USNM	145362	None	Brazil	U	None	Yes	Sk	—	Fig. 4.12
90	ZISP	117201	1842 (A)	Brasil	♂	Demidoff[49]	Yes	Sk	—	Fig. 4.7
91	ZISP	117202	1842 (A)	Brasil	♀	Demidoff[49]	Yes	Sk	—	Fig. 4.32
92	ZISP	117203	1842 (A)	None	[♂]	Kuprianow[50]	Yes	Sk	Bakkal (2018)	Fig. 4.33
93	ZISP	117204	None	None	[♂]	Wosness[51]	Yes	Sk	—	Fig. 4.13
94	ZISP	1819	1842 (A)	Brasilia	♀	Kuprianow[50]	Yes	Ms	Bakkal (2018)	Fig. 4.2
95	ZMB	2305	1818-1820 (I)	Brasilien	U	Sellow & Olfers[52]	No	Sk	Stopiglia *et al.* (2009)	Fig. 4.22
96	ZMB	2306	1819-1820 (I)	Brasilien, San Paulo	♀	Sellow & Olfers[52]	No	Sk	Wagler (1830), Stopiglia *et al.* (2009)	Fig. 4.23
97	ZMB	7567	1817-1820 (I)	Brasilien	U	Theremin[53]	No	Sk	—	Fig. 4.24
98	ZMB	2000.12101	*c.* 1847 (I)	Brasilien, Rio	U	Behn[54]	No	Sk	Pacheco (1999)	Fig. 4.18
99	ZMB	2000.12102	1856	None	U	Boie[55]	Yes	Sk	—	Fig. 4.19
100	ZMB	2000.12103	*c.* 1847 (I)	Brasilien, Rio	[♂]	Behn[54]	No	Sk	Pacheco (1999)	Fig. 4.20
101	ZMB	2000.12104	*c.* 1847 (I)	Brasilien, Rio	U	Behn[54]	No	Sk	Pacheco (1999)	Fig. 4.21
102	ZMMU	R525	None	None	Ad	None	Yes	Sk	Smirnov (2018)	Fig. 4.25
103	ZMUC	105508	1 August 1827	Rosário, Novo Friburgo	♂ ad	Lund[56]	No	Sk	Krabbe (2007)	Fig. 4.34
104	ZMUC	105507	3 January 1828	Rosário, Novo Friburgo	♂ imm	Lund[56]	No	Ms	Krabbe (2007)	Fig. 2.32

Notes:

[1] Maximilian Collection/Maximilian Alexander Philipp, Prinz zu Wied-Neuwied (1782-1867), German explorer, ethnologist and naturalist, who led an expedition to south-east Brazil (in the states of Rio de Janeiro, Espírito Santo and Bahia) in 1815-1817, initially with Sellow (see note 51), and subsequently published a travelogue, *Reise nach Brasilien,* containing descriptions of new birds, as well as his *Beiträge zur Naturgeschichte von Brasilien*. His zoological collections, among them many avian type specimens, but also including material from North America (which he visited in 1832-1834), were sold in Paris three years after his death, and purchased by AMNH (Allen, 1889). This specimen was incorporated into Wied's collections after his trip to Brazil. Despite his having remained in Rio de Janeiro, the species is not mentioned in his works.

[2] Lawrence Collection/George Newbold Lawrence (1806-1895), New York businessman and ornithologist, whose collection totalling 8,000 bird specimens was sold to AMNH in 1887 (Mearns & Mearns, 1992); for an obituary, see Elliot (1896)/John L. Bode (d. 1866) was an award-winning New York taxonomist of German extraction.

[3] Henry Whitely (1844-1893), English naturalist and explorer, who visited Japan in 1864, and subsequently, in 1867, travelled in Peru and across northern South America, eventually residing in what is now Guyana until his death; there is no evidence that he visited south-east Brazil, so the ultimate provenance of this specimen is quite unknown (Sclater,1893).

[4] Boucard Collection/Adolphe Boucard (1839-1905), French ornithologist and trader in specimens who collected extensively in Middle America, concentrating on hummingbirds, selling bird skins to museums and private individuals such as P.L. Sclater, as well as supplying the plume trade; he spent the last few years of his life in England (see Kofoid, 1923).

[5] Rivoli Collection/François Victor Masséna, Duke of Rivoli (1799-1863), an amateur French ornithologist, who amassed a collection of *c.* 12,500 bird specimens, many of them from the New World. He sold his collection in 1846/Thomas Bellerby Wilson (1807-1865), natural history collector and influential patron of ANSP, purchased the Duke of Rivoli's collection and donated it to the Philadelphia museum. The many types included therein were studied first by Stone (1899).

[6] Malmazet Collection/Jean-André Malmazet (1808-1877); for an obituary, see Mulsant (1878). We have no information as to where he may have acquired this specimen.

[7] Henry Perkins Bryant (1820-1867), American physician and naturalist, who collected in the USA and on various islands in the West Indies, and travelled to France in 1865 to purchase the Lafresnaye Collection on behalf of the Boston Society of Natural History, who he had served as Curator of Ornithology since 1854 (for an obituary, see Abbot, 1867)/ex-Lafresnaye Collection 2210/Baron Nöel Frédéric Armand André de Lafresnaye (1783-1861), French aristocrat, ornithologist and collector, amassed a collection of more than 8,000 bird specimens. Following its purchase by Bryant, these birds eventually passed to MCZ in 1914.

[8] Karl Hermann Konrad Burmeister (1807-1892), a German naturalist of wide-ranging interests and a professor of zoology at the Martin Luther University of Halle-Wittenberg; he visited Brazil between 1850 and 1852, principally the area around Nova Friburgo (Rio de Janeiro), where he acquired specimens from another German, C.H. Bescke, and further north (outside the known range of *C. cristata*) around Lagoa Santa (Minas Gerais), where he met Lund and Reinhardt (Sick, 1997: 54). Following a visit to Argentina during 1857-1860, he returned to the latter country in 1861, making a significant contribution to the development of the natural sciences in his adopted home.

[9] Reinhold Ferdinand Sahlberg (1811-1874), a Finnish naturalist, participated in a circumnavigatory expedition between 1839 and 1843, visiting Brazil (for three weeks, in 1839), Chile and Alaska, and returned to Brazil in November 1849-January 1851, during which period he was based in Petrópolis and visited Rio de Janeiro, Sumidouro, Cantagalo, Boa Sorte and Ouro Preto (Lima, 2005). His collections reside in LUOMUS and NRM.

[10] Titian Ramsay Peale (1799-1885), an American ornithologist and explorer from Philadelphia, was a member of the United States Exploring Expedition, 1838-1842, which circumnavigated the globe. His ship, the *Peacock*, reached Rio de Janeiro on 21 November 1838 and remained there until 6 January 1839 (Peale, 1849; Poesch, 1961). Most specimens from this expedition, including additional *C. cristata,* are held at USNM.

[11] Johann G.W. Brandt (*fl.* 1830-1860), a German natural history dealer based in Hamburg, and brother of Johann Friedrich Brandt (1802-1879) (Jobling, 2010).

[12] Specimens acquired by José Teixeira da Silva Braga Júnior (1844-1904) for his private collection in Porto, Portugal, from the Maison Deyrolle, in Paris, founded in 1831 by Jean-Baptiste Deyrolle (Ricardo Lopes *in litt.,* 2023, Lopes *et al.,* 2021). Achille Deyrolle (1813-1865), son of Jean-Baptiste, visited Brazil mainly to collect insects for the Brussels museum (Moret, 2012).

[13] The two specimens were purchased from a certain Mr. Mathieu in July 1842 (Aude Medina, *in litt.,* 2019).

[14] Johann Jakob von Tschudi (1818-1889), Swiss naturalist and diplomat, visited Brazil (and other countries in South America) between 1857 and 1859 (Straube & Pacheco, 2011). He returned to Brazil in 1860, as the Swiss ambassador to the country, remaining until 1868, and sending specimens (mainly plants) to museums in Neuchâtel, Glarus and Freiburg.

[15] Pierre Antoine Delalande (1787-1823), French naturalist and taxidermist, became an assistant to Augustin François César Prouvençal de Saint-Hilaire (1779-1854), and the two of them visited the environs of Rio de Janeiro in 1816 collecting on behalf of MNHN; Saint-Hilaire remained in Brazil until 1822, meeting Natterer (see below) at Ypanema, in São Paulo (Sick, 1997: 51-52). Subsequently, Delalande collected in South Africa with his nephew Jules Verreaux between 1818 and 1821. Type of *Pardalotus cristatus* Vieillot (1818).

[16] Benjamin Leadbeater (1773-1851) was a well-known merchant of natural history materials based in London/Thomas Campbell Eyton (1809-1880), English naturalist and regular correspondent of Darwin/Adolphe Boucard (1839-1905) (Beolens & Watkins, 2003).

[17] Adolphe Delattre (1805-1854), a French ornithologist with a particular interest in hummingbirds, who made several visits to South America between 1831 and 1851. https://pt.wikipedia.org/wiki/Adolphe_Delattre.

[18] François Louis Nompar de Caumont La Force, Comte de Castelnau (1810-1880), a French naturalist, was a member of the four-man Expédition dans les parties centrales de l'Amérique du Sud, 1843-1847, which traversed South America from Rio de Janeiro to Lima (Peru), and whose material was studied by des Murs, Menegaux and, ultimately, Hellmayr (Sick, 1997: 54).

[19] Antonio José Peixoto (1816-1864). Brazilian orthopaedic doctor (Pôrto *et al.,* 2008) who sent bird skins from Rio de Janeiro to Paris.

[20] Bouvier Collection/Aimé Bouvier (1844-1919) founded the Société zoologique de France in 1876 (Beolens & Watkins, 2003).

[21] Jean Moris Édouard Ménétries (1802-1861), a French naturalist, joined the Russian Consul-General Georg Heinrich von Langsdorff (1774-1852) expedition to Brazil, between 1822 and 1825, visiting various localities in the Serra do Mar near Rio de Janeiro, including Nova Friburgo, and subsequently Minas Gerais. In 1826, on Langsdorff's recommendation Ménétries became Curator of Zoology in St. Petersburg. He did not return to South America (Pacheco, 2004).

[22] Salvin & Godman Collection/The English ornithologists and naturalists Osbert Salvin (1835-1898) and Frederick du Cane Godman (1834-1919) are best known for co-authoring the 52-volume, encyclopaedic *Biologia Centrali-Americana* (1879-1915); their huge joint collections of Nearctic and Neotropical birds (totalling 52,120 specimens) were eventually donated to what is now NHMUK in 1885 (Sharpe, 1906: 366).

[23] Coll. Novara/SMS *Novara* was a frigate that completed an around-the-world voyage during 1857-1859 at the behest of the Austrian Archduke Ferdinand Maximilian Joseph (1832-1867), bringing back large collections for NMW and other museums in Wien; one of the expedition's first ports of call was Rio de Janeiro, where its members remained almost the entire month of August 1857, during which time they certainly visited Petrópolis, in the Serra dos Órgãos. Some of the material collected during the Novara Expedition was deposited in Trieste, where the circumnavigation terminated in August 1859. A popular account of the expedition was published in English by Scherzer (1861-1863).

[24] Collezione Biagini/Carlo Biagini (*fl.* 1830-50).

[25] Axel Gustaf Gyllenkrok (1783-1865), member of the Swedish aristocracy, collector and philanthropist, whose collections were donated to the Lund museum in 1845 (Löwegren, 1968).

[26] Gould Collection/John Gould (1804-1881), one of the most famous and most productive ornithologists (and artists) of the 19th century, never visited South America but published monographs on several New World families, among them hummingbirds (Trochilidae) and toucans (Ramphastidae), and possessed a huge network of contacts with whom he exchanged specimens, *e.g.,* Bonaparte, Swainson, Jardine, Natterer, and many others (Sauer, 1995). This specimen presumably formed part of the balance of his private collection (6,315 skins), which was purchased by British Museum in 1881 (Sharpe, 1906: 375).

[27] Sclater Collection/Philip Lutley Sclater (1829-1913), English lawyer and ornithologist, whose *c.* 9,000 specimen collection specialised (at least 4,100 specimens) in the Americas (Sclater, 1862) and included material from diverse collectors such as Natterer; it was eventually donated to what is now NHMUK in 1886/Little is known about the London-based natural history dealer James Argent (*fl.* 1840-60).

[28] Salvin & Godman Collection. See note 21/John Youds (perhaps *fl.* 1860-1890?).

[29] Alexander Fry (1821-1905), born in England, moved to Rio de Janeiro in 1838 to work in his father's business, where he remained near-constantly until 1854, but even after his return to England he continued to visit Brazil periodically (Burr, 1905). Primarily an entomologist, who ultimately bequeathed a huge collection to what is now the Natural History Museum, in London, his interests extended to ornithology, for example providing advice to P.L. Sclater in the latter's capacity as editor of *Ibis* (see Series 5, vol. 7 (1899): 436). He presented some 947 birds, nests and eggs to the then British Museum in 1895 (Sharpe, 1906: 277, 355).

[30] Carl Hieronymus Euler (1834-1901), a Swiss ornithologist, born in Basel, who travelled to Rio de Janeiro, in 1853, and married Madeleine Guerrini-Girrard (1822-1904), who owned a large farm near Cantagalo. He became the Swiss Vice-Consul, but studied birds in his spare time, publishing various observations, especially on bird breeding biology, in the *Journal für Ornithologie,* and also sending specimens to both ZMB and MNRJ (Minvielle, 1981).

[31] This specimen must have been integrated into the NMBE collection between 1872 and 1880; it is not mentioned in a catalogue completed in 1872, but does appear in that prepared in 1879/1880 (MS *pers. obs.*).

[32] John Edington Warwick (1793-1874), a 'naturalist' employed by the Royal Surrey Zoological Gardens in Walworth, London (Grigson, 2016). 13th Earl of Derby Collection (Mus. Derbianum)/Edward Smith-Stanley, 13th Earl of Derby (1775-1851), politician and one of the great naturalist accumulators, whose collection was housed at Knowsley Hall, and bequeathed to the nearby city of Liverpool on his death; his specimens, and those of another great accumulator Canon Henry Baker Tristram (1822-1906), formed the nucleus of what is now the bird collection at NML-VZ (Fisher, 1981; Mearns & Mearns, 1998).

[33] See previous note.

[34] Herrn. Kons. David/Niklaus Heinrich David (1823-1867), General Consul of Switzerland in Rio de Janeiro, between 1856 and 1859 (Fluck, 2004).

[35] Bought by Johann Natterer (1787-1843), an Austrian naturalist who (financed by the first emperor of Austria, Francis I, 1768-1835) spent 18 years in Brazil (1817-1835), travelling virtually throughout the country, although because Natterer never published an account of his travels and his notebooks and diary were lost in a fire in 1848, many of his innumerable discoveries were only fully detailed by the then-curator of NMW, Pelzeln (1868-1871), more than 40 years later. Natterer spent the remainder of his life in Europe, living in Vienna (Vanzolini, 1996).

[36] Purchased by Johann Natterer (1787-1843)/Johann G.W. Brandt (*fl.* 1830-1860).

[37] Jean Carlos Danckwardt (1818-1901), Brazilian captain of Swedish origin residing in Rio de Janeiro. https://www.geni.com/people/Jean-Carlos-Danckwardt/6000000005729662001.

[38] Gunnar Olof Hyltén-Cavallius (1819-1889), a Swede, had a varied career, but was employed as a diplomat in Brazil between 1860 and 1864, as the Chargé d'affaires in the Swedish consulate in Rio de Janeiro (Hofberg *et al.,* 1906).

[39] de Selys Collection/Baron Michel Edmond de Selys-Longchamps (1813-1900), Belgian politician and scientist, was a great expert on Odonata (Wasscher & Dumont, 2013), but also assembled a large collection of birds, most of which is now at RBINS (Fraipont, 1910).

[40] Label is in the handwriting of Coenraad Jacob Temminck (1778-1858), Dutch aristocrat, ornithologist and first director of the Leiden museum (Beolens & Watkins, 2003).

[41] Acquired in 1883 from G.A. Frank Jr./Gustav Adolph Frank Jr. (1844-1921), son of the famous Gustav Adolph Frank (1809-1880), an Amsterdam-based dealer in natural history specimens who had worldwide trade connections (Fransen *et al.,* 1997).

[42] Verreaux, J.; Verreaux, E./Jules Pierre Verreaux (1807-1873); Jean Baptiste Édouard Verreaux (1810-1868). continued the natural history dealership, the Maison Verreaux, founded by their father Jacques Philippe Verreaux, in Paris. Specimens traded by the firm are now widely scattered across the Western world (Mearns & Mearns, 1988; Beolens & Watkins, 2003).

[43] Gustav Schneider (1834-1900), German taxidermist and dealer in Basel, Switzerland, as conservator and taxidermist at the Natural History Museum in 1858.

[44] Frank (Francisco) Stephan (*fl.* 1840-1860)/Anton Fischer (1876-1957) spent his entire life around Augsburg and apparently never travelled abroad, but he acquired specimens, including South American material (*e.g.,* various hummingbirds from Santa Catarina, in southern Brazil), from a variety of contacts; his skins and eggs are scattered across various museums, including SMNS, which has almost 9,900 specimens from his collection (F. Woog *in litt.,* 2022).

[45] Untraced.

[46] Original collector unknown but the specimen was formerly held in the Cleveland Museum of Natural History, Ohio (CMNH 23974), it came to UMMZ as part of a permanent exchange in 1953 (B. Benz *in litt.,* 2023). We suspect, but cannot prove, that this is the same specimen as that originally in the Carnegie Museum of Natural History, Pittsburgh (CM P918), which on 12 March 1913 was exchanged with Henry Kelso Coale (1858-1926), an American amateur ornithologist and bird collector with a private collection. There is an older Coale label still attached to the UMMZ specimen (catalog number 16526). He acquired many of the birds in his collection through exchange with foreign collectors. In 1936 the Field Museum of Natural History, in Chicago, acquired a great portion of his specimens.

[47] Nathaniel Constantine Strickland (1792-1886), a cousin of Hugh Edwin Strickland (1811-1853), whose specimens are also largely held at UMZC (Benson, 1999). H.E. Strickland purchased *c.* 1,200 specimens from his cousin in 1838, but these were originally assembled from dealers in England and Scotland, and 'captains of merchantmen' (Salvin, 1882: 13-14). UMZC 27/Cot/4/a/1 seems likely to be one of the two Swainson specimens previously thought to be missing (see footnote 9 to Table 3).

[48] See note 10.

[49] Anatoliy Nikolayevich Demidov [alt. Demidoff] (1812-1870), Russian traveller and patron of the arts. https://en.wikipedia.org/wiki/Anatoly_Demidov,_1st_Prince_of_San_Donato.

[50] Ivan Antonovich Kupriyanov [alt. Kuprianow] (1794-1857), Russian naval officer, who participated in two circumnavigations, in 1819-1821 (commanded by Fabian Gottlieb von Bellingshausen, 1778-1852) and 1822-1825 (under the leadership of Admiral Mikhail Petrovich Lazarev, 1788-1851). Kupriyanov was briefly in Rio de Janeiro in 1819 and 1823 (Debenham, 1945; Barratt, 2011).

[51] Ilya Gavrilovich Voznesensky [alt. Wosness] (1816-1871), a Russian explorer and naturalist who collected in the Russian Far East as well as North and South America, and subsequently became a custodian of ZISP; his work in 'Russian America' was described by Feklova (2014), but his travels in South America appear to have received no contemporary attention.

[52] Friedrich Sellow (1789-1831), German naturalist, who arrived in Brazil (at the invitation of Langsdorff, see note 20) in 1814 and remained there until his death by drowning; he was active around Rio de Janeiro, joining Wied (see note 1) as far as Bahia, and subsequently (until mid 1819) crossing the Serra dos Órgãos from Rio de Janeiro to Minas Gerais, thereafter continuing to São Paulo with another German, the diplomat Ignaz Franz Werner Maria von Olfers (1793-1871) (see Stresemann, 1948; Stopiglia *et al.,* 2009; Rego *et al.,* 2013). His scientific material was sent variously to London, Berlin and Vienna. Sellow's contributions to botanical knowledge, especially, were discussed by, among others, Urban (1893) and Krausch (2002).

[53] Karl Wilhelm Theremin (1784-1852), a German painter, diplomat and businessman spent several years in Brazil, around Rio de Janeiro, between 1817 and at least 1820 (Peixoto, 1989).

[54] Wilhelm Friedrich Georg Behn (1808-1878), a German zoologist, participated in the Danish *Galathea* circumnavigation (1845-1847), which called at Rio de Janeiro en route home in 1847 (see Pacheco, 1999).

[55] Friedrich Boie (1789-1870), a German naturalist who specialised in entomology and birds; he had contacts with ornithologists elsewhere in Europe including Temminck (see note 39) and Gould (see note 25); see obituary by Möbius (1870).

[56] Peter Wilhelm Lund (1801-1880), a Danish palaeontologist and zoologist, who spent most of his life in Brazil, initially around Rio de Janeiro between 1825 and 1828, where he collected mainly birds, plants and insects; he returned to the country in 1832, eventually settling at Lagoa Santa, in Minas Gerais (see Sick, 1997: 53; Krabbe, 2007).

Table 3. Untraced or lost specimens of Kinglet Calyptura *Calyptura cristata.* Listed are: **Collection/specimen** – museum acronyms are listed under Methods. Registration numbers when available; **date** – estimated or reported date by source; **locality** – via the source; **age/sex** – based on source: M = male, F = female, U = unknown sex; **Name** of collector or dealer; **Remarks** – publication that mentioned this untraced or lost specimen. Correspondence from the curator reporting the loss. See Table 2 note 45 for the possibility that a 14th specimen, originally in the Carnegie Museum, Pittsburgh, should also be considered lost.

	Collection/specimen	Date	Locality	Age/Sex	Name	Remarks
1	AMNH 5155	None	No locality	U	None	Trade out/misplaced/mislabelled (Jason Sheldon, Curator, 23 Oct 2019)
2	Burmeister collection	1850-1852	Brasilien. Neu-Freiburg	U	Hermann Burmeister	Burmeister (1856); at least a second specimen
3	Descourtilz collection	Before 1852	Brasil	U	J.T. Descourtilz[1]	Descourtilz (1852); at least one specimen
4	Gould Collection	Before 1881	South America	M	Gould[2]	Sclater (1888): specimen "e"[7]
5	MNRJ	Before 1876	Brasil	U	None	At least one specimen (Anonymous, 1876)
6	MZUF	None	None	U	None	Hume & Walters (2012); (Fausto Barbagli, Curator, 21 Oct 2019)
7	NLMH 1562	Before 1882	Brasilien	U	Tölsner[3]	Anonymous (1897); (Chistiane Schilling, Curator, 4 Oct 2019)
8	Swainson collection	1818	Brazil	M	W. Swainson[4]	Swainson (1841)
9	Swainson collection	1818	Brazil	F	W. Swainson[4]	Swainson (1841)[8]
10	ZIMG	Before 1855	Brasilien	U	None	At least one specimen (Berthold, 1855)
11	ZMB	Before 1874	Brasilien, Cantagallo	M	Karl Euler[5]	Cabanis (1874); destroyed
12	ZMK	None	None	U	None	Hume & Walters (2012); (Malte Seehausen, Curator, 20 Mar 2023)
13	ZMUC	15 June 1828	[Rosário]	M	P.W. Lund[6]	Lost specimen (Krabbe, 2007)
14	ZMUL R.E. 205	1856	Brasil	U	None	Marie Bournonville, Curator, 1 Feb 2023

[1] Jean-Theodore Descourtilz (*c.* 1796-1855) was a French naturalist, painter and draftsman who lived for about 30 years in Brazil. The only contemporary account of *Calyptura cristata* is provided by this author (Descourtilz, 1852; Lambert & Kirwan, 2010).
[2] See note 25 (Table 2).
[3] Karl August Tölsner (1805-1882) was a Swiss doctor who lived in Nova Friburgo and in southern Bahia (Benchimol, 2013).
[4] William John Swainson (1789-1855) a British naturalist, travelled to Brazil, between 1816 and 1818, for a total of 18 months, including three months in Rio de Janeiro (Bethell, 2021). Swainson (1841) provided the first published illustration of *Calyptura cristata.*
[5] See note 29 (Table 2).
[6] See note 54 (Table 2).
[7] This seems likely to be one of the specimens now held in Oslo (NHMO) which were sent to Norway after the publication of Sclater (1888).
[8] One of these specimens is probably UMZC 27/Cot/4/a/1 in Cambridge, UK, especially as the script on what is evidently the oldest label appears to be in Swainson's hand (based on comparison with labels provided as exemplars by Benson (1999). Furthermore, the annotation "Very rare" is one that Swainson made on some of his other specimens, including types of his from Brazil., *e.g.,* that (UMZC 27/Tyr/28/a/1) of *Lepturus ruficeps* (a synonym of Fulvous-crowned Scrub-Tyrant *Euscarthmus meloryphus*).

for reasons to consider that the total of "lost" specimens is 12, rather than 15).

One of the specimens added to the list in a small Swiss museum (MAB) was previously misidentified as a species from North America, a Regulidae, the Ruby-crowned Kinglet, *Corthylio calendula* (Linnaeus, 1766), labelled: "*Regulus calendula* ♂, le Roitelet, Amerique du Nord". It was discovered by Julien Mazenauer who recognised the specimen in the museum's public exhibition as a Kinglet Calyptura.

One of the two RBINS specimens (RBINS 10126A) was removed from the list, because it is not a *C. cristata,* but rather a Tyrannidae, possibly a Yellow-crowned Tyrannulet *Tyrannulus elatus* (Latham, 1790), despite its label declaring it to be *C. cristata.*

Of the 104 extant specimens, just eight (IZH-V 3260, NHMUK 1888.1.20.972, NMB 2041, NMB 2042, NMSG 5741, SMNG A07725a, ZMUC 105508 and ZMUC 105507) possess locality information that is any way specific ("Nova Friburgo", "Cantagalo" or "Rosário"). These three localities lie within 45 km of each other. Nova Friburgo (also Neu Freiburg or Novo Fribourgo) is at *c.* 850 m elevation in the Serra dos Órgãos, in north-central Rio de Janeiro state (22°16′S, 42°32′W). This general area was visited by several relevant collectors, including Peter Wilhelm Lund, Jean-Théodore Descourtilz, Karl Hermann Konrad Burmeister and, but see below, John Youds (see Paynter & Traylor, 1991, and references and notes therein). Cantagalo (formerly spelt Cantagallo) lies *c.* 40 km north-east of Nova Friburgo, at *c.* 21°58′S, 42°22′W, *c.* 405 m, is where Carl Hieronymus Euler owned a large farm, Fazenda Bom Valle (*c.* 21°56′S, 42°16′W, *c.* 355 m), in what is now the small town of Euclidelândia, 44 km from the centre of Nova Friburgo. Both Lund and Burmeister also visited Cantagalo (see Paynter & Traylor, 1991). Rosário (sited at *c.* 22°16′S, 42°32′W, *c.* 855 m, according to Paynter & Traylor, 1991, but 22°06′S, 42°25′W, *c.* 655 m, by Krabbe, 2007) was another farm in the environs of Nova Friburgo; alternatively, JFP and others have visited a locality that is still called Rosário, at the border of the municipalities of Bom Jardim and Duas Barras, at *c.* 22°08′S, 42°29′W, *c.* 1,110 m, and just 15 km north-east of Nova Friburgo. Krabbe (2007) indicated that Lund was at Rosário almost permanently between 8 February 1827 and late June 1828, and that the fazenda was somewhere between Nova Friburgo and Cantagalo, but not as close to the former as the coordinates given by Paynter & Traylor (1991) suggested. Krabbe (2007) also noted that Lund may well have taken many of the birds labelled Rosário on a forested mountain named "Morro Queimado" ("Burnt Hill"), perhaps as far as several hours walk from the farm. A "Morro Quemado" (presumably the same locality) was also mentioned by another contemporary observer, Descourtilz. However, D. Miller (*in* Lambert & Kirwan, 2010) ascertained that Morro Queimado was the headquarters of a fazenda of the same name depicted in the background of an aquatint produced in the late 1820s, and that "Morro Queimado"

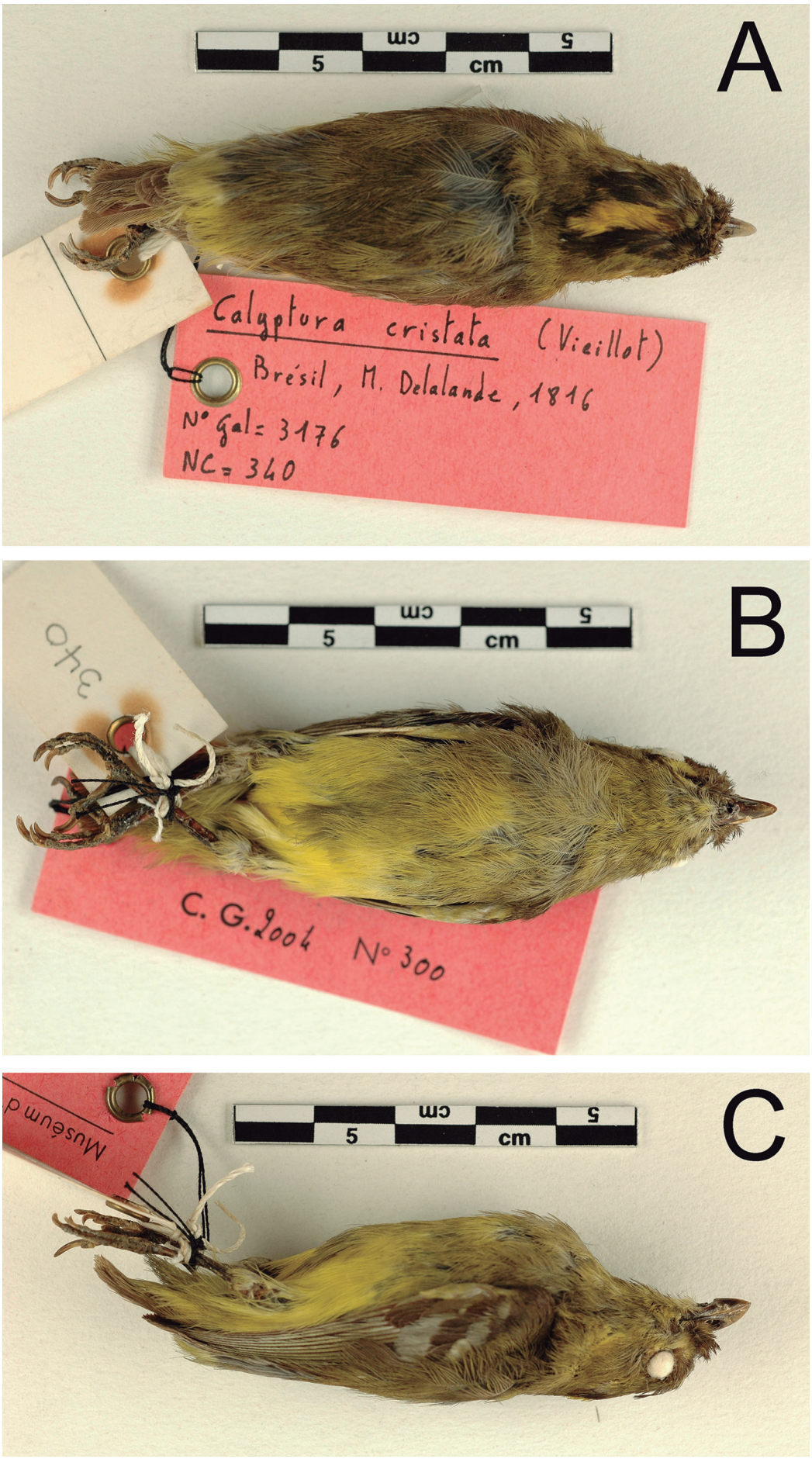

Figure 1. Holotype of *Calyptura cristata* (MNHN ZO-MO-2004-300), (A) dorsal view; (B) ventral view; (C) lateral view. Photos: Muséum National d'Histoire Naturelle, Paris.

Figure 2. Extant mounted specimens of *Calyptura cristata,* acronyms are listed in Methods. (1) IZH-V 3260, photo: Frank Steinheimer/IZH; (2) LUOMUS 1573, photo: Hanna Laakkonen/LUOMUS; (3) MHNN 926029, photo: Celia Bueno/MHNN; (4) MNHN 3137, photo: Vitor Piacentini; (5) NRM 535288, photo: Ulf Johansson/NRM; (6) MHNGr OR.8050, photo: MHNGr; (7) MHNVT R1-E6-C151-001, (8) MHNVT R1-E6-C151-002, photos: Christophe Remy/MHNVT; (9) NMW 17350, photo: Hans-Martin Berg/NMW; (10) MSNT, photo: Nicola Bressi; (11) MZLU Aves L848/6080, photo: Maria Mostadius/MZLU; (12) MZS Ave 08286, photo: Marie Meister/MZS; (13) NMSG 5741, photo: Lorenzo Vinciguerra/NMSG; (14) MPUW 203024, photo: Jan Lotkowski/MPUW; (15) MHNMON 0.2427, (16) MHNMON 0.2426, photos: Aude Medina/MHNMON; (17) ZISP 1819, photo: Vladimir Loskot/ZISP; (18) LMNM 5741, photo: Mathieu Waldeck; (19) NMBE 1033790, photo: Manuel Schweizer/NMBE; (20) MAB, photo: Pierre-Henri Béguin; (21) RMNH.AVES.172607, (22) RMNH.AVES.172611, (23) RMNH.AVES.172610, (24) RMNH.AVES.172609, (25) RMNH.AVES.172608, photos: Robson Silva e Silva; (26) MSNTP AV3082, (27) MSNTP AV3083, (28) AV3081, photos: Simone Farina & Lorenzo Vanni/MSNTP; (29) NMB 2042, (30) NMB 2041, photos: Dieter Thomas Tietze/NMB; (31) SMNG A07725a, photo: Diana Jeschke/SMNG; (32) ZMUC 105507, photo: Jon Fjeldså/ZMUC; (33) MHNC-UP AVE-1125, (34) MHNC-UP AVE-1126, photos: Mariana Costa/MHNC-UP.

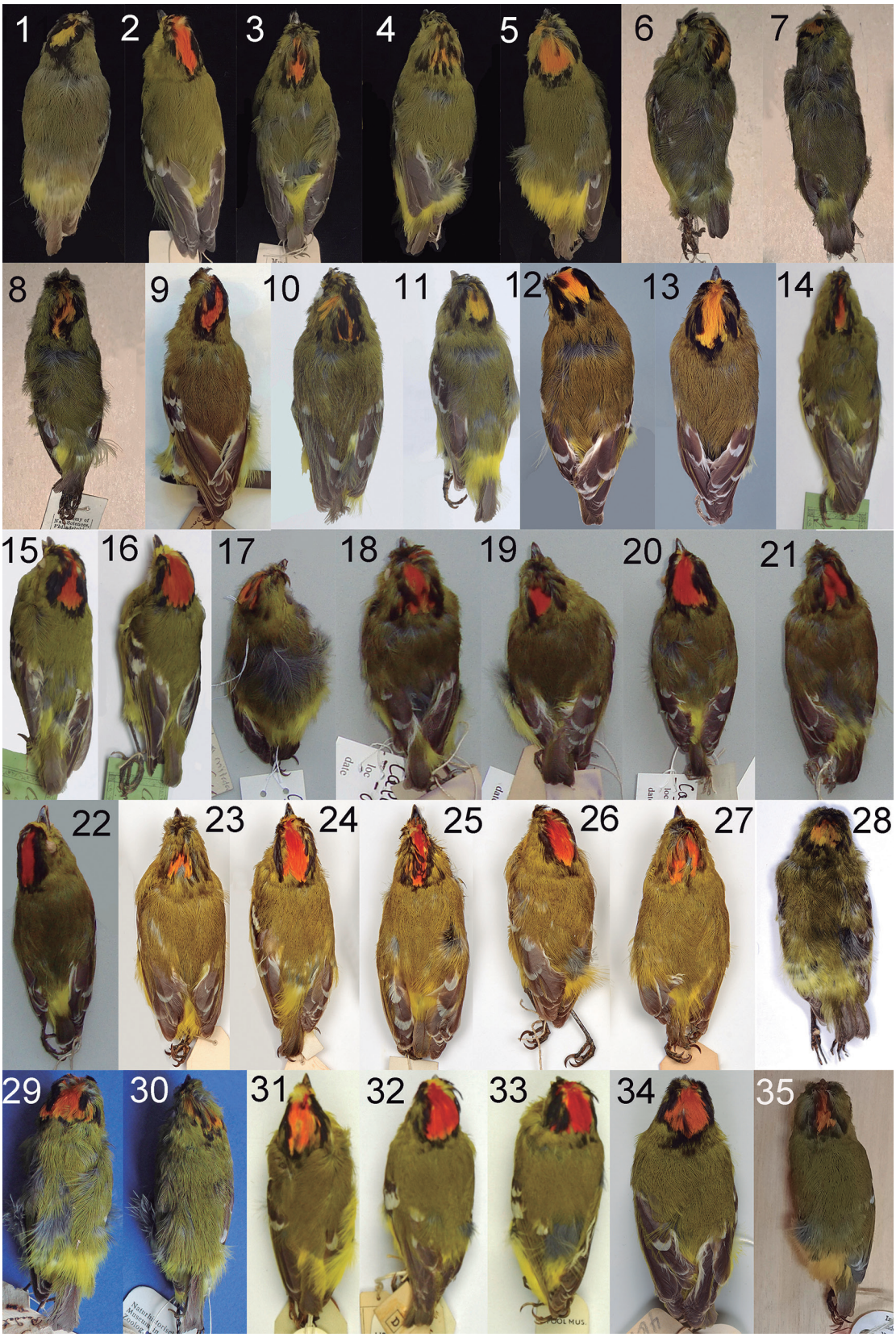

Figure 3. Extant skin specimens of *Calyptura cristata,* acronyms are listed in Methods. (1) AMNH 5156, (2) AMNH 494721, (3) AMNH 494720, (4) AMNH 494719, (5) AMNH 43795, photos: Jason Sheldon/AMNH; (6) ANSP 8366, (7) ANSP 8367, (8) ANSP 8368, photos: Nate Rice/ANSP; (9) CCECL 41007379, photo: Cédric Audibert/CCECL; (10) MCZ 75787, (11) MCZ 85035, photos: MCZ © President and Fellows of Harvard College; (12) LUOMUS 4950, (13) LUOMUS 4949, photos: Hanna Laakkonen/LUOMUS; (14) MHH 5667, (15) MHH 5666, (16) MHH 5665, photos: Rüdiger Becker/MH; (17) MNHN ZO-MO-2002-661, (18) MNHN ZO-MO-2000-2155, (19) MNHN ZO-MO-2000-2154, (20) MNHN ZO-MO-2000-2153, (21) MNHN ZO-MO-1931-1285, (22) MNHN ZO-MO-1845-440, photos: Vitor Piacentini; (23) NHMUK 1895.4.1.731, (24) NHMUK 1895.4.1.730, (25) NHMUK 1888.1.20.972, (26) NHMUK 1888.1.13.1675, (27) NHMUK 1881.5.1.3739, photos: Jonathan Jackson/NHMUK; (28) MZUT AV16101, photo: Luca Ghiraldi/MZUT; (29) NMW 17351, (30) NMW 17349, photos: Hans-Martin Berg/NHMW; (31) NML-VZ 5055a, (32) NML-VZ 3029, (33) NML-VZ 1980-70a, photos: John-James Wilson/NML-VZ; (34) SMF 41364, photo: Gerald Mayr/SMF; (35) RBINS 10126B, photo: Olivier Pauwels/RBINS.

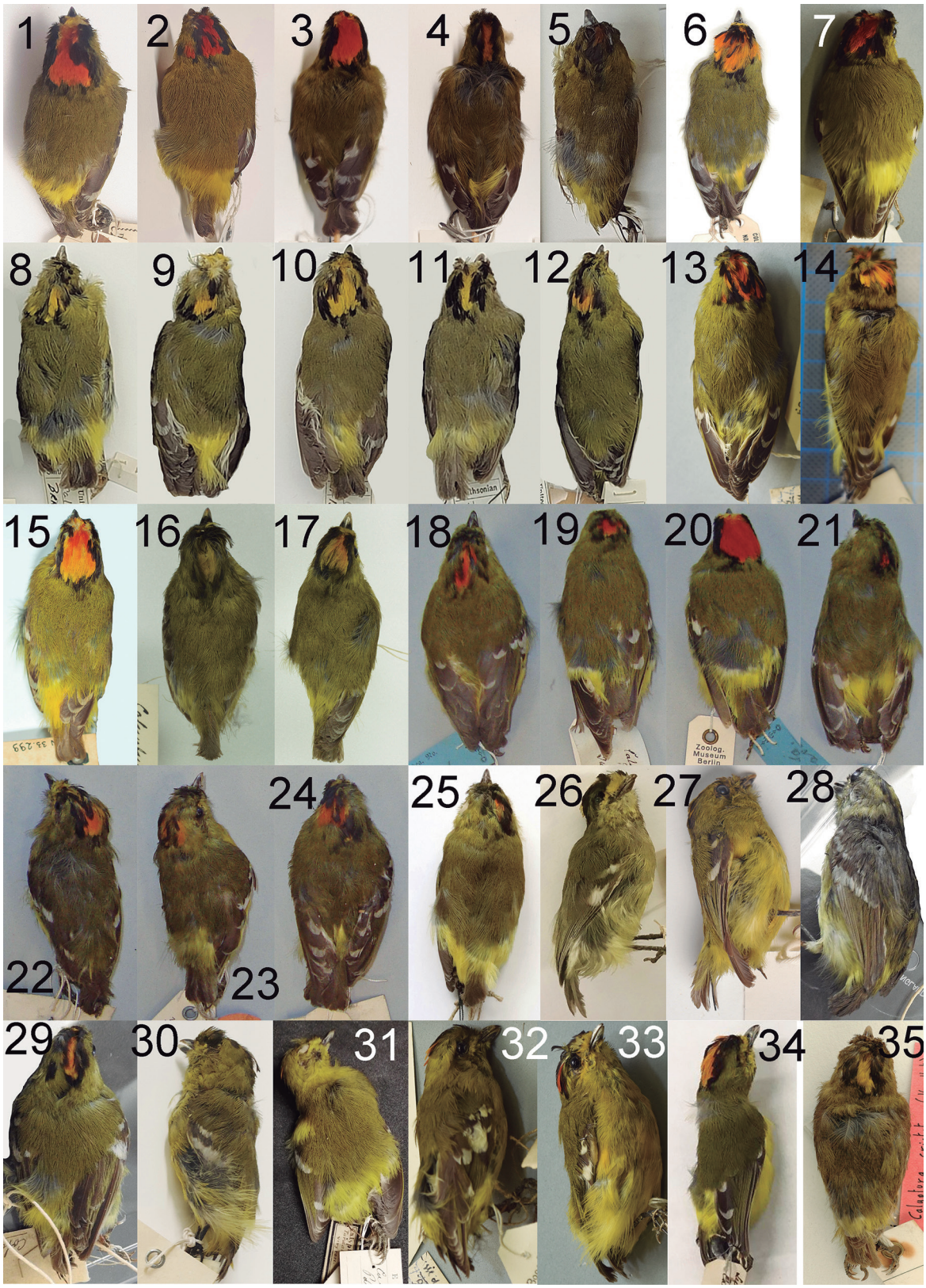

Figure 4. More extant skin specimens of *Calyptura cristata,* acronyms are listed in Methods. (1) UMZC 27/Cot/4/a/2, (2) SMNS 38253, (3) SMNS 33477, (4) SMNS 33478 photos: Guy M. Kirwan; (5) SMNS 114246, photo: Friederike Woog/SMNS; (6) UMMZ 134367, photo: Brett Benz. Image used with permission of University of Michigan Museum of Zoology Bird Division; (7) ZISP 117201, photo: Robson Silva e Silva; (8) USNM 33161, (9) USNM 33162, (10) USNM A15195, (11) USNM A15224, (12) USNM 145362, photos: Brian Schmidt/USNM; (13) ZISP 117204, photo: Robson Silva e Silva; (14) MWNH AV 5323, photo: Fritz Geller-Grimm/MWNH; (15) MNRJ 33299, photo: Claydson Assis/MNRJ; (16) NHMO BI-66671/1-P, (17) NHMO BI-66672/1-P, photos: Lars Erik Johannessen/NHMO; (18) ZMB 2000.12101, (19) ZMB 2000.12102, (20) ZMB 2000.12103, (21) ZMB 2000.12104, (22) ZMB 2305, (23) ZMB 2306, (24) ZMB 7567, photos: Vitor Piacentini; (25) ZMMU R525, photo: Pavel Smirnov/ZMMU; (26) CUVM 48403, photo: Vanya Gregor Rohwer/CUMV; (27) MHNN 92.6030, photo: Celia Bueno/MHNN; (28) MM B6327, (29) MM B6328, photos: MM; (30) NRM 90127687, photo: Ulf Johansson/NRM; (31) UMZC 27/Cot/4/a/1, photo: Nigel Collar; (32) ZISP 117202, (33) ZISP 117203, photos: Robson Silva e Silva; (34) ZMUC 105508, photo: Guy M. Kirwan; (35) MNHN ZO-MO-2004-300, photo: Muséum National d'Histoire Naturelle, Paris.

was sometimes used synonymously with "Nova Friburgo" when George Gardner visited in 1840 (Miller *et al.,* 2006). According to Miller, "Morro Queimado" refers to the area around the farm headquarters (probably the present base of Anchieta College, Nova Friburgo; https://pt.wikipedia.org/wiki/Fazenda_do_Morro_Queimado), and the probable elevation of the original forest in this area would have been 600-900 m (Lambert & Kirwan, 2010).

Some specimens lack any indication of locality, while others are erroneous (*e.g.,* AMNH 5156, labelled "Guiana, Suriname"; NML-VZ 3029, "Bogotá"; RMNH AVES.172607, "México"), but most are labelled simply Brazil (Brésil, Brasilia, Brasilien, Brasile) (*n* = 57), "south-east Brazil" (*n* = 6), or occasionally "Rio de Janeiro" (*n* = 11). Others are, inaccurately, attributed more generally to the Americas (CCECL 41007379, MHNVT R1-E6-C151-002). Two (MSNTP AV3081, AV3083) are labelled "Nuova Olanda" (= New Holland), in an apparent (but clearly erroneous) allusion to the area of north-east Brazil, stretching from Sergipe to Maranhão, and centred on Recife, which was formerly administered by the Dutch, until it was ceded to the Portuguese crown in 1661 (Lockhart & Schwartz, 1983). One specimen (ZMB 2306) stemming from Friedrich Sellow mentions São Paulo ("San Paulo") on the label, and Stopiglia *et al.* (2009) contested that this provided the first incontrovertible proof that *C. cristata* is not endemic to the state of Rio de Janeiro. Rego *et al.* (2013), however, advocated caution in placing too much faith in the label data because Sellow sent multiple shipments of specimens to ZMB during the relevant period, and because of gaps in the original documentation in the museum's archive concerning these arrivals.

Only a small percentage of the material can be more or less accurately dated as to when it was collected, all of which was probably acquired during the first two-thirds of the 19th century, for example IZH-V 3260, MCZ 75787, MNHN 3137, MSNT uncatalogued, ZMB 2305 and 2306, and ZMUC 105507 and 105508 (for the latter two specimens, see Krabbe, 2007). For the majority of traced specimens, the date of registration in a European or North American institution, or the date of acquisition, donation or exchange makes identifying when they were collected extremely difficult, probably impossible, especially given a lack of knowledge of the collectors involved. Nevertheless, where archival material might be available, we encourage curators and researchers at the museums concerned to pursue such avenues of investigation as may be open to them. Although some material was certainly not accessioned until the last third of the 19th century, *e.g.,* NMBE 1033790 (sometime in the 1870s) and all of that at NHMUK (in the 1880s and 1890s), and a few specimens (MM B6327, MNHN ZO-MO-2000-2153 and MNHN ZO-MO-1931-1285) were not registered in other European collections until the first third of the 20th century, in none of these cases do we possess definite evidence that they were collected so late. For example, the NHMUK specimens came to the British Museum via P.L. Sclater (*n* = 1), John Gould (*n* = 1), the Salvin-Godman collection (*n* = 1) and Alexander Fry (*n* = 2). That originally in Sclater's private collection must have been collected prior to 1862, given that it was listed in his own catalogue published in that year (Sclater, 1862: 247), and the specimen reached him via the natural history specimen dealer, James Argent, about whom very little seems to be known, but the British Museum purchased a total of 500 specimens directly from him between 1843 and 1854, including a batch of 30 from Brazil in 1846 (Sharpe, 1906: 300-301). We lack any knowledge concerning the provenance of Gould's specimen, which was purchased by the British Museum in 1881, on his death; neither a dealer nor a collector is mentioned on the museum's label (no original label is attached to the specimen). A trawl of Gould's correspondence (reproduced by Sauer, 1998a, 1998b, 1999) has failed to located any reference to this bird, but Sauer's volumes only cover his life up to 1845. Future researchers might wish to study the Gould correspondence held in the UK National Archives (https://discovery.nationalarchives.gov.uk/details/r/55f98d6c-8dac-4163-bafe-70414ef1c494) for information pertaining to this bird. The specimens from the Salvin-Godman collection came via John Youds, another person about whom very little is known, especially as the family (originally from Cheshire, in north-west England, but emigrated to Bahia, Brazil, around the 1820s) numbered multiple members named John, at least one of whom was involved in the slave trade. Ihering (1900) reported many species/specimens from the vicinity of Nova Friburgo attributable to Youds, but gave (or knew) no further details about him. Given the complexities, it may prove impossible to elucidate (even to the decade) when this specimen was collected, especially as Youds presumably was responsible only for trading it. Fry lived in Brazil between 1838 and 1854, and it seems most likely that his specimens were collected during this 16-year period, but he did continue to visit the country in the years thereafter (see Table 2, note 28).

Even Snow's (2004) suggestion that the species' last known specimen was collected around 1890 appears to be based more on assumption than definite knowledge (and his basis is unfortunately unknown). Indeed, it is unclear whether any of the 100+ specimens was taken later than the 1860s. One of the last that can be pinpointed with any certainty is NRM 90127687, which was acquired by Gunnar Olof Hyltén-Cavallius sometime between 1860 and 1864 during his tenure in the Swedish consulate in Rio de Janeiro (see Table 2, footnote 37).

The specimens from Florence (MZUF) and Kiel (ZMK), cited by Hume & Walters (2012), could not be re-located. After contact by e-mail with Fausto Barbagli (University of Firenze), it proved impossible to confirm the presence of a specimen of the species in MZUF, only that the collection is currently stored in a warehouse due to renovation (Fausto Barbagli *in litt.,* 21 October 2019). Neither could we confirm the existence of a specimen in Kiel; according to the curator the species is not represented in the collection (Malte Seehausen *in litt.,* 20 March 2023).

Plumage variation

Although a much larger number of specimens preserved in museums is now known, the state of conservation of these specimens varies greatly, reflecting the conditions they have been exposed to over the last 150-200 years.

In the 19th century it was common to publicly display birds in cases, with the result that many specimens have faded plumage, whereas others were quickly incorporated into scientific collections, remaining better protected inside cabinets unexposed to the light, but still others remain on display (*e.g.,* LUOMUS 1573, MAB, ZISP 1819), despite the species being considered Critically Endangered and thus of special significance and very rare in natural history museums. Changes to original colours were caused not only by exposure to light, as Jon Fjeldså (*in litt.,* 21 August 2019) at ZMUC, said: "The mounted specimen therefore is faded and stained grey by carbon particles, as the old exhibition rooms were heated by burning coal."

To know a little more about the plumage of a recently prepared specimen (or a live bird), we consulted the original description of the species (Vieillot, 1818; pp. 528-529): "Le Pardalote huppé, *Pardalotus cristatus,* se trouve au Brésil, d'où il a été apporté par M. Delalande fils. La huppe qui orne sa tête est rouge et près l'occiput, comme dans le *roitelei rubis;* la gorge et toutes les parties inférieures sont d'un beau jaune, plus foncé sur le devant du cou et sur la poitrine; les pieds noirs; le bec est de cette couleur à sa base et à sa pointe, et couleur de corne sur le milieu et en dessous; la tête, le dessus du cou et du corps d' un vert olive tirant au jaune; les plumes du milieu de la tête, du front et de l' occiput, terminées de brun-noir; les petites couveriures des ailes moitié blanches à l'extérieur; les pennes brunes et bordées de vert-olive en dehors; celles de la queue du même vert et strê-courtes; taille à peu prés pareille à celle du *pardalote pointillé*".

Our translation: "The Kinglet Calyptura, *Pardalotus cristatus,* is found in Brazil, from where it was brought by the younger Mm. Delalande. The crest which adorns its head is red and close to the rear head, as in the *roitelei rubis;* the throat and all the lower parts are of a beautiful yellow, darker on the foreneck and on the breast; the feet are black; the bill is of this colour at its base and tip, and horn-coloured in the middle and below; the head, nape and upperparts are olive-green to yellow; the feathers on the middle of the head, forehead and rear head are brownish-black; the small wing coverts are half white on the outside; the remiges are brown and edged with olive-green on the outside; those on the tail are of the same green and very short; the size of the bird is about the same as that of *pardalote pointillé*". *Roitelei rubis* is a reference to the bird we now know as Ruby-crowned Kinglet *Corthylio calendula* (Linnaeus, 1766), whilst *pardalote pointillé* is the Spotted Pardalote *Pardalotus punctatus* (Shaw, 1792).

The holotype of *Calyptura cristata* (MNHN ZO-MO-2004-300) used in Vieillot's description was collected sometime in 1816 in Rio de Janeiro by Pierre Antoine Delalande, and is preserved in the Muséum National d'Histoire Naturelle, Paris, France (Fig. 1). It is possible to note clearly the effects of time, more than 200 years, on this specimen, which has faded coloration, mainly its yellow crest, as opposed to the red described by Vieillot.

A feature that draws attention in the Kinglet Calyptura specimens (checked personally or via photographs) is the great variation in the colour of the crest, as well as the area or number of feathers with this coloration. The crest colour ranges from bright red (*e.g.,* MHH 5665; MNHN ZO-MO-2000-2153; ZMB 2000/12103) through orange (*e.g.,* LUOMUS 4949; MNRJ 3137; RMNH.AVES.172608; ZMB 2306) to yellow (*e.g.,* AMNH 5156; MSNTP AV3082; NMBE 1033790; NRM 535288). Given that red was the original colour in the crest of the holotype, according to Vieillot's description, we might assume that other colours (orange and yellow) are only the result of discoloration over the intervening years, in line with research into the effects of time on the colour of museum specimens, perhaps especially carotenoid-based colours (such as reds and yellows) (McNett & Marchetti, 2005; Armenta *et al.,* 2008; Riedler *et al.,* 2014). However, this cannot be used to explain why a large number of specimens, all in excess of 100 years old, exhibit such variation in the colour of the coronal patch, especially as some specimens that are known to have been exposed to direct natural light for considerable periods of time, *e.g.,* that in IZH, still have a bright red crown. However, we lack details of how every specimen has been stored throughout the last two centuries, and it is plausible that specimen storage and individual/sex-related differences could be among the factors to explain the variation that is currently observed.

The distinction between the sexes in *C. cristata* is based mainly on the yellow coloration in the forehead and forecrown in males and dark olive-green in the females, and the volume of red feathers in the crest, with males (*e.g.,* MNHN ZO-MO-1854-440) having more red feathers, and bolder black lateral borders (Snow, 2004; Kirwan & Green, 2011). Examination of a larger number of specimens allowed us to pinpoint other plumage characteristics that might help to identify males and females, and distinguish between adults and immatures. We noticed that in males (*e.g.,* NHMO 66671; NMB 2041; NHMUK 1895.4.1.730) the black band starts just in front of the eye and continues to border the red crest on the nape, whereas in females (*e.g.,* NHMUK 1895.4.1.731; NMB 2042; ZISP 117202; ZMB 2306) there is only a small yellow spot behind and below the eye, and the black borders to the red/orange/yellow coronal patch are much less well defined.

Juveniles/immatures might be those individuals with few, or only a very small number of red feathers in the crest (*e.g.,* RMNH AVES.172608), and which also lack yellow in the forehead and forecrown, perhaps with immature males possessing more yellow and red feathers compared to immature females. Analysing tail feather shape, which can be useful for separating adults and juveniles of passerines (being narrower with more pointed tips in the latter), is not always easy in very old museum specimens, rather than live birds, especially when attempting

to base the identification solely on photos. Feathers can be lost, become frayed or otherwise changed in shape, however, RMNH.AVES.172608 does appear to have narrower rectrices. Among other specimens that share the full suite of these immature characters are ZMB 2306, ZMB 2000, 12104, ZMUC 105507, and NMBE 1033790.

DISCUSSION

Our inventory almost doubles previous estimates of the number of *Calyptura cristata* specimens held in the world's natural history museums. We have identified at least 104 specimens, the majority of which are held in European collections. Given that several specimens were found in relatively small institutions, there is still the potential for additional material to come to light in collections subject to less intensive and detailed curation work.

To try and contextualise just how remarkably large this total is, one useful comparison to make is with another species endemic to a tiny area (estimated at 410 km^2) of southeast Brazil, in the lowlands of Rio de Janeiro state, and which was also "lost" for more than a century, Black-hooded Antwren *Formicivora erythronotos.* Pacheco (1988) related the species' dramatic rediscovery in the environs of Angra dos Reis in September 1987, slightly less than a decade prior to the multi-observer record of *Calyptura cristata* near Teresópolis in October 1996. Unlike the latter, however, the *Formicivora* continues to be seen, some additional (albeit nearby) localities have been identified for it, and there are now literally hundreds of photographs of the species on citizen science databases, attesting to its local abundance. Specimens in museums are, however, exceptionally few in number: Pacheco (1988), repeated by Collar *et al.* (1992) postulated there are "about 20 nineteenth century skins in European and American museums", but in fact we have found evidence of just ten or 11: one or two of them lost, five extant in Europe, one in the USA, and three in Brazil (MNRJ 33300); see below, and a pair held at the Museu de Zoologia da Universidade de São Paulo, MZUSP 76678 and 76679; (L.F. Silveira *in litt.,* 2023). Hartlaub's holotype, a male, is in the Zoologisches Institut und Zoologisches Museum, Hamburg (Bolau, 1898); another male from Burmeister is held in IZH (Pacheco, 1988; GMK *pers. obs.*), an adult male reported to have been collected in February 1879 (?) is in the Naturmuseum Senckenberg, Frankfurt am Main (SMF 24044), and there are two specimens (one male, one female) in NHMUK (Knox & Walters, 1994; H. van Grouw *in litt.,* 2023). Another specimen, reported to have been either a female or immature male, was presumably formerly in IZH (*e.g.,* Burmeister, 1856), but seems to be no longer present there. The specimen in SMF has apparently never been specifically referred to in the literature before; it was purchased from Gustav Schneider (1834-1900), the Basel-based taxidermist. At one time or another, the museum in Tring had five specimens (Sclater, 1890; Knox & Walters, 1994), the others being the male now in MNRJ (exchanged in 1984), another male, from Gould, that was one of the four listed by Sclater (1890) but is now lost, and a third male, originally in the Sclater collection, that was exchanged with AMNH in 1921. The female still at NHMUK was also originally in Sclater's private collection and came to him via a dealer named Warwick (it thus seems unlikely to be the same specimen once at IZH). Searches of VertNet and GBIF, as well as databases of several of the large North American museums (AMNH, FMNH, MCZ, NMNH), have revealed no additional material.

The most detailed prior analysis of plumage variation in *Calyptura cristata* is that by Kirwan & Green (2011). This was based on the earlier literature and analysis of specimens by GMK in eight museums (IZH, MNHN, MNRJ, NHMUK, RMNH, UMZC, USNM and ZISP). These authors suggested that females differ from males by having the forehead and forecrown largely dark olive-green (rather than yellow), with paler orange-red restricted to the rear crown and any black not forming well-defined lateral crown-stripes, narrower white tips to the wing-coverts and tertials, and a paler yellow rump patch. Furthermore, in common with other authors (*e.g.,* Snow, 2004), they noted that any non-adult plumages are undescribed, but that ZMUC 105507 (photos of which were analysed as part of the present study) said to be an immature male was illustrated (by J. Fjeldså *in* Krabbe, 2007) as having a pale throat and a greenish cast to the flanks (Kirwan & Green, 2011). This specimen does indeed appear to have the narrower and slightly more pointed rectrices that might be expected to characterise a younger bird.

Sex and age-related plumage variation in Kinglet Calyptura's closest relatives are not always well known. In Cinnamon Neopipo *Neopipo cinnamomea,* the sexes are similar, but the female's yellow coronal patch is smaller, and there is no published information concerning juvenile plumage (Farnsworth & Lebbin, 2004). Among the seven species of spadebills (genus *Platyrinchus*), the sexes are separable based on the colour and pattern of the coronal patch in three, Cinnamon-crested Spadebill *P. saturatus,* Golden-crowned Spadebill *P. coronatus* and White-crested Spadebill *P. platyrhynchos* (Hilty, 2003; Johnson & Wolfe, 2018), whilst less detailed but similar differences have been reported in coronal patch size and colour (smaller and often paler in females) of two other species, Stub-tailed Spadebill *P. cancrominus* and White-throated Spadebill *P. mystaceus* (Tello, 2004). In contrast, the sexes are reported to be alike in Yellow-throated Spadebill *P. flavigularis* and Russet-winged Spadebill *P. leucoryphus* (Tello, 2004), although this perhaps requires re-evaluation in light of the details presented by Johnson & Wolfe (2018). Among *Platyrinchus,* the juveniles of Yellow-throated and Russet-winged Spadebills are both undescribed, whilst some of the other species are reported to differ principally in that they lack any evidence of a coronal patch, with reduced facial markings (usually well marked in adults) and generally paler and duller underparts, but at least in the hand ageing is probably more reliably based on relatively pointed versus dull and rounded rectrices, molt limits in the wing-coverts, and subtle differences in the colour of some feathers of the wing (Tello, 2004; Johnson & Wolfe, 2018). It is also

interesting to compare another, slightly more distantly related tyrannid (based on the Ohlson *et al.,* 2012 phylogeny), Many-coloured Rush Tyrant *Tachuris rubrigastra,* in which females are characterised by generally duller colours and a smaller coronal patch, and juveniles are distinguished by their lack of wingbars, duller underparts, some yellow scaling on the green upperparts and a lack of blue in the facial mask (Clock, 2004).

We yet again confirm the vital importance of scientific collections in museums around the world, not only the large and famous, but also smaller and little-known institutions that house much smaller amounts of material. With a considerably larger number of specimens preserved in museums, *C. cristata* was evidently an even commoner species than was previously imagined, despite its seemingly restricted distribution, thereby making the reasons for its apparently imperilled conservation situation even more mysterious.

AUTHORS' CONTRIBUTIONS: RSS, GMK: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project Administration, Visualization, RSS, GMK, JFP, MS: Writing – review & editing. All authors actively participated in the discussion of the results, and they reviewed and approved the final version of the paper.

CONFLICTS OF INTEREST: Authors declare there are no conflict of interest.

FUNDING INFORMATION: This project did not use any external financial support.

ACKNOWLEDGMENTS: Pepijn Kamminga and Steven van der Mije (RMNH, now Naturalis Biodiversity Center), and the late Vladimir Loskot (ZISP) are thanked for their hospitality and courtesy to RSS and GMK during our separate visits to these institutions. Julian Hume sent information concerning the specimens reported (perhaps erroneously) to be in Florence and Kiel. The following curators provided data concerning specimens of *Calyptura cristata* in the collections under their care (GMK has personally examined relevant material at those institutions marked with an asterisk): Paul Sweet and Jason Sheldon (AMNH), Nate Rice (ANSP), Cédric Audibert (CCECL), Vanya Gregor Rohwer (CUMV), Frank Steinheimer (IZH*), Christina Barilaro (LMNM), Alexandre Aleixo (LUOMUS), Pierre-Henri Béguin (MAB), Jeremiah Trimble (MCZ), Bernd Nicolai and Rüdiger Becker (MHH), Ricardo Jorge Lopes and Mariana Costa (MHNC-UP); Philippe Candegabe (MHNGr), Aude Medina (MHNMON), Celia Bueno and Martin Zimmerli (MHNN), Christophe Remy (MHNVT), Henry McGhie, Rachel Petts and David Gelsthorpe (MM*), Patrick Boussès (MNHN*), Marco Aurélio Crozariol and Claydson Assis (MNRJ*), Jan Lontkowski (MPUW), Paul Tout and Nicola Bressi (MSNT), Simone Farina and Lorenzo Vanni (MSNTP), Fritz Geller-Grimm (MWNH), Maria Mostadius (MZLU), Marie Meister (MZS), Luca Ghiraldi (MZUT), Lars Erik Johannessen (NHMO), Hein van Grouw (NHMUK*), Christiane Schilling (NLMH); David Marques, Dieter Thomas Tietze and Urs Wüest (NMB), John-James Wilson (NML-VZ), Lorenzo Vinciguerra (NMSG), Hans-Martin Berg (NMW), Ulf Johansson (NRM), Olivier Pauwels and Annelise Folie (RBINS), Gerald Mayr (SMF), Hjalmar S. Kühl and Diana Jeschke (SMNG), Friederike Woog (SMNS*), Janet Hinshaw and Brett W. Benz (UMMZ), Michael del Brooke, Daniel Field and Matthew Lowe (UMZC*), Brian K. Schmidt (USNM*), Pascal Eckhoff and Sylke Frahnert (ZMB*), Malte Seehausen (ZMK), Pavel Smirnov (ZMMU), Pete Hosner and Jon Fjeldså (ZMUC) and Marie Bournonville (ZMUL). Julien Mazenauer identified the specimen in the Musée de l'Areuse Boudry, Neuchâtel, Switzerland. Nigel Collar photographed one of the specimens at the UMZC on our behalf. The following confirmed the lack of specimens of Kinglet Calyptura at their institutions: Jakob Pöhacker (Haus der Natur, Museum für Natur und Technik, Salzburg, Austria), Peter Sackl (Universalmuseum Joanneum, Graz, Austria), Stephan Weigl (Biologiezentrum des Oberösterreichisches Landesmuseums, Linz, Austria), Alain Reygel (Royal Museum of Central Africa, Tervuren, Belgium), Luís Fábio Silveira (Museu de Zoologia da Universidade de São Paulo, Brazil); Maria de Fátima Cunha Lima (Museu Paraense Emílio Goeldi, Belém, Brazil), Zlatozar Boev (National Museum of Natural History, Bulgarian Academy of Sciences, Sofia, Bulgaria), Jan Hušek and Jiří Mlíkovský (Museum of Natural History, Prague, Czech Republic), Miroslav Sebela and Martin Cerny (Moravské Zemské Muzeum, Brno, Czech Republic), Margus Ots (University of Tartu Natural History Museum, Estonia), Mathilde Schneider (Muséum d'Histoire Naturelle, Rouen, Normandy, France), Muriel Lecouvez (Musée d'Histoire Naturelle, Lille, France), Nathalie Mémoire (Musée d'Histoire Naturelle de Bordeaux, France), Andreas Bick (Zoologischen Sammlung der Universität Rostock, Germany), Cordula Bracker (Zoologisches Institut und Zoologisches Museum, Hamburg, Germany), Dietrich von Knorre (Jena Phyletisches Museum, Germany), Albrecht Manegold (Staatliches Museum für Naturkunde, Karlsruhe, Germany), Matthias Mäuser (Naturkunde-Museum Bamberg, Germany), Carsten Ritzau (Naturkunde-Museum Coburg, Germany), Christiane Schilling (Niedersächsisches Landesmuseum, Hannover, Germany), Melita Vamberger and Martin Päckert (Staatliches Museum für Tierkunde, Dresden, Germany), Till Töpfer (Leibniz Institute for the Analysis of Biodiversity Change, Museum Koenig, Bonn, Germany), Markus Unsöld (Zoologische Staatssammlung München, Germany), Erich Weber (Institute für Evolution und Ökologie, Vergleichende Zoologie, Eberhard-Karls-Universität Tübingen, Germany), Tibor Fuisz (Magyar Nemzeti Múzeum, Budapest, Hungary), Andrea Benocci (Museo Zoologico dell'Accademia dei Fisiocritici, Siena, Italy), Carla Marangoni (Museo Civico de Zoologia, Rome, Italy), Stefano Maretti (Museo di Storia Naturale Università di Pavia, Italy), Alain Frantz and Francesco Vitali (Musée National d'Histoire Naturelle, Luxembourg), Terje Lislevand (Zoologisk Museum, University of Bergen, Norway), Tomasz Huflejt and Dominika Mierzwa-Szymkowiak (Museum and Institute of Zoology, Warsaw, Poland), Josefina Barreiro Rodríguez (Museo Nacional de Ciencias Naturales, Madrid, Spain), Alice Cibois (Museum d'Histoire Naturelle de Genève, Switzerland), Sarah Kenyon (Saffron Walden Museum, UK), Zena Timmons (National Museums of Scotland, Edinburgh, UK), and Stephen P. Rogers (Carnegie Museum of Natural History, Pittsburgh, USA). Dione Seripierri and Martha Zamana in the Museu de Zoologia da Universidade de São Paulo library enabled access to various references. Vitor Piacentini provided additional photographs of *Calyptura* specimens held at AMNH, MNHN and ZMB. We are grateful to two referees for their comments on the submitted version of the manuscript.

REFERENCES

Abbot, S.L. 1867. Account of the life and scientific career of the late Dr. Henry Bryant. *Proceedings of the Boston Society of Natural History,* 11: 205-215.

Allen, J.A. 1889. On the Maximilian types of South American birds in the American Museum of Natural History. *Bulletin of the American Museum of Natural History,* 2(19): 209-276.

Ames, P.L. 1971. The morphology of the syrinx in passerine birds. *Bulletin of the Peabody Museum of Natural History,* 37: 1-194.

Anonymous. 1844. Stated meeting, June 4, 1844. Donations to museum. *Proceedings of the Academy of Natural Sciences of Philadelphie,* 2: 66. https://www.biodiversitylibrary.org/item/30491#page/80/mode/1up.

Anonymous. 1876. Computo geral das collecções zoológicas existentes no Museu Nacional. *Archivos do Museu Nacional,* 1: 101-132.

Anonymous. 1897. *Katalog der systematischen Vogelsammlung des Provinzial-Museums in Hannover.* Hannover, Wilhelm Riemschneider. https://www.biodiversitylibrary.org/item/259199#page/5/mode/1up.

Armenta, J.K.; Dunn, P.O. & Whittingham, L.A. 2008. Effects of specimen age on plumage color. *Auk,* 125(4): 803-808. https://doi.org/10.1525/auk.2008.07006.

Bakkal, S.N. 2018. [Johann von Tschudi (1818-1889) and the South American bird collections of the Zoological Museum of the Imperial Academy of Sciences, Russia]. *Russkii ornitologicheskii zhurnal,* 27(1601): 1963-1990. (in Russian)

Barratt, G. 2011. *Russia in Pacific Waters, 1715-1825. A Survey of the Origins of Russia's Naval Presence in the North and South Pacific.* Vancouver, UBC Press.

Benchimol, J.L. 2013. O Brasil e o mundo germânico na medicina e saúde pública (1850-1918): uma história a voo de pássaro. *História,* São Paulo, 32(2): 105-138. https://doi.org/10.1590/S0101-90742013000200007.

Benson, C.W. 1999. Type specimens of bird skins in the University Museum of Zoology, Cambridge, United Kingdom. *British Ornithologists' Club Occasional Publications,* 4: 1-221.

Beolens, B. & Watkins, M. 2003. *Whose bird? Common bird names and the people they commemorate.* London, Christopher Helm.

Berthold, A.A. 1855. Königlishes akademishes Museum. Nachrichten von der Georg-Augusts-Universität und der Königl. *Gesellschaft der Wissenschaften zu Göttingen,* 6: 65-100.

Bethell, L. 2021. William Swainson: um naturalista britânico no Brasil (1817-1818). *Revista do Instituto Histórico e Geográfico Brasileiro,* 182(487): 103-120. https://doi.org/10.23927/issn.2526-1347.RIHGB.2021(487):103-120.

BirdLife International. 2023. Species factsheet: *Calyptura cristata.* Available: http://datazone.birdlife.org/species/factsheet/kinglet-calyptura-calyptura-cristata. Access: 27/01/2023.

Bolau, H. 1898. Die Typen der Vogelsammlung des Naturhistorischen Museums zu Hamburg. *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten,* 15: 47-71.

Boucard, A. 1876. *Catalogus avium: hucusque descriptorum.* Londini. https://www.biodiversitylibrary.org/item/31757#page/5/mode/1up.

Bruce, M.D. & Barr, N. 2020. The discovery and naming of the remarkable Tooth-billed Pigeon *Didunculus strigirostris* of Samoa and the history of the reception, attempted suppression and acceptance of Titian Peale's report on the mammals and birds of the United States Exploring Expedition 1839-1842 (1849), with a summary of the status of Peale's new species. *Sherbonia,* 6: 1-42.

Burmeister, H. 1856. *Systematische Uebersicht der Thiere Brasiliens: welche während einer Reise durch die Provinzen von Rio de Janeiro und Minas Geraës gesammlt oder beobachtet Wurden,* Bd. 3. Berlin, G. Reimer.

Burr, M. 1905. Obituary. *Entomologist's Monthly Magazine, Second Series,* 16(41): 119-120.

Cabanis, J. 1874. Uebersicht der von Herrn Carl Euler im District Cantagallo, Provinz Rio de Janeiro, gesammelten Vögel. *Journal für Ornithologie,* 22: 81-90. https://doi.org/10.1007/BF02004174.

Cabanis, J. & Heine, F. 1860. *Museum Heineanum: Verzeichniss der ornithologischen Sammlung des Oberamtmann Ferdinand Heine, auf Gut St. Burchard vor Halberstadt.* Halbertstadt, R. Frantz.

Clock, B.M. 2004. Many-coloured Rush-tyrant *Tachuris rubrigastra. In:* del Hoyo, J.; Elliott, A. & Christie, D.A. (Eds.). *Handbook of the birds of the world.* Barcelona, Lynx Edicions. v. 9. p. 315.

Collar, N.J.; Gonzaga, L.P.; Krabbe, N.; Madroño Nieto, A.; Naranjo, L.G.; Parker, T.A. & Wege, D.C. 1992. *Threatened birds of the Americas: the ICBP/IUCN Red Data book.* Cambridge, International Council for Bird Preservation.

Debenham, F. (Ed.). 1945. *The Voyage of Captain Bellingshausen to the Antarctic Seas, 1819-1821.* London, Hakluyt Society.

Descourtilz, J.T. 1852. *Ornithologie Brésilienne, ou histoire des oiseaux du Brésil remarquables par leur plumage, leur chant ou leurs habitudes.* Rio de Janeiro, Thomas Reeves.

Dickinson, E.C. & Christidis, L. (Eds.). 2014. *The Howard and Moore complete checklist of the birds of the world.* 4. ed. Eastbourne, Aves Press. v. 2.

Elliot, D.G. 1896. *In memoriam.* George Newbold Lawrence. *Auk,* 13: 1-10. https://doi.org/10.2307/4068733.

Ericson, P.G.P.; Zuccon, D.; Ohlson, J.I.; Johansson, U.S.; Alvarenga, H. & Prum, R.O. 2006. Higher level phylogeny and morphological evolution of tyrant flycatchers, cotingas, manakins and their allies (Aves: Tyrannida). *Molecular Phylogenetics and Evolution,* 40(2): 471-483. https://doi.org/10.1016/j.ympev.2006.03.031.

Farnsworth, A. & Lebbin, D.J. 2004. Cinnamon Tyrant *Neopipo cinnamomea. In:* del Hoyo, J.; Elliott, A. & Christie, D.A. (Eds.). *Handbook of the birds of the world,* Barcelona, Lynx Edicions. v. 9, p. 352-353.

Feklova, T.Y. 2014. The expedition of Ilya G. Voznesensky to Russian America in 1839-1849 and the formation of the American collections in St. Petersburg academic museums. *Acta Baltica Historiae et Philosophiae Scientiarum,* 2(2): 55-69. https://doi.org/10.11590/abhps.2014.2.04.

Fisher, C.T. 1981. Specimens of extinct, endangered or rare birds in the Merseyside County Museums, Liverpool. *Bulletin of the British Ornithologists' Club,* 101(2): 276-285.

Fluck, M.R. 2004. *Basler Missionare in Brasilien: Auswanderung, Erweckung Und Kirchenwerdung Im 19. Jahrhundert.* Berlin, Peter Lang Gmbh Verlag.

Foster, L.S. 1892. The published writings of George Newbold Lawrence, 1844-1891. *Bulletin of the United States National Museum,* 40(4): 1-124. https://doi.org/10.5962/bhl.title.13445.

Fraipont, J. 1910. Oiseaux. Bulletin de l'Institut royal des Sciences naturelles de Belgique. Catalogue systématique et descriptif des collections zoologiques du Baron Edmond de Selys Longchamps. Systematische en beschrijvend catalogus van zoölogische collecties van Baron Edmond Selys Longchamps. *Bulletin van het Koninklijk Belgisch Instituut voor Natuurwetenschappen,* 31: 2-130.

Fransen, C.H.J.M.; Holthuis, L.B. & Adema, J.P.H.M. 1997. Type-catalogue of the Decapod Crustacea in the collections of the Nationaal Natuurhistorisch Museum, with appendices of pre-1900 collectors and material. *Zoologische Verhandelingen,* 311(1): 1-344.

Ghiraldi, L. & Aimassi, G. 2019. Extinct and endangered ('E&E') birds in the ornithological collection of the Museum of Zoology of Torino University, Italy. *Bulletin of the British Ornithologists' Club,* 139(1): 28-45. https://doi.org/10.25226/bboc.v139i1.2019.a2.

Gill, F.; Donsker, D. & Rasmussen, P. (Eds.). 2021. *IOC world bird list* (v11.1). https://doi.org/10.14344/IOC.ML.11.1.

Grigson, C. 2016. *Menagerie: The history of exotic animals in England, 1110-1837.* Oxford, Oxford University Press.

Heine, F. & Reichenow, A. 1882-1890. *Nomenclator Musei Heineani Ornithologici: Verzeichniss der Vogel-Sammlung Königlichen Oberamtmanns Ferdinand Heine, auf Klostergut St. Burchard vor Halberstadt.* Berlin, R. Friedländer & Sohn. https://doi.org/10.5962/bhl.title.49169.

Hellmayr, C.E. 1929. *Catalogue of birds of the Americas and the adjacent islands. Part 6. Oxyruncidae, Pipridae, Cotingidae, Rupicolidae, Phytotomidae.* Chicago, Field Museum of Natural History (Zoological Series. Publication 266).

Hilty, S.L. 2003. *Birds of Venezuela.* Princeton, NJ, Princeton University Press.

Hofberg, H.; Heurlin, F.; Millqvist, V. & Rubenson, O. (Eds.). 1906. *Svenskt biografiskt handlexikon alfabetiskt ordnade lefnadsteckningar af sveriges namnkunniga män och kvinnor från reformationen till nuvarande tid.* 2. ed. Stockholm, Albert Bonniers Förlag.

del Hoyo, J. & Collar, N.J. 2016. *HBW and BirdLife International illustrated checklist of the birds of the world.* Barcelona, Lynx Edicions. v. 2.

Hume, J.P. & Walters, M. 2012. *Extinct birds.* London, T. & A.D. Poyser.

Ihering, H. von. 1900. Aves observadas em Cantagalo e Nova Friburgo. *Revista do Museu Paulista,* 4: 149-164.

Jobling, J.A. 2010. *The Helm dictionary of scientific bird names.* London, Christopher Helm.

Johnson, E.I. & Wolfe, J.D. 2018. *Molt in Neotropical birds. Life history and aging criteria.* Boca Raton, Taylor & Francis. (Studies in Avian Biology Vol. 51). https://doi.org/10.4324/9781315119755.

King, W.B. 1978-1979. *Red Data book, 2. Aves.* 2. ed. Morges, IUCN.

Kirwan, G.M. & Green, G. 2011. *Cotingas and manakins.* London, Christopher Helm.

Knox, A.G. & Walters, M.P. 1994. Extinct and endangered birds in the collections of The Natural History Museum. *British Ornithologists' Club Occasional Publications,* 1: 1-292.

Kofoid, C.A. 1923. A little known ornithological journal and its editor Adolphe Boucard, 1839-1904. *Condor,* 25(3): 85-89. https://doi.org/10.2307/1362665.

Krabbe, N. 2007. Birds collected by P.W. Lund and J.T. Reinhardt in south-eastern Brazil between 1825 and 1855, with notes on P.W. Lund's travels in Rio de Janeiro. *Revista Brasileira de Ornitologia,* 15(3): 331-357.

Krausch, H.-D. 2002. Friedrich Sello, ein vergessener Pflanzensammler aus Potsdam. *Zandera,* 17(2): 73-76.

Lambert, F. & Kirwan, G.M. 2010. The twice-vanishing 'pardalote': what future for the Kinglet Calyptura? *Neotropical Birding,* 6: 4-17.

Lees, A.C. & Pimm, S. 2015. Species, extinct before we know them? *Current Biology,* 25(7): R177-R180. https://doi.org/10.1016/j.cub.2014.12.017.

Lima, L.M. 2005. O acervo ornitológico brasileiro do Finnish Museum of Natural History, Helsinki, Finlândia. *In:* Congresso Brasileiro de Ornitologia, Belém, 13º. *Resumos.* Belém, Sociedade Brasileira de Ornitologia. p. 160.

Lockhart, J. & Schwartz, S.B. 1983. *Early Latin America.* New York, Cambridge University Press.

Lopes, R.J.; Faria, P.M.V.; Gomes, D.; Freitas, B. & Málinger, J. 2021. The hummingbird collection of the Natural History and Science Museum of the University of Porto (MHNC-UP), Portugal. *Biodiversity Data Journal,* 9: e59913. https://doi.org/10.3897/BDJ.9.e59913.

Löwegren, Y. 1968. *Zoologiska museet och institutionen vid Lunds universitet. Ur Lunds universitets historia, del 6.* Lund, Gleerups.

McGhie, H.A. 2005. Specimens of extinct and endangered birds in the collections of the Manchester Museum. *Bulletin of the British Ornithologists' Club,* 125(4): 247-252.

McNett, G.D. & Marchetti, K. 2005. Ultraviolet degradation in carotenoid patches: live versus museum specimens of wood warblers (Parulidae). *Auk,* 122(4): 793-802. https://doi.org/10.1093/auk/122.3.793.

Mearns, B. & Mearns, R. 1988. *Biographies for birdwatchers. The lives of those commemorated in Western Palearctic bird names.* London, Academic Press.

Mearns, B. & Mearns, R. 1992. *Audubon to Xantus. The lives of those commemorated in North American bird names.* San Diego, Academic Press.

Mearns, B. & Mearns, R. 1998. *The bird collectors.* London, Academic Press.

Miller, D.; Warren, R.; Moura Miller, I. & Seehawer, H. 2006. *Serra dos Órgãos. Sua história e suas orquídeas.* Rio de Janeiro, Editora Soart.

Minvielle, M.E. 1981. *Carlos Euler, origens, vida e obras: um engenheiro na "idade de ouro" da Central do Brasil.* Rio de Janeiro, Gráfica do Livro.

Möbius, K. 1870. Friedrich Boie. Nekrolog. *Journal für Ornithologie,* 18: 231-233. https://doi.org/10.1007/BF02249927.

Moret, P. 2012. La péninsule ibérique et l'entomologie européenne au xixe siècle. *In:* Lemps, X.H. & Luis, J.-P. (Ed.). *Sortir du labyrinthe, Madrid.* p. 479-502. (Collection de la Casa de Velázquez, 131). https://doi.org/10.4000/books.cvz.24064.

Mulsant, E. 1878. Notice sur Jean-André Malmazet. *Annales de la Société Linnéenne de Lyon et des Société Botanique de Lyon, Société d'Anthropologie et de Biology de Lyon réunies,* 25: 75-82.

Ohlson, J.I.; Fjeldså, J. & Ericson, P.G.P. 2008. Tyrant flycatchers coming out in the open: phylogeny and ecological radiation in Tyrannidae (Aves: Passeriformes). *Zoologica Scripta,* 37(3): 315-335. https://doi.org/10.1111/j.1463-6409.2008.00325.x.

Ohlson, J.I.; Irestedt, M.; Fjeldså, J. & Ericson, P.G.P. 2012. Nuclear DNA from a 180-year-old study skin reveals the phylogenetic position of the Kinglet Calyptura *Calyptura cristata* (Passeriformes: Tyrannides). *Ibis,* 154(3): 533-541. https://doi.org/10.1111/j.1474-919X.2012.01243.x.

Olalla, A.M. 1943. Algumas observações sobre a biologia das aves e mamíferos sul-americanos. *Papéis Avulsos do Departamento de Zoologia de São Paulo,* 3: 229-236. https://doi.org/10.11606/0031-1049.1940.1p229-236.

Pacheco, F. 1988. Black-hooded Antwren *Formicivora [Myrmotherula] erythronotos* re-discovered in Brazil. *Bulletin of the British Ornithologists' Club,* 108(4): 179-182.

Pacheco, J.F. 1999. Galleria biographica IV: o Professor Wilhelm Behn (1808-1878) e a ornitologia brasileira. *Atualidades Ornitológicas,* 92: 6.

Pacheco, J.F. 2004. Pílulas históricas VI Sabará ou Cuiabá? O problema das localidades de Ménétriès. *Atualidades Ornitológicas,* 117: 4-5.

Pacheco, J.F. & Bauer, C. 2001. A lista de aves do Espírito Santo de Augusto Ruschi (1953): uma análise crítica. *In:* Albuquerque, J.L.B., Cândido, J.F.; Straube, F.C. & Roos, A.L. (Eds.). *Ornitologia e conservação: da ciência às estratégias.* Tubarão, Editora Unisul. p. 261-278.

Pacheco, J.F. & Fonseca, P.S.M. 2000. A admirável redescoberta de *Calyptura cristata* por Ricardo Parrini no contexto das preciosidades aladas da Mata Atlântica. *Atualidades Ornitológicas,* 93: 6-7.

Pacheco, J.F. & Fonseca, P.S.M. 2001. The remarkable rediscovery of the Kinglet Calyptura *Calyptura cristata. Cotinga,* 16: 48-51.

Palmgren, P. 1936. *Calyptura cristata* von R.F. Sahlberg in der Gegend von Rio de Janeiro gefunden. *Ornis Fennica,* 13: 173.

Paynter, R.A. & Traylor, M.A. 1991. *Ornithological gazetteer of Brazil.* Cambridge, Museum of Comparative Zoology.

Peale, T.R. 1849. *United States Exploring Expedition. During the years 1838, 1839, 1840, 1841, 1842. Mammalia and ornithology.* Philadelphia, C. Sherman. [Dating of this important work follows Bruce & Bahr, 2020].

Peck, R. 1878. Verzeich niss der in dem Gesellschaftsjalire 1878-1879 als Geschenke und durch Ankauf für die Sammlungen eingegangenen Gegenstände. *Abhandlungen der Naturforschenden Gesellschaft zu Görlitz,* 17: 264-266.

Peixoto, M.E.S. 1989. *Pintores alemães no Brasil durante o século XIX.* Rio de Janeiro, Pinakotheke.

Pelzeln, A. von. 1868-1871. *Zur Ornithologie brasiliens: Resultate von J. Natterers reisen in den Jahren 1817-35.* Wien, A. Pichler's Witwe & Sohn. https://doi.org/10.5962/bhl.title.3654.

Pinto, O.M.O. 1944. *Catálogo das aves do Brasil.* 2ª parte. São Paulo, Departamento de Zoologia.

Poesch, J.P. 1961. *Titian Ramsay Peale and his journals of the Wilkes Expedition.* Philadelphia, American Philosophical Society.

Pôrto, A.; Sanglard, G.; Fonseca, M.R.F. & Costa, R.G.R. 2008. *História da saúde no Rio de Janeiro: instituições e patrimônio arquitetônico (1808-1958).* Rio de Janeiro, Editora Fiocruz. https://doi.org/10.7476/9788575415993.

Purcell, R.W. 1999. *Swift as a shadow: extinct and endangered animals.* Boston, Houghton Mifflin Co.

Rego, M.A.; Moreira-Lima, L.; Silveira, L.F. & Frahnert, S. 2013. On the ornithological collection of Friedrich Sellow in Brazil (1814-1831), with some considerations about the provenance of his specimens. *Zootaxa,* 3616(5): 478-484. https://doi.org/10.11646/zootaxa.3616.5.4.

Remsen, J.V.; Areta, J.I.; Bonaccorso, E.; Claramunt, S.; Jaramillo, A.; Lane, D.F.; Pacheco, J.F.; Robbins, M.B.; Stiles, F.G. & Zimmer, K.J. 2021. *A classification of the bird species of South America. American Ornithological Society.* Version 15 July 2021. Available: http://www.museum.lsu.edu/~Remsen/SACCBaseline.htm. Access: 07/2021.

Ridgely, R.S. & Tudor, G. 1994. *The birds of South America.* Austin, University of Texas Press. v. 2.

Riedler, R.; Pesme, C.; Druzik, J.; Gleeson, M. & Pearlstein, E. 2014. A review of color-producing mechanisms in feathers and their influence on preventive conservation strategies. *Journal of the American Institute for Conservation,* 53(1): 44-65. https://doi.org/10.1179/1945233013Y.0000000020.

Roselaar, C.S. 2003. An inventory of major European bird collections. *In:* Collar, N.J.; Fisher, C.T. & Feare, C.J. (Eds.). *Why museums matter: avian archives in an age of extinction. Bulletin of the British Ornithologists' Club Supplement,* 123A. p. 253-337.

Rothschild, M. 2008. *Walter Rothschild: the man, the museum and the menagerie.* London, Natural History Museum.

Ruschi, A. 1953. Lista das aves do Estado do Espírito Santo. *Boletim do Museu de Biologia Professor Mello Leitão, série Zoologia,* 11: 1-21.

Salvin, O. 1882. *A catalogue of the collection of birds formed by the late Hugh Edwin Strickland.* Cambridge, Cambridge University Press. https://doi.org/10.5962/bhl.title.29379.

Sauer, G.C. 1995. *John Gould the bird man: associates and subscribers.* Mansfield Centre, CT, Maurizio Martino.

Sauer, G.C. 1998a. *John Gould the bird man: correspondence.* Mansfield Centre, CT, Maurizio Martino. v. 1.

Sauer, G.C. 1998b. *John Gould the bird man: correspondence.* Mansfield Centre, CT, Maurizio Martino. v. 2.

Sauer, G.C. 1999. *John Gould the bird man: correspondence.* Mansfield Centre, CT, Maurizio Martino. v. 3.

Scherzer, K. 1861-1863. *Narrative of the circumnavigation of the globe by the Austrian frigate Novara: undertaken by order of the imperial government, in the years 1857, 1858, & 1859,* 3 vols. London, Saunders, Otley & Co.

Sclater, P.L. 1862. *Catalogue of a collection of American birds.* London, N. Trubner & Co. https://doi.org/10.5962/bhl.title.13323.

Sclater, P.L. 1888. *Catalogue of the birds in the British Museum.* London, Trustees of the British Museum. v. 14.

Sclater, P.L. 1890. *Catalogue of the birds in the British Museum.* London, Trustees of the British Museum. v. 15.

[Sclater, P.L.] 1893. Obituary: Henry Whitely. *Ibis,* (6)5: 287-289.

Sharpe, R.B. 1906. *The history of the collections contained in the natural history departments of the British Museum, vol 2. Birds.* London, Trustees of the British Museum. https://doi.org/10.5962/bhl.title.14168.

Sick, H. 1997. *Ornitologia brasileira.* Rio de Janeiro, Editora Nova Fronteira.

Sick, H. & Pabst, L.F. 1968. As aves do Rio de Janeiro (Guanabara). Lista sistemática anotada. *Arquivos do Museu Nacional do Rio de Janeiro,* 53: 99-160.

Sigrist, T. 2006. *Aves do Brasil: uma visão artística.* Vinhedo, Editora Avis Brasilis.

Smirnov, P.A. 2018. [Poster: Extinct and probably extinct birds in the collection of the Zoological Museum of Moscow State University M.V. Lomonosov]. *First All-Russian Ornithological Congress, Tver, January 29-February 4, 2018.* Available: https://istina.msu.ru/download/100034719/1lec9O:9mcwOeL2keMc0O59Pcjeh7lCNYY. Access: 06/05/2021. (in Russian)

Snow, D.W. 1973. The classification of the Cotingidae (Aves). *Breviora,* 409: 1-27.

Snow, D.W. 1979. Family Cotingidae, cotingas. *In:* Traylor, M.A. (Ed.). *Check-list of birds of the world.* Cambridge, Museum of Comparative Zoology. v. 8, p. 281-308.

Snow, D.W. 1982. *The Cotingas: bellbirds, umbrellabirds and other species.* London, British Museum (Natural History) & Ithaca, Cornell University Press.

Snow, D.W. 2004. Family Cotingidae (cotingas). *In:* del Hoyo, J.; Elliott, A. & Christie, D.A. (Eds.). *Handbook of the birds of the world,* Barcelona, Lynx Edicions. v. 9, p. 32-108.

Stone, W. 1899. A study of the type specimens of birds in the collection of the Academy of Natural Sciences of Philadelphia, with a brief history of the collection. *Proceedings of the Academy of Natural Sciences of Philadelphia,* 51(1): 5-62.

Stopiglia, R.; Straker, L.C. & Raposo, M.A. 2009. Kinglet Calyptura *Calyptura cristata* (Vieillot, 1818): documented record for the state of São Paulo and taxonomic status of the name *Pipra tyrannulus* Wagler, 1830. *Bulletin of the British Ornithologists' Club,* 129(3): 185-188.

Straube, F.C. & Pacheco, J.F. 2011. O naturalista Tschudi e a imigração suiça. *Educação em Linha,* 6(17): 27-29.

Stresemann, E. 1948. Der Naturforscher Friedrich Sellow († 1831) und sein Beitrag zur Kenntnis Brasiliens. *Zoologische Jahrbücher Jena Systematik,* 77: 401-425.

Swainson, W. 1841. *A selection of the birds of Brazil and Mexico: the drawings.* London, H.G. Bohn. https://doi.org/10.5962/bhl.title.49941.

Tello, J.G. 2004. Genus *Platyrinchus* (spadebills). *In:* del Hoyo, J.; Elliott, A. & Christie, D.A. (Eds.). *Handbook of the birds of the world.* Barcelona, Lynx Edicions. V. 9. p. 340-343.

Tello, J.G.; Moyle, R.G.; Marchese, D.J. & Cracraft, J. 2009. Phylogeny and phylogenetic classification of the tyrant flycatchers, cotingas, manakins and their allies (Aves: Tyrannides). *Cladistics,* 25(5): 429-467. https://doi.org/10.1111/j.1096-0031.2009.00254.x.

Tobias, J.A.; Butchart, S.H.M. & Collar, N.J. 2006. Lost and found: a gap analysis for the Neotropical avifauna. *Neotropical Birding,* 1: 4-22.

Urban, I. 1893. Biographische Skizzen. 1. Friedrich Sellow (1789-1831). *Botanische Jahrbücher fur Systematik, Pflanzengeschichte und Pflanzengeographie,* 17: 177-198.

Vanzolini, P.E. 1996. A contribuição zoológica dos primeiros naturalistas viajantes no Brasil. *Revista USP,* 30: 190-238. https://doi.org/10.11606/issn.2316-9036.v0i30p190-238.

Vieillot, L.P. 1818. Oiseaux. *In: Nouveau dictionnaire d'histoire naturelle.* Nouvelle édition. Paris, Deterville. v. 24.

Wagler, J. 1830. Revisio generis Pipra. *Isis von Oken,* 35: 928-943.

Waldeck, M. 2018. *The mysterious Kinglet Calyptura.* Available: http://thelittlestint.blogspot.com/2018/02/the-mysterious-kinglet-calyptura.html. Access: 06/05/2021.

Wartmann, F.B. 1874. Jahresbericht, erstattet in der 54. Hauptversammlung (21 October 1873) von Rector Dr. Wartmann. *Bericht über die Thäiigkeil der St. Gallischen naturwissenschaftlichen Gesellschaft während des Vereinsjahrcs,* 1872-73: 1-53.

Wasscher, M. & Dumont, H. 2013. Life and work of Michel Edmond de Selys Longchamps (1813-1900), the founder of odonatology. *Odonatologica,* 42(4): 369-402.

Published with the financial support of the "Programa de Apoio às Publicações Científicas da Universidade de São Paulo"