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Four decades after Belton: a review of records and evidences on the avifauna of Rio Grande do Sul, Brazil*

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ABSTRACT. We present a new update of the list of birds of the state of Rio Grande do Sul, Brazil, based on a thorough review of new records and evidences accumulated from February 2011 to July 2017. This is the fifth update since the first compilation based on a reasonably complete geographic coverage of the state, published by William Belton in 1978, and the second produced by a regional (informal) committee. It is also the first to widely use citizen science contributions available on shared portals and digital databases on the internet. Forty-three taxa were added, resulting in a final list with 704 species, 6.5% more than in the previous assessment in 2010. Two species were replaced due to taxonomic changes. Documentation for inclusions based on unpublished records is indicated or published here. We also updated the documentation of another 20 species previously included in the list. Inclusions represent mainly migrants recorded in the state as vagrants or irregular visitors (22), but also cases of recent range expansion (especially from the north) and previously overlooked resident or migratory taxa. The average rate of additions (over six species per year) was 30% higher than in the previous period and is expected to accelerate. The percentage of accepted species without documented records in the state decreased from 1.8% in 2010 to 0.7% in the current list. We attribute these results to a better spatial and temporal coverage of the state in recent years, mainly due to the increasing contribution of amateurs, who accounted for 60% of the new occurrences. In contrast, the percentage of species documented by museum specimens has decreased steadily over time (currently at 84%). Investment in scientific research and collection of voucher specimens in the state should keep pace with the growing interest birds arouse in society, due to the importance and usefulness of museum specimens.

KEYWORDS. Avifauna, checklist, new occurrence, distribution, documentation.

RESUMO. Quatro décadas após Belton: uma revisão de registros e evidências sobre a avifauna do Rio Grande do Sul, Brasil. Apresentamos uma nova atualização da lista das aves do estado do Rio Grande do Sul, Brasil, a partir da revisão de novos registros e evidências acumuladas no período de fevereiro/2011 a julho/2017. Esta é a quinta atualização desde a primeira compilação baseada em uma cobertura geográfica razoavelmente completa do estado, publicada por William Belton em 1978, e a segunda produzida por um comitê regional (informal). Também é a primeira a usar amplamente contribuições da ciência cidadã disponíveis em portais de compartilhamento e bases de dados digitais na internet. Foram adicionados 43 táxons, resultando em uma lista final com 704 espécies, 6,5% a mais do que na versão anterior (de 2010). Duas espécies foram substituídas devido a alterações taxonômicas. A documentação para as inclusões baseadas em registros não publicados é indicada ou apresentada aqui. Também atualizamos a documentação de outras 20 espécies previamente incluídas na lista. As inclusões representam principalmente migrantes registrados no estado como vagantes ou visitantes irregulares (22), mas também casos de expansões recentes de distribuição (especialmente a partir do norte) e táxons residentes ou migratórios previamente subamostrados. A taxa média de incremento da lista (mais de seis espécies novas por ano no período da presente revisão) foi 30% maior do que no período anterior e deverá continuar crescendo a um ritmo acelerado. A porcentagem de espécies sem documentação no estado caiu de 1,8% em 2010 para 0,7% na lista atual. Atribuímos estes resultados a uma melhor cobertura espacial e temporal do território estadual na atualidade, principalmente pelo aumento da contribuição de observadores amadores, responsáveis por 60% dos novos registros. Em contraste, o percentual de espécies documentadas por espécimes de museu vem diminuindo de forma constante ao longo do tempo, estando atualmente em 84%. Alertamos para o fato de que o investimento em pesquisa científica e na coleta de exemplares-testemunho no estado deve acompanhar o crescente interesse que as aves despertam na sociedade, devido à importância e utilidade dos espécimes de museu.

PALAVRAS-CHAVE. Avifauna, *checklist*, novas ocorrências, distribuição, documentação.

* *In memory* of André de Mendonça Lima, 1973–2015 (obituary in Hartz *et al*., 2015).

Unlike the scenario in most other Brazilian states, the avifauna of Rio Grande do Sul (hereafter RGS) can be considered reasonably well known (Bencke, 2001, 2010; Bencke *et al*., 2010). The assembly of the existing knowledge on the birds of RGS goes back to the end of the nineteenth century, but this relatively short history of investigation is marked by a few decades of fruitfulness interspersed with long periods of minimal or no progress in the ornithological knowledge. Between 1880 and 1892, the state was residence to the German naturalist Hermann von Ihering, who published the first annotated checklist of the birds of RGS (Ihering, 1899). Although pioneering, his list covered only a small part of the state's territory. Three decades later, Rudolf Gliesch produced the second list of the birds of RGS based on information collected by himself and collaborators mostly on the outskirts of Porto Alegre and along the northern littoral (Gliesch, 1930), but once again the list did not provide a representative picture of the state's avifauna (for a summary of the early history of ornithological investigation in RGS, see Belton, 1984). The next few decades witnessed only modest progress, with the work of Camargo (1962) standing out alone as the only significant contribution. This phase lasted until the first publications of the American ornithologist William Belton in the mid-1970s. Belton's contributions were particularly central and in many ways pioneering because he used for the first time standardized survey methods and covered all ecosystems and physiographic regions of the state. His work resulted in the first compilation of the birds of RGS based on a reasonably complete geographical coverage of the state's territory (Belton, 1978).

Since then, four updates of the RGS checklist were published: (1) Belton (1984; 1985) – the most important contribution to the ornithology of RGS, including distribution maps for all species listed, indication of museum specimens and original data on field marks, voice, seasonality, abundance, breeding, behavior, and ecology; (2) Belton (1994) – an updated Portuguese version of the previous work; (3) Bencke (2001) – the first review to adopt explicit criteria for the inclusion of species and to consider other types of documentation in addition to museum specimens; and (4) Bencke *et al*. (2010) – the first update produced by a regional, albeit informal, committee of ornithologists from some of the main research institutions in RGS. Therefore, in the last four decades the RGS checklist has been continuously revised and updated in a more or less standardized way, allowing comparisons between lists.

Since the first comprehensive assessment (*i.e.*, Belton, 1978), almost 100 new species have been added to the state list (Bencke *et al*., 2010). Comparing their data with the results of previous reviews, Bencke *et al*. (2010) detected an accelerated increase in the number of species recorded in RGS (over four new species per year in 2001–2010). They also drew attention to the increased contribution of amateurs to the improvement of the list, either by contributing new occurrences or by providing better documentation. As in other regions, the proliferation of field-based observers in the state has catalyzed the emergence of important bird records and also enhanced the detection of rare species, including some previously unrecorded within the country or state boundaries. A large proportion of these records are accompanied by documentation in the form of sound recordings or, more frequently, digital photographs, which enable the confirmation of the identifications by experts. In addition to this greater involvement of amateurs, a significant increase in the number of professional ornithologists working in the state is also evident in the last three decades (I. Franz, unpubl. data).

The Brazilian ornithology has benefited from the contribution of bird watchers and photographers in recent years as well. Both birding and (especially) wildlife photography are fast-growing activities that have gained many enthusiasts in Brazil through the development of digital databases (*e.g.*, WikiAves), specific events (*e.g.*, Avistar and Festival Brasileiro de Aves Migratórias), and specialized magazines (*e.g.*, Passarinhando and Uru). Besides being powerful tools for environmental education (Farias, 2007), these hobbies have great potential for generating large volumes of useful data (see Dickinson *et al*., 2010), for example, by nourishing national databases of bird records, which are key for spatial and temporal analysis, as well as for careful conservation planning (Giorgi *et al*., 2014; Lees & Martin, 2014; Pegas & Castley, 2014; Callaghan & Gawlik, 2015).

Continuing Belton's legacy, and now making broad use of public-access databases nourished by both amateur and professional birders, we provide here the fifth update of the checklist of the birds of RGS. Recent records and new evidences are thoroughly revised and implemented. Furthermore, as recommended by Bencke *et al*. (2010), we tried to distinguish between range extension vs. expansion and between instances of vagrancy and pseudo-vagrancy when interpreting the new occurrences, in order to contribute to a better understanding of the composition and dynamics of the regional avifauna.

MATERIALS AND METHODS

As defined by Bencke *et al*. (2010), the geographic coverage of the checklist includes the continental territorial area of RGS (281,748.54 km^2), as well as the corresponding territorial sea and Exclusive Economic Zone (EEZ) up to the limit of 200 nautical miles, or 370 km, from the coastline.

The list revised and updated by Bencke *et al*. (2010) served as the basis for the present review, which covers the period from February 2011 through July 2017. We incorporated all new information and updated the taxonomy and classification according to the latest checklist of Brazilian birds published by the Brazilian Ornithological Records Committee – CBRO (Piacentini *et al*., 2015). The only exceptions were the separation of the willets (Scolopacidae) into two distinct species, *Tringa semipalmata* (Gmelin, 1789) and *T. inornata*, in which case we followed Oswald *et al*. (2016), and the treatment of *Thalassarche steadi* Falla, 1933 as a full species, following Abbott & Double (2003a,b), Chambers *et al*. (2009), ACAP (2011) and del Hoyo *et al*. (2017a).

Criteria for inclusion of species in the list were the same as in Bencke *et al*. (2010). Accepted species must have (i) occurrence in the state documented by verifiable physical evidence in the form of a study skin or complete specimen, skeleton, photograph, video or audio recording, published in bibliographic sources or available for examination in scientific collections or archives of public access, or (ii) at least one state record supported by non-material evidence allowing an unequivocal diagnosis of the taxon involved, such as a circumstantiated written report containing a detailed description of, or reference to, the diagnostic features observed.

We compiled new information from published and unpublished sources. For new occurrences and documentation updates compiled from the scientific literature (including 'in press' manuscripts), we provide only basic metadata for each record in summary tables. Additional information on these published records can be obtained by consulting the original sources. For unpublished records, the information is presented or discussed in more detail and, as a rule, the available evidence is fully referenced or published here. In a few cases, however, we intentionally chose not to publish the evidence in order to preserve its novelty, as the authors of some of the new state records expressed the intent to publish their findings in the near future. In any case, we made sure that supporting evidence for these records is available for examination in archives of public access.

In general, only the evidence of higher support is indicated for each species, according to the following order of importance: specimen (complete or partial, in the form of dry study skin, skeleton or specimen preserved in liquid ["spirit specimen"]) > photograph or video > audio recording > circumstantiated sight record (*sensu* Bencke *et al*., 2010). More than one evidence is mentioned for species that present identification problems or when the main evidence is unsatisfactory, ambiguous or has uncertain availability.

We also updated the lists of species of probable and hypothetical occurrence in the state, following the criteria outlined in Bencke *et al*. (2010). In short, probable species are those for which the existing RGS records have distributional or biogeographic coherence but lack minimal ancillary information to allow a reliable taxonomic identification or an independent assessment of their validity; and hypothetical species are those known in RGS only from unsubstantiated records and whose occurrence in the state is not consistent with their distributional pattern.

Museum collections and digital libraries of photographs and/or sound recordings cited in the text are as follows: Museu de Ciências Naturais, Universidade Federal do Rio Grande do Sul, Imbé, RGS, Brazil (MUCIN); Coleção de Aves da Universidade Federal do Rio Grande-FURG, Rio Grande, RGS, Brazil (CAFURG); Museu de Ciências e Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, RGS, Brazil (MCP); Museu de Ciências Naturais, Universidade de Caxias do Sul, Caxias do Sul, RGS, Brazil (MCNCS); Museu de Zoologia da Universidade do Vale do Rio dos Sinos, São Leopoldo, RGS, Brazil (UNISINOS); Xeno-canto – digital database of bird sounds (XC; http://www.xeno-canto.org); Arquivo Sonoro Elias Coelho, Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil (ASEC); Macaulay Library, Cornell Lab of Ornithology, Ithaca, NY, USA (ML); WikiAves – digital database of photographs and sounds of Brazilian birds (WA; http://www.wikiaves.com.br); VIREO – Visual Resources for Ornithology, The Academy of Natural Sciences of Drexel University, Philadelphia, USA (VIREO; http://vireo.ansp.org). Ridgely & Tudor (2009) and the online encyclopedic databases Handbook of the Birds of the World Alive (del Hoyo *et al*., 2017b) and The Birds of North America (Rodewald, 2015) served as the main sources of information on geographic distribution and winter range of the species discussed in the text.

RESULTS

Additions. Our compilation of published and unpublished new records resulted in the addition of 42 species to the main list of the birds of RGS. An additional species (*Tringa inornata*) was included as a result of taxonomic changes affecting the state list, totaling 43 new species compared to the previous list (Tab. I). Of these, 27 had records for RGS previously published in the scientific literature since the last update of the list, though in a few cases without accompanying diagnostic documentation. The remaining 16 species had only unconfirmed (taxa uplisted from the "probable" and "hypothetical" categories) or unpublished records for the state (Tab. I). Two taxa (*Charadrius* sp. and *Catharus* **cf.** *swainsoni*) could not be safely identified to species level from the available evidence, but undoubtedly belong to species not previously recorded for RGS.

We were able to find documentation for all but one of the newly incorporated taxa. Of these, 36 are documented with photographs, three with museum specimens and two with photographs complemented by voice recordings (Tab. I). One Nearctic migrant (*Contopus virens*) was added based on the re-identification of a photographic record that had been erroneously identified in the WikiAves online archive (see below). The inclusion of the only undocumented species (*Pterodroma deserta*) is based on information retrieved from data-loggers attached to living individuals tracked to oceanic waters within the EEZ of the state.

We herein publish or explicitly indicate supporting voucher documentation for the occurrence of 18 new species for which no published evidence was available in the bibliography (Tab. I; Figs 1–15, 17–20), including one species (*Pseudocolopteryx acutipennis*) recently mentioned for the state without reference to any specific supporting documentation. With regard to *T. inornata*, although a specimen of its sister taxon *T. semipalmata* and photographs of both taxa had been previously mentioned for the state, no published photographs documenting its occurrence in RGS were available. We thus provide a photograph of an individual in nonbreeding (basic) plumage taken at the mouth of the Lagoa dos Patos estuary in 2014 (Fig. 4). We also indicate supplementary documentation

Tab. I. Species added to the main list of birds of Rio Grande do Sul, Brazil, recorded in the period February 2011–July 2017.

Taxa	Date	Location	Evidence	Source/Author
Anatidae				
Chloephaga picta (Gmelin, 1789)	21 January 2013	Parque Nacional da Lagoa do Peixe, Tavares	Published photograph	Bencke & Souza (2013)
Phoenicopteridae				
Phoenicoparrus jamesi (Sclater, 1886)	30 October 2013	About 1 km south of Barra do Estreito, São José do Norte	Published photograph	Dias & Cardozo (2014)
Diomedeidae				
Phoebetria palpebrata (Forster, 1785)[#]	14 May 2014 and 5 October 2016	Itapeva, Torres (29°23'S; 49°46'W) and Arroio do Sal (29°34'S; 49°54'W)	Skeleton (MUCIN 591); published photograph (Fig. 1)	This study (Maurício Tavares, MUCIN staff)
Procellariidae				
Pterodroma deserta Mathews, 1934	2008–2010	Within Exclusive Economic Zone of RGS	Data-logger recovery	Ramírez *et al*. (2013)
Calonectris diomedea (Scopoli, 1769)	March 2013	Southern coast of RGS	Specimen (CAFURG 626)	Oliveira *et al*. (2017)
Hydrobatidae				
Fregetta tropica (Gould, 1844)	27 May 2013	6.7 km north of Solidão lighthouse, Mostardas	Published photograph	Petry *et al*. (2016)
Accipitridae				
Gampsonyx swainsonii Vigors, 1825[#]	18 May 2014	Airfield of Palmeira das Missões	Published photograph	Wagener (2015)
Ictinia mississippiensis (Wilson, 1811)	6 November 2016	Hotel Fonte Ijuí (28°18'S; 53°55'W), Ijuí	Published photograph (Fig. 2)	This study (Carlos Eduardo Agne)
Buteo platypterus (Vieillot, 1823)	25 November 2010	Parque Estadual do Turvo, Derrubadas	Published photograph	Meller & Bencke (2012)
Heliornithidae				
Heliornis fulica (Boddaert, 1783)	17 October 2015	Banks of the Rio Marau, Marau (28°28'S; 52°11'W)	Published photograph (Fig. 3)	This study (Cláudio Longo)
Charadriidae				
Charadrius sp.	December 2015	Parque Nacional da Lagoa do Peixe (31°21'S; 51°02'W), Tavares	Photographs (WA1943013, WA1944101, WA1963959, WA1963968)	This study (André Luiz Briso, Flavio Ronaldo)
Scolopacidae				
Tringa inornata (Brewster, 1887)	17 April 2014	Lagoa dos Patos estuary (32°08'44"S; 52°04'42"W), São José do Norte	Published photograph (Fig. 4)	This study (Cláudio D. Timm); cited for RGS (as *T. semipalmata inornata*) by Martínez-Curci *et al.* (2014)
Numenius phaeopus (Linnaeus, 1758)	15 December 2015	Parque Nacional da Lagoa do Peixe (31°21'S; 51°02'W), Tavares	Photographs (WA1962248, WA2561401, WA2561475)	This study (Paulo Buchabqui Rodrigues, Pedro Sessegolo)
Thinocoridae				
Thinocorus rumicivorus Eschscholtz, 1829[†]	5 August 2016	Trilha das Figueiras (31°19'49"S; 51°03'44"W), Parque Nacional da Lagoa do Peixe, Tavares	Published photograph (Fig. 5)	This study (Flavio Ronaldo)
Stercorariidae				
Stercorarius maccormicki Saunders, 1893[*]	7 November 2011	Atlantic Ocean off RGS	Published photographs	Daudt *et al*. (in press)
Laridae				
Leucophaeus atricilla (Linnaeus, 1758)[†]	7 January 2016	Ocean beach at Cidreira (30°06'3"S; 50°10'26"W)	Published photograph (Fig. 6)	This study (Paulo Fenalti)
Sternidae				
Sterna vittata Gmelin, 1789	3 September 2012	Continental slope off RGS (c. 34°07'S; 51°19'W)	Published photograph	Carlos *et al*. (2017)

Tab. I. Cont.

Taxa	Date	Location	Evidence	Source/Author
Picidae				
Picumnus cirratus Temminck, 1825[#]	11 June 2014	Parque Estadual do Espinilho (30°10'46"S; 57°29'44"W), Barra do Quaraí	Specimen (MCP 4332)	First reported for RGS by Santos *et al*. (2015)
Melanerpes cactorum (d'Orbigny, 1839)	November/ December 2012	Parque Estadual do Espinilho, Barra do Quaraí	Published photograph	Pereira *et al*. (2013)
Furnariidae				
Tarphonomus certhioides (d'Orbigny & Lafresnaye, 1838)	21 July 2012	Parque Estadual do Espinilho, Barra do Quaraí	Published photograph	Repenning *et al*. (2012)
Phacellodomus sibilatrix Sclater, 1879	26 January 2012	Parque Estadual do Espinilho, Barra do Quaraí	Published photographs	Bellagamba & Oliveira (2012)
Pipridae				
Pipra fasciicauda Hellmayr, 1906	23 March and 6 September 2015	Derrubadas	Published photographs	Meller *et al*. (2016)
Rhynchocyclidae				
Todirostrum cinereum (Linnaeus, 1766)	7 November 2015	UFSM campus (27°55'S; 53°18'W), Palmeira das Missões	Published photograph (Fig. 7)	This study (Carlos Eduardo Agne)
Tyrannidae				
Phaeomyias murina (Spix, 1825)	12 December 2013	Near Rio Ijuí, Dezesseis de Novembro	Published photograph + audio recording (XC367617)	Pereira (2017)
Pseudocolopteryx acutipennis (Sclater & Salvin, 1873)	9 December 2012 and 28 December 2015	Lagoa da Custódia (30°01'16"S; 50°10'17"W), Tramandaí, and Porto do Barquinho (31°2'52"S; 51°0'17"W), Mostardas (see text)	Photographs (WA828480, WA1979557, WA1967150; Fig. 8)	This study (Paulo Fenalti, Oscar A. Fenalti, Vilde E. Florencio); first cited for RGS by Bornschein *et al.* (2017)
Casiornis rufus (Vieillot, 1816)	30 September 2013	Riparian forest of the Arroio Pindaí, Uruguaiana	Published photograph	Vizentin-Bugoni *et al.* (2015)
Tyrannus tyrannus (Linnaeus, 1758)	7 February 2017	Porto do Barquinho, Mostardas (31°03'03"S; 50°59'14"W)	Photographs (WA2461678, WA2462327, WA2462326, WA2479784; Figs. 9, 10)	This study (Gil Ribeiro Peres, Nina Wenoli, Flavio Ronaldo)
Fluvicola nengeta (Linnaeus, 1766)	9 January 2017	Parque Estadual da Guarita (29°21'S; 49°44'W), Torres	Photograph (WA2429646)	This study (Joel Martinez)
Contopus virens (Linnaeus, 1766)	8 November 2016	Chácara Manduca Belém (31°23'12"S; 51°7'38"W), Tavares	Published photographs (Figs. 11–14)	This study (José Laércio Junqueira Ribeiro)
Knipolegus aterrimus Kaup, 1853	23 August 2013	Carumbé, Uruguaiana	Published photograph	Bellagamba *et al*. (2016)
Muscisaxicola maclovianus (Garnot, 1826)	8 May 2011	Parque Nacional da Lagoa do Peixe, Tavares	Published photographs	Schwertner *et al*. (2011)
Muscisaxicola capistratus (Burmeister, 1860)	24 April 2015	Mostardas	Published photograph	Santos *et al*. (2017)
Xolmis velatus (Lichtenstein, 1823)	10 July 2015	Road to Lagoão (28°34'S; 53°31'W), Cruz Alta	Published photograph; also WA1753269	Anonymous (2015); Charles Boufleur
Xolmis rubetra (Burmeister, 1860)	15 August 2012	Uruguaiana	Published photograph	Bellagamba-Oliveira *et al.* (2013)
Agriornis micropterus Gould, 1839	8 September 2012	Estância Tarumã, Uruguaiana	Published photograph	Bellagamba *et al*. (2014)
Troglodytidae				
Campylorhynchus turdinus (Wied, 1831)[*]	26 April 2015	Urban area of Santa Maria	Published photographs	Vargas-Peixoto & Bosholn (2016)
Donacobiidae				
Donacobius atricapilla (Linnaeus, 1766)[†]	18 June 2015	Sewage treatment plant of São Borja (28°37'S; 56°00'W)	Published photograph (Fig. 15)	This study (Dirce Freitas)

Tab. I. Cont.

Taxa	Date	Location	Evidence	Source/Author
Turdidae				
Catharus **cf.** *swainsoni* (Tschudi, 1845)	15 February 2013 and 18 January 2016	Erechim (27°38'S; 52°16'W) and Marques de Souza (29°19'S; 52°06'W)	Published photograph (Fig. 16); also poor quality audio recordings (see text)	Meyer *et al.* (2014); this study (Maickel Sand)
Thraupidae				
Tangara ornata (Sparrman, 1789)	30 January 2010	Morro Azul, Três Cachoeiras (29°24'S; 49°57'W)	Published photograph (Fig.17)	This study (Amarildo Cardoso)
Sporophila hypochroma Todd, 1915†	1 February 2015	Touro Passo (29°37'23"S; 56°45'16"W), Uruguaiana	Photograph (WA1647035) + audio recording (WA1645476)	This study (Sergio Messias, Márcio Repenning)
Saltatricula multicolor (Burmeister, 1860)	7 May 2013	Uruguaiana	Published photograph	Bellagamba *et al*. (2013)
Thlypopsis sordida (d'Orbigny & Lafresnaye, 1837)	12 June 2012	Outskirts of Uruguaiana (29°45'12"S; 57°04'09"W)	Published photographs (Figs. 18, 19)	This study (Emilio Mandarino)
Sturnidae				
Sturnus vulgaris Linnaeus, 1758	29 October 2014	Near Cordilheiras (30°35'S; 53°50'W), Lavras do Sul	Published photograph (Fig. 20)	This study (Valerio Souza)#

* Listed as hypothetical in Bencke *et al*. (2010); † listed as probable in Bencke *et al*. (2010).

First reported for RGS and Brazil by Silva *et al*. (2017), but this source was issued to late to be included in the text.

for two other species that already had published records for RGS supported by material evidence (*Picumnus cirratus* and *Catharus* **cf.** *swainsoni*; Tab. I, Fig. 16).

Nine species included in the main list were upgraded from the lists of species of probable and hypothetical occurrence owing to new documented records (Tab. I), including representatives of three taxonomic families not previously represented in the state list (Thinocoridae, Heliornithidae and Donacobiidae). In contrast, 13 of the newly incorporated taxa had not been previously reported from the state in the bibliography and constitute genuine additions, of which two are new for Brazil as well (*Charadrius* sp. and *Sturnus vulgaris*).

Taxonomic changes. Two species included in the previous list were substituted due to taxonomic splits. *Thalassarche steadi* Falla, 1933 is considered a species distinct from *T. cauta* (Gould, 1841) and replaces the latter in the list. In addition, the southern, yellow-billed form of gray seedeater previously considered a variant morph of *Sporophila plumbea* (Wied, 1830) has recently been described as a new species, endemic to the upland grasslands of southern Brazil, *S. beltoni* Repenning & Fontana, 2013, which substitutes the former on the main list.

Documentation updates. We updated the documentation of 20 species previously included in the main list by compiling or providing higher-quality evidence for their occurrence in the state (Tab. II). Of these, eleven were previously known in RGS only from sight records, two were documented with voice recordings and seven with photographs. The new documentation includes eight museum specimens (in one case complemented by a voice recording), ten photographs (in one case complemented by a voice recording) and two audio recordings. Five updates were based on evidences previously published in bibliographic sources. We publish or indicate herein the new documentation for the remaining species (Tab. II, Figs 21–29). In one case (*Fluvicola albiventer*), we supplement the previous photographic documentation (VIREO archive d01/34/078) with a new photographic record because the former was only weakly connected to RGS.

Probable and hypothetical species. One species (*Sporophila iberaensis* Di Giacomo & Kopuchian, 2016) was added as probable and another three – *Progne* **cf.** *sinaloae* Nelson, 1898; *Sicalis citrina* Pelzeln, 1870, and *Cyanerpes cyaneus* (Linnaeus, 1766) – as hypothetical (Figs 30, 31), resulting in 21 species with unconfirmed records from RGS (Appendix 2 and 3).

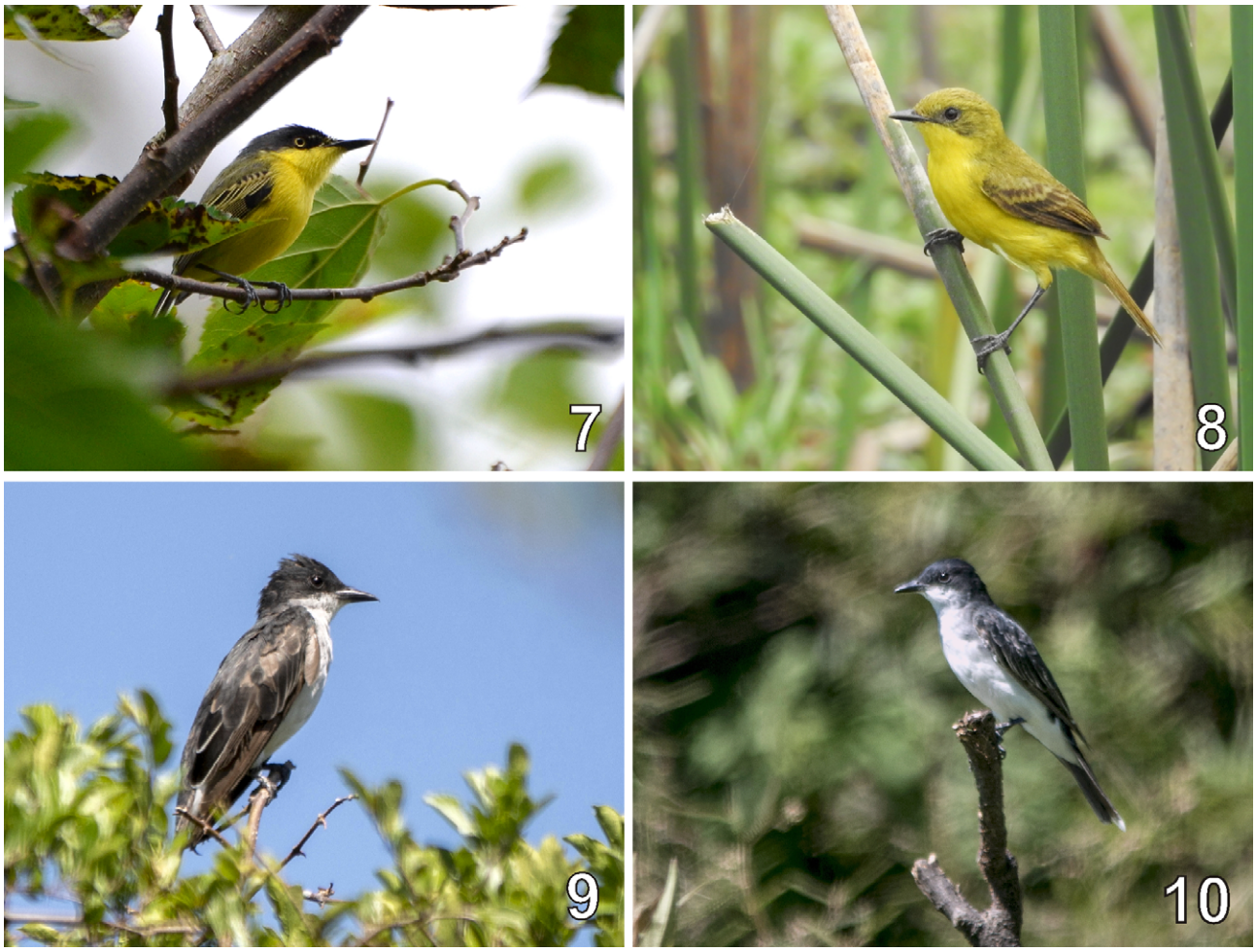
DISCUSSION

Updated list of the birds of RGS. The changes implemented here increase the number of accepted species in the RGS checklist to 704 (Appendix 1), 6.5% more than in the previous assessment (*i.e.*, Bencke *et al*., 2010). This increase was accompanied by a reduction in the number of species listed as probable and hypothetical in the state, from 10 and 16 to the current 7 and 14, respectively (Appendix 2 and 3), which signals an important gain in consistency towards the stability of the list.

Among the additions to the main list, nine (21%) are long-distance, non-pelagic boreal migrants that winter primarily in lower latitudes of the Neotropics or in the tropics and subtropics of the Old World and Australasia. Four of these (*Buteo platypterus*, *Leucophaeus atricilla*, *Contopus virens* and *Catharus* **cf.** *swainsoni*) are Nearctic breeders that have their normal wintering ranges well to the north of RGS and

Figs 1–6. Photographic documentation for six species added to the main list of birds of Rio Grande do Sul, Brazil: 1, *Phoebetria palpebrata*, Arroio do Sal, 5 October 2016 (M. Tavares); 2, *Ictinia mississippiensis*, juvenile, Ijuí, 6 November 2016 (C. E. Agne); 3, *Heliornis fulica*, presumed male, Marau, 17 October 2015 (C. Longo); 4, *Tringa inornata*, adult nonbreeding, São José do Norte, 17 April 2014 (C. D. Timm); 5, *Thinocorus rumicivorus*, male (left) and female (right), Tavares, 5 August 2016 (F. Ronaldo); 6, *Leucophaeus atricilla*, adult nonbreeding, Cidreira, 7 January 2016 (P. Fenalti).

are thus overshooting vagrants from North America. Two other Nearctic species, *Ictinia mississippiensis* and *Tyrannus tyrannus*, winter in areas much closer to RGS in central South America and were already somewhat expected. Both occur as vagrants or irregular visitors to adjacent areas of Argentina, and the latter has also been recently found south of our study area in Uruguay (Rodríguez-Cajarville *et al*., 2017). *Tringa inornata*, like its congener *T. semipalmata*, seems to be a scarce non-breeding visitor rather than a Nearctic vagrant in southeastern South America, as recently pointed out by Martínez-Curci *et al*. (2014). *Charadrius* sp. (*C. mongolus* or *C. leschenaultii*) and *Numenius phaeopus*, in contrast, are



Figs 7–10. Photographic documentation for three species added to the main list of birds of Rio Grande do Sul, Brazil: 7, *Todirostrum cinereum*, Palmeira das Missões, 7 November 2015 (C. E. Agne); 8, *Pseudocolopteryx acutipennis*, Mostardas, 28 December 2015 (P. Fenalti); 9, 10, *Tyrannus tyrannus*, Mostardas, 7 February 2017 (G. R. Peres).

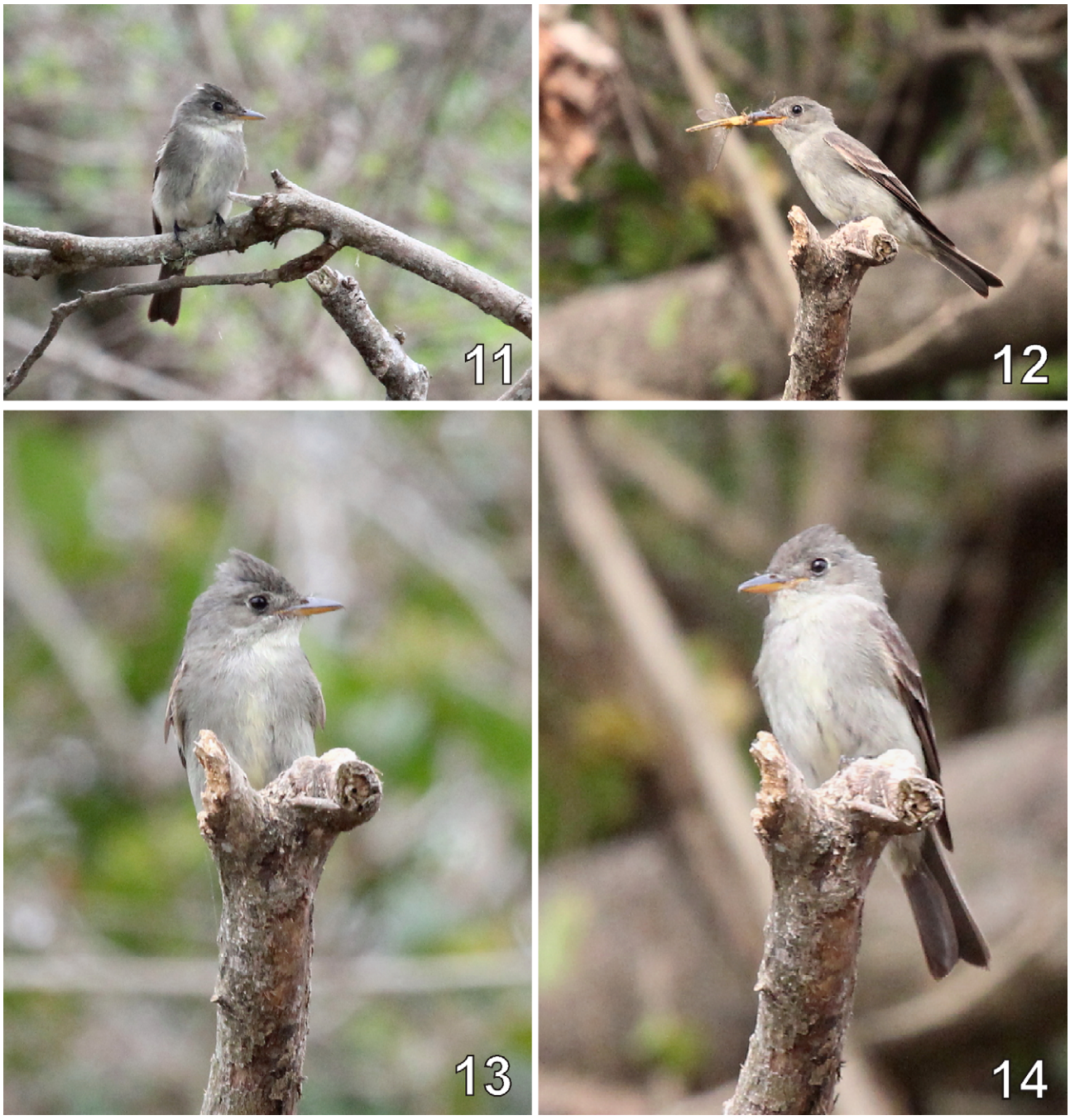
Tab. II. Documentation updates for species previously included in the main list of birds of Rio Grande do Sul, Brazil, period February 2011–July 2017.

Taxa	Previous evidence*	New evidence	Remarks/Source
Sulidae			
Sula leucogaster (Boddaert, 1783)	Published photograph	Skeleton (MUCIN 001, formerly UFRGS 001)	Franz *et al*. (2011)
Ardeidae			
Egretta caerulea (Linnaeus, 1758)	Published photograph	Specimen (CAFURG 532)	Lagoa dos Patos estuary (32°00'S; 52°09'W), unknown date
Cathartidae			
Cathartes burrovianus Cassin, 1845	Published photograph	Specimen (CAFURG 724)	Caçapava do Sul (30°31'S; 53°29'W), 1 October 2016 (Jeferson Vizentin-Bugoni, Juliana Cordeiro)
Accipitridae			
Chondrohierax uncinatus (Temminck, 1822)	Audio recording	Published photograph (Claudio Furini)	Tenente Portela (27°22'S; 53°45'W), 4 February 2017 (this work; Fig. 21)
Parabuteo unicinctus (Temminck, 1824)	Sight records	Published photograph	Bellagamba *et al*. (2015)
Pseudastur polionotus (Kaup, 1847)	Sight records	Published photograph (Élinton Rezende)	Vacaria (28°30'S; 50°56'W), 3 May 2015 (this work; Fig. 22)
Rallidae			
Neocrex erythrops (Sclater, 1867)	Sight record	Specimen (MCNCS DZ32c6.397c)	Bertin *et al*. (2017)

Tab. II. Cont.

Taxa	Previous evidence*	New evidence	Remarks/Source
Scolopacidae			
Calidris pugnax (Linnaeus, 1758)	Sight records	Published photograph (Marcelo Alievi)	Talha Mar road (31°15'S; 50°58'W), Parque Nacional da Lagoa do Peixe, Tavares (this work; Figs 23, 24)
Laridae			
Larus atlanticus Olrog, 1958	Published photograph	Specimen (MZUSP 86160)	Praia do Cassino (32°09'52"S, 52°07'00"W), Rio Grande, 18 August 2009 (Fabio Schunck, Bret Whitney, Fernando Jacobs)
Sternidae			
Chlidonias niger (Linnaeus, 1758)	Sight record	Published photographs (Paulo Fenalti, Raphael Kurz)	Mostardas (31°09'S; 50°48'W), 8 January 2014 and Rio Grande (32°11'S; 52°09'W), 8 March 2016 (this work; Figs 25, 26)
Strigidae			
Pulsatrix koeniswaldiana (Bertoni & Bertoni, 1901)	Published photograph	Specimen (UNISINOS 903)	Garcia *et al*. (2015)
Caprimulgidae			
Nannochordeiles pusillus (Gould, 1861)	Sight records	Published photograph (Dilson V. Peixoto)	Itaqui (29°08'S; 56°33'W), 27 November 2011 (this work; Fig. 27)
Trochilidae			
Polytmus guainumbi (Pallas, 1764)	Sight records	Photograph (WA942007) + audio recording (ML199133)	3 km south of Santa Bárbara do Sul (28°24'S; 53°16'W), 24 December 2012 (Márcio Repenning)
Picidae			
Campephilus leucopogon (Valenciennes, 1826)	Sight record	Published photograph (Carlos E. Agne)	Pai Passo (30°16'27"S; 57°25'44"W), Barra do Quaraí, 28 May 2015 (this work; Fig. 28)
Falconidae			
Falco rufigularis Daudin, 1800	Sight records	Published photograph	Meller (2013)
Furnariidae			
Cichlocolaptes leucophrus (Jardine & Selby, 1830)	Sight records	Audio recordings (XC393331, XC393332)	North of Aratinga (29°18'32"S, 50°11'02"W), São Francisco de Paula, 16 May 2002 (Glayson A. Bencke); XC180881, from "Parque Nacional Aparados da Serra, Cambará do Sul, RS", is clearly from southern Santa Catarina, based on altitude and coordinates
Tityridae			
Xenopsaris albinucha (Burmeister, 1869)	Published photographs (Prestes & Martinez 2011)	Specimen (MCP 3793)	Fazenda Pacífico (30°07'27"S, 57°09'15"W), Barra do Quaraí, 18 October 2013 (Márcio Repenning, Mauricio S. Pereira)
Tyrannidae			
Phyllomyias griseocapilla Sclater, 1862	Sight records	Audio recording (ASEC 16392)	Maquiné (29°40'S; 50°12'W), 18 March 2010 (Grasiela Casas)
Serpophaga griseicapilla Straneck, 2007	Audio recording	Specimen (MZUSP 86172) + audio recording (ML 229921)	Banhado do Capão Seco (31°51'20"S, 52°16'25"W), Rio Grande, 17 August 2009 (Fabio Schunck, Bret Whitney, Fernando Jacobs)
Fluvicola albiventer (Spix, 1825)	Photograph	Published photograph (Ricardo O. de Oliveira)	Uruguaiana (29°46'S; 57°05'W), 23 October 2015 (this work; Fig. 29)

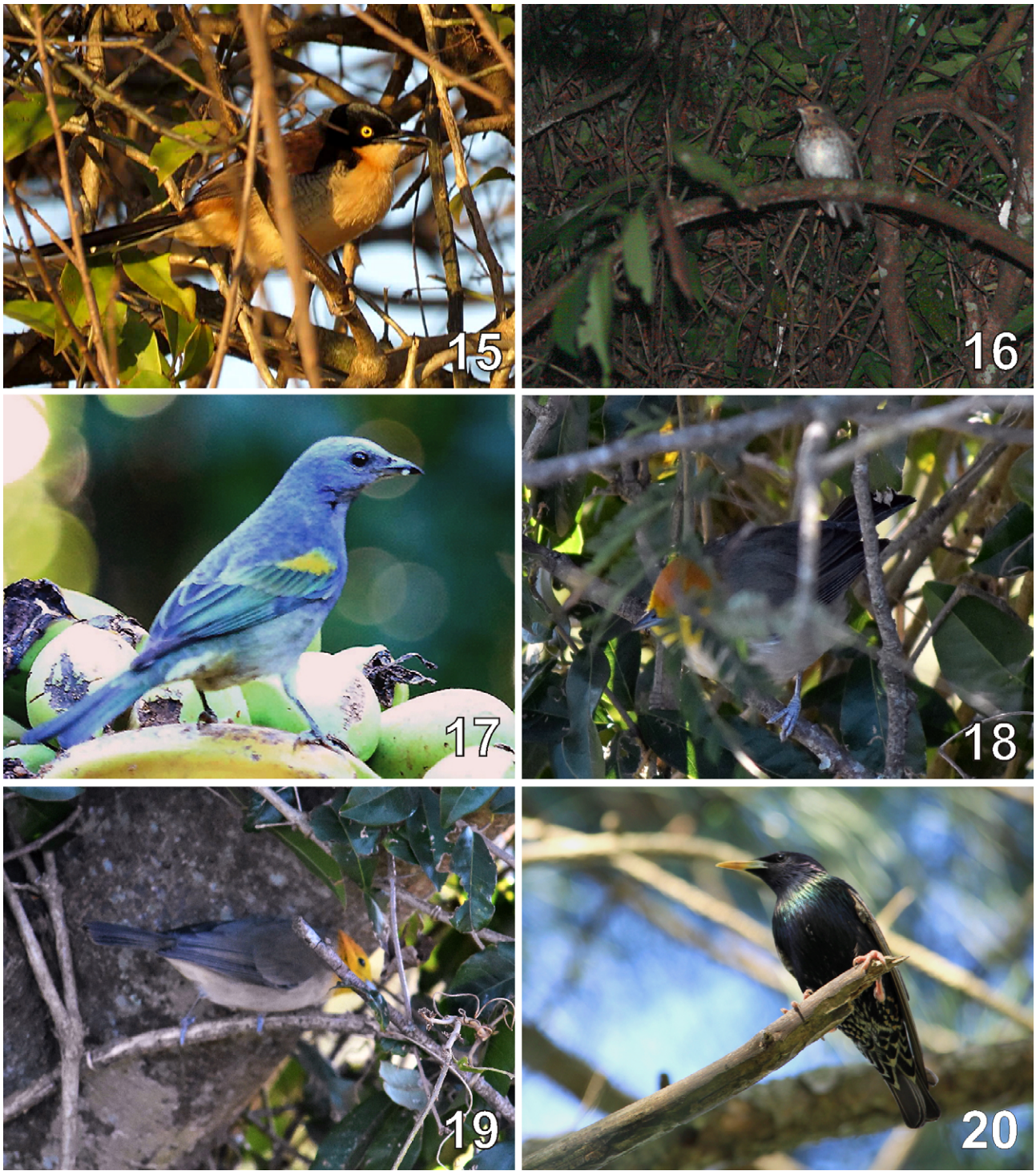
* According to Bencke *et al*. (2010) or otherwise specified.



Figs 11–14. *Contopus virens*, Tavares, 8 November 2016 (J. L. J. Ribeiro). Note the whitish throat, center breast and belly contrasting with the darker breast-sides (giving a "vested" appearance), relatively long, pointed wings, distinct wing bars, and rather heavy-looking bill, which exclude the sympatric *C. cinereus*. The combination of a pale overall coloration (especially underneath), extensively orange-yellow lower mandible and relatively long tail extension are consistent with *C. virens* and not *C. sordidulus*.

casual or accidental vagrants to RGS and South America, since both records involved migrating birds that obviously strayed well off their normal routes. The occurrence of the latter is presumably linked to the transatlantic vagrancy of Palearctic migrants headed to Africa from northwestern Europe. Such birds may continue heading south after arriving in equatorial South America or the Caribbean and may eventually reach higher latitudes along the Brazilian coast. The only previous records of *N. phaeopus* in Brazil are from Fernando de Noronha Archipelago, a well-known vagrant trap for Old World species (Silva e Silva & Olmos, 2006). Concerning *Charadrius* sp., a central Asian species, two distinct routes by which displaced or misoriented migrants can reach South America are perhaps equally likely: one crossing the Atlantic ocean from Africa and the other via the islands off western Alaska and the Pacific coast of North America.

Eight other additions (19%) are austral migrants that breed in the southern cone of South America and in some cases also northward along the Southern and Central



Figs 15–20. Photographic documentation for five species added to the main list of birds of Rio Grande do Sul, Brazil: 15, *Donacobius atricapilla*, São Borja, 18 June 2015 (D. Freitas); 16, *Catharus* **cf.** *swainsoni*, Marques de Souza, 18 January 2016 (M. Sand); 17, *Tangara ornata*, Três Cachoeiras, 30 January 2010 (A. Cardoso); 18, 19, *Thlypopsis sordida*, Uruguaiana, 12 June 2016 (E. Mandarino); 20, *Sturnus vulgaris*, male in breeding season, Lavras do Sul, 29 October 2014 (V. Souza).

Andes. At least the southern populations of these species are migratory and winter in lower latitudes of the continent, mostly in north-central Argentina, Paraguay and southern Bolivia, or along either coast of South America or the Andes, as far north as southern Peru and Uruguay. Among these, *Chloephaga picta*, *Muscisaxicola capistratus* and *Agriornis micropterus* appear to be overshooting vagrants to RGS, while *Thinocorus rumicivorus*, *Knipolegus aterrimus*, *Muscisaxicola maclovianus* and *Xolmis rubetra* have known wintering ranges extending almost to RGS and may be more regular than currently documented. Regarding *Pseudocolopteryx acutipennis*, Bornschein *et al*. (2017)

suggested that birds recorded in RGS may be latitudinal migrants in transit between breeding grounds in the Pampas of Argentina and wintering areas in coastal marshes of southeastern Brazil. The existence of a restricted breeding population of *P. acutipennis* in the lowlands of southeastern South America has only recently been revealed (Roesler, 2009). Therefore, these records are most likely attributable to pseudo-vagrancy (*sensu* Gilroy & Lees, 2003), *i.e.*, extralimital records of seemingly vagrant individuals that are actually pioneering new migration routes or using previously unknown migratory flyways at low densities (see Dias *et al*., 2010).

Though not considered an austral migrant (*sensu* Chesser, 1994 and Stotz *et al*., 1996), *Phoenicoparrus jamesi* moves from its breeding sites in the high Andean plateaus to lower elevation wetlands in the central plains of Argentina in the non-breeding season (Caziani *et al*., 2007). Dias & Cardozo (2014) attributed the only RGS record of this species to vagrancy and speculated that it might have reached the Atlantic coast of the state following the more abundant and widespread Chilean Flamingo *Phoenicopterus chilensis* Molina, 1782, which breeds in north-central Argentina and regularly migrates to southern Brazil.

Six novel species (14%) are pelagic or coastal seabirds that disperse widely in southern oceans or throughout the Atlantic in non-breeding season. All but *Phoebetria palpebrata* are expected as regular (albeit scarce) transients or non-breeding visitors to waters off southern Brazil based on their known at-sea distribution and migration routes. Three are transequatorial migrants from the northern (*P. deserta*, *Calonectris diomedea*) or southern hemisphere (*Stercorarius maccormickii*). The latter is mostly pelagic in winter (Furness *et al*., 2017), while the coastal *Sterna vittata* may be overlooked because of identification problems and potential confusion with similar species present along the RGS coast at different times of the year (Bugoni & Vooren, 2005). *Fregetta tropica* has tentatively been regarded as rare off the coast of southern and southeastern Brazil, but nocturnal habits and difficulty of distinguishing it from *F. grallaria* (Vieillot, 1818) in pelagic censuses may be leading to an underestimation of its regional abundance (Petry *et al*., 2016). Records of *P. deserta* in particular point to the great potential of geolocation data to reveal the occurrence of rare or unexpected seabirds in pelagic waters within the Exclusive Economic Zone of the state, particularly species that are not usually attracted to fishing vessels, as is the case with most gadfly petrels (*Pterodroma* spp.). As demonstrated by such studies, *Pterodroma arminjoniana* (Giglioli & Salvadori, 1869) has a high probability of occurrence in RGS territorial waters during the breeding season (Krüger *et al*., 2016). This species has been recorded in both Uruguayan (Abreu *et al*., 2010) and Argentinean (Savigny *et al*., 2005) waters, and therefore is a strong candidate to have its occurrence in RGS confirmed in the near future.

Four additions (9%) – *Melanerpes cactorum*, *Tarphonomus certhioides*, *Phacellodomus sibilatrix* and *Saltatricula multicolor* – are non-migratory species primarily or entirely restricted to the Chaco region (Stotz *et al*., 1996), of which the Espinal Province (*sensu* Cabrera & Willink, 1973) can be considered an extension. The Espinal reaches RGS as the *Vachellia–Prosopis* espinilho parkland, typical of the westernmost tip of the state, where several Chaco species occur (Belton, 1984). Bird species above have range boundaries nearly abutting the western border of RGS in adjacent Argentina and Uruguay. Because range boundaries are dynamic and abundances tend to be lower near the edges of a species distribution (Brown *et al*., 1996), the presence of extralimital Chaco specialists in this part of the state, either as "transgressive" individuals or temporary colonizers, may simply reflect the spatial variation that is expected to occur over time at the periphery of their geographic distributions. The same may apply to records of *P. cirratus*, which presumably refer to the Chaco subspecies *pilcomayensis*, although in this case a recent range expansion may also be involved (Santos *et al*., 2015). *Saltatricula multicolor* is considered largely sedentary (Jaramillo, 2017), but data presented by Delhey & Scorolli (2002) indicate that it is apparently migratory at the southern end of its range in La Pampa and southwestern Buenos Aires provinces. Therefore, birds recorded in RGS in May (Bellagamba *et al*., 2013) could alternatively be thought of as being austral migrants originating in this region, as suspected by Di Giacomo (2005) for birds recorded mostly in fall and winter at El Bagual Reserve in the province of Formosa, Argentina.

At least nine species added (21%) are, or are likely to be, recent invaders from the north. These include both open-zone (*Gampsonyx swainsoni*, *Todirostrum cinereum*, *Phaeomyias murina*, *Fluvicola nengeta*, *Xolmis velatus*, *Casiornis rufus*, *Campylorhynchus turdinus*) and forest-based species (*Pipra fasciicauda*, *Tangara ornata*). Explicit evidences of recent range expansion in southeastern South America exist for *T. cinereum*, *F. nengeta*, *C. turdinus* and *X. velatus* (Piacentini *et al*., 2004; Straube *et al*., 2007; Bodrati *et al*., 2012; Meyer, 2013, 2016), and elsewhere for *G. swainsoni* and *F. nengeta* (Aguiar, 2010; Dort *et al*., 2010). With the exception of *C. rufus*, none of these species has so far been reported from Uruguay. *Melanerpes cactorum* is believed to be expanding its range in northeastern Buenos Aires province (Guerrero & Agnolin, 2016) and should perhaps be included among the newly colonizing species. Records of *C. rufus* in northwestern Uruguay are recent and suggest a range expansion directly from the Paraná–Paraguay river corridor or from the south, since the species is apparently absent along the Uruguay river in eastern Corrientes, but occasionally reach the gallery forests of the La Plata river (Montaldo & Roitman, 1999). A double invasion of the state by *F. nengeta* and *X. velatus* can be inferred from the WikiAves records. Both species appear to have entered RGS simultaneously from the north/northwest and via the southern littoral of Santa Catarina, thereby circumventing the highlands of the Planalto. Birds of open and semi open zones undoubtedly benefited from large-scale land-use changes in originally forested regions of southern Brazil, northeastern Argentina (Misiones) and southeastern Paraguay, which

created favorable conditions and enabled the southward dispersion of these species. Significant positive trends in surface air temperature recorded in southern Brazil and elsewhere in southeastern South America over the last few decades may also be driving shifts in regional species ranges (Bencke, 2010; Guerrero & Agnolin, 2016).

Thlypopsis sordida and *Donacobius atricapilla* may be recent invaders from the north as well. The former is suspected to be expanding in southern Brazil (Arzua *et al*., 2001; Ghizoni-Jr & Silva, 2006), while the latter is known from unconfirmed records in RGS (Bencke, 2001). However, both have been recorded in southern Misiones and eastern Corrientes close to the RGS border (Chebez, 1996; Capllonch *et al*., 2005; Nores *et al*., 2005), either historically or in recent times, and may simply have gone unnoticed until recently.

The record of *Heliornis fulica* does not clearly fit into any of the previous cases. Instances of short-distance vagrancy involving this species have been recorded elsewhere (Trinidad, Bonaire and New Mexico, USA; Bertram & Kirwan, 2017). Nearby RGS, it is known from several localities in the provinces of Misiones and Corrientes (south to at least 30°S) and from an old record in northeastern Santa Catarina (Carbonell, 1987; Parera, 1987; Rosário, 1996). It may be regularly present in RGS in small numbers and should be looked for along the Ibicuí and other well preserved rivers of the north and west of the state.

Finally, the exotic *S. vulgaris* has not been listed among the non-native bird species introduced to Brazil (Fontoura *et al*., 2013). It is presumably spreading northwards from Uruguay and Argentina, perhaps via jump dispersal, since it is not known to occur in these countries close to the RGS border. However, its establishment in the state as a wild bird has yet to be confirmed.

Documentation. Following the documentation updates, the percentage of accepted species without documented occurrence in the state decreased from 1.8% in 2010 to 0.7% in the present review. Currently, only five RGS species still lack documentation. These are known exclusively from sight records – *Notharchus swainsoni* (Gray, 1846), *Anodorhynchus glaucus* (Vieillot, 1816) and *Chloris chloris* (Linnaeus, 1758) – and band/data-logger recoveries – *P. deserta* and *Anas discors* Linnaeus, 1766. Of the 699 species for which physical evidence is available, 590 are documented primarily by museum specimens (in one case complemented by an audio recording), three by osteological material, 95 by photographs (in three cases complemented by voice recordings), and 11 by audio recordings.

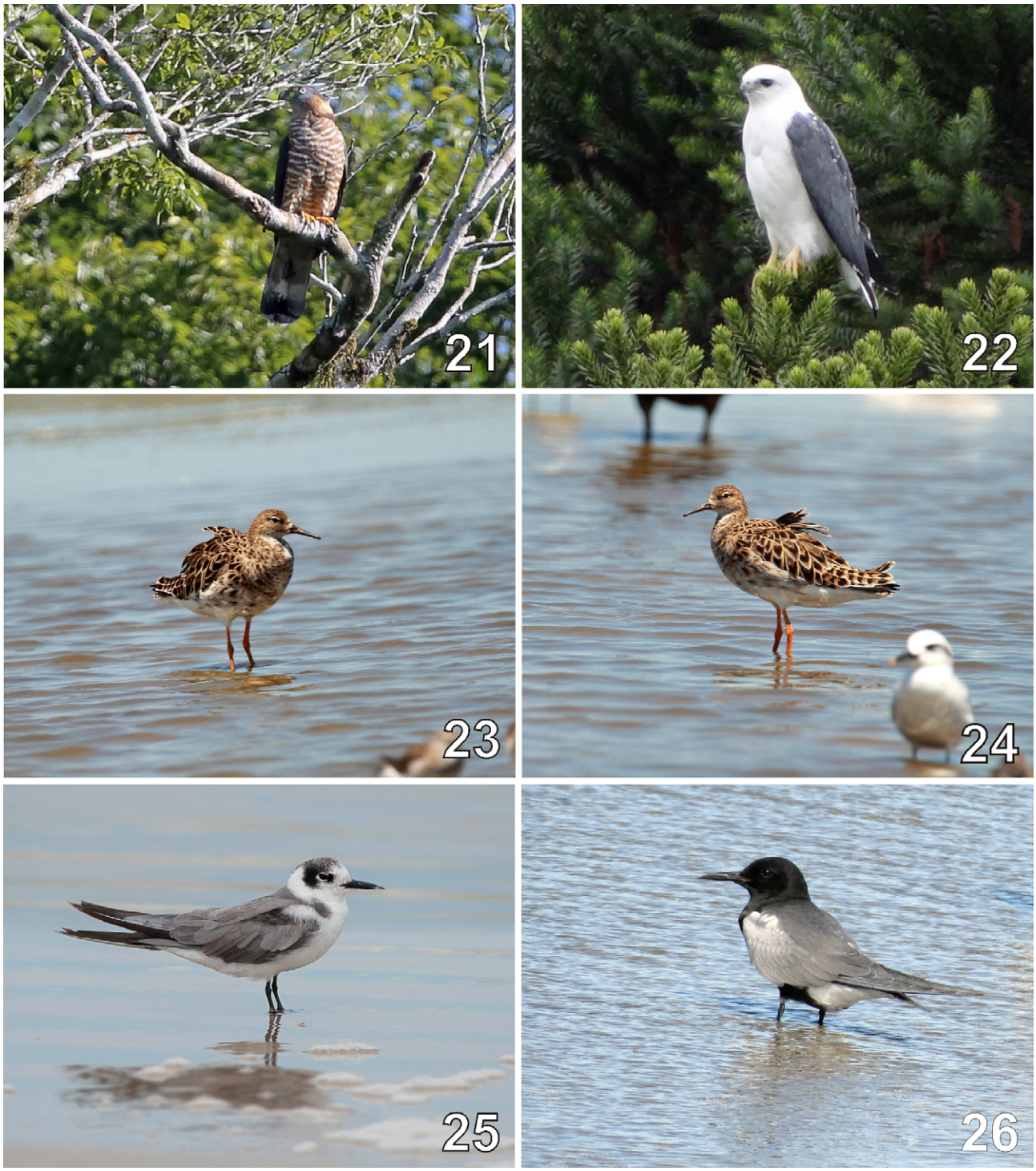
Identification and documentation accounts. The documentation indicated or provided in Tables I, II and in Figures 1–29 allows accurate identification of most species included in the main list based on unpublished information. Below we detail records and discuss diagnostic characteristics of some of the added or newly documented species whose identification is not straightforward.

Phoebetria palpebrata. One specimen found on the beach at Itapeva, Torres, was photographed and collected by the MUCIN staff on 14 May 2014, and its skeleton was preserved, together with tissue samples (MUCIN 591). A second specimen (field number AM 881) was found on the beach at Arroio do Sal on 5 October 2016; it was photographed (Fig. 1) and both the skeleton and tissue samples will be included in the same collection (M. Tavares, pers. comm.). Both specimens are clearly assignable to *P. palpebrata* rather than to the similar *Phoebetria fusca* (Hilsenberg, 1822) due to their light upper dorsum and neck.

Thalassarche steadi. This species was included in the main list based on an immature female collected in 2011 on the northern littoral of the state and identified using discriminant functions and molecular techniques (Pereira *et al*., 2016). The specimen (also immature) that served as the basis for the inclusion of *Thalassarche cauta* in previous lists, reported by Petry *et al*. (1991), has not been examined with the same methods and cannot be presently assigned to either species because immatures of *T. cauta* and *T. steadi* are indistinguishable on external characters (Pereira *et al*., 2016). Following this reasoning, we excluded the former from the list.

Pterodroma deserta. Ramírez *et al*. (2013) provided tracking data based on global location sensors (GLSs), or geolocators, deployed on breeding birds at Bugio Island, North Atlantic Ocean. At least five birds made intense use of waters within the EEZ of southeastern and southern Brazil. Some daily locations plotted on map of Fig. 1 in Ramírez *et al*. (2013:273) are within EEZ waters of RGS. Because some of these locations are clearly within 140 km of the coast of RGS and geolocators have a maximum error of 200 km (Phillips *et al*., 2004), even adding the maximum possible error of devices, locations are still within the 200 nautical miles (*c.* 370 km) of the EEZ.

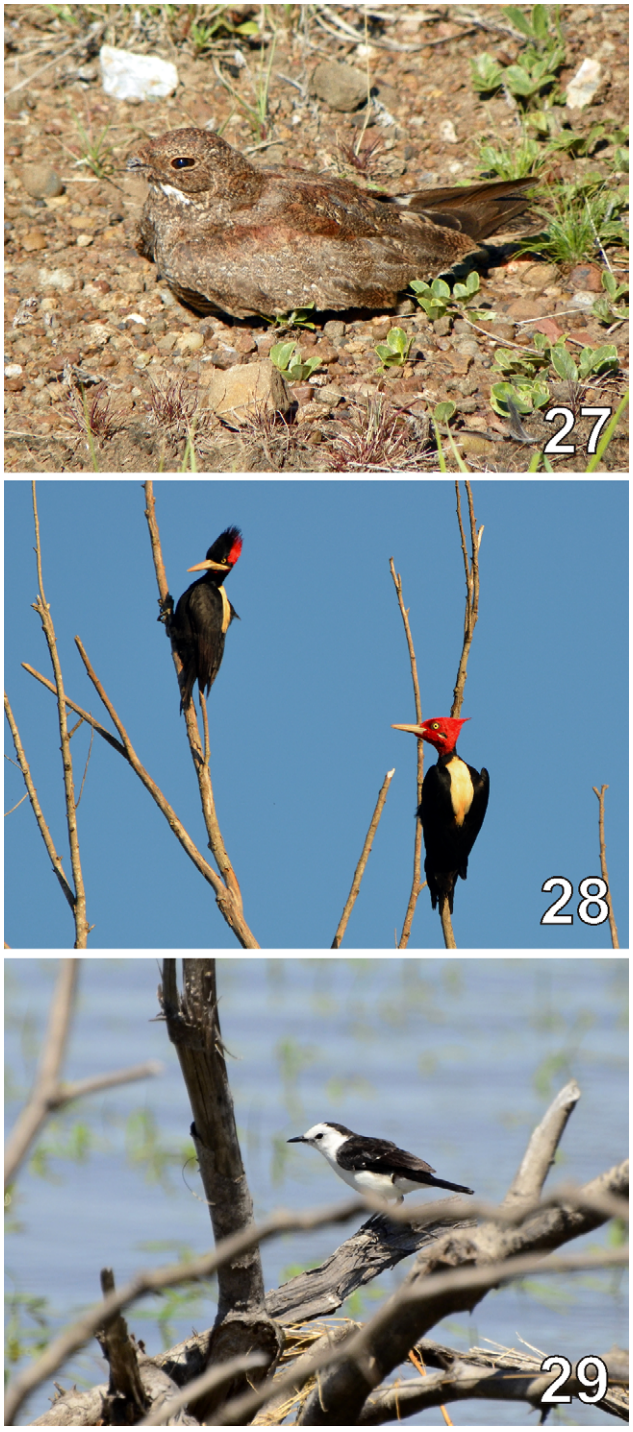
Charadrius mongolus/*leschenaultii*. There are four photographs of an unidentified *Charadrius* plover taken at the Parque Nacional da Lagoa do Peixe in the WikiAves website. Photographs WA1943013 and WA1944101 were taken by A. Briso on 5 December 2015, whereas WA1963959 and WA1963968 were obtained by F. Ronaldo on 29 December 2015. All photographs are presumably of the same individual, as inferred from the overall aspect of the birds and commentaries made by F. Ronaldo (who guided A. Briso and saw the bird on both occasions). In all photographs, the depicted individual is in basic plumage. The upperparts are dull gray-brown, with wing feathers displaying lighter margins. The forehead is white and the whitish supercilium broadens behind the eye. The underparts are white except for the large grayish-brown patches on the sides of the breast. The bill is black and relatively long, with mandibles gently tapering to a point at the tip. The maxillary unguis in A. Briso's photographs is approximately half of the total bill length. Legs are long (including the tibia), dark olive-gray in A. Briso's photographs and light gray in F. Ronaldo's. Differences in color reflect the influence of substrate (wet mud in A. Briso's photographs and dry soil in F. Ronaldo's). Toe joints appear to be the same color as the rest of the legs (visible in WA1963968). The tarsus-to-bill-length



Figs 21–26. Documentation updates for four species previously included in the main list of birds of Rio Grande do Sul, Brazil: 21, *Chondrohierax uncinatus*, adult female, Tenente Portela, 4 February 2017 (C. Furini); 22, *Pseudastur polionotus*, Vacaria, 3 May 2015 (E. Rezende); 23, 24, *Calidris pugnax*, presumed male, Tavares, 15 February 2015 (M. Alievi); 25, *Chlidonias niger*, molting nonbreeding adult, Mostardas, 8 January 2014 (P. Fenalti); 26, *C. niger*, adult in alternate plumage, Rio Grande, 8 March 2016 (R. Kurz).

ratio ranged from 1.86–2.0 in WA1943013 and 1.94–2.04 in WA1944101 (variation of four different measurements of both tarsus and bill). The species is a mid-sized *Charadrius*, judging by comparisons with a *Calidris fuscicollis* (Vieillot, 1819) and two *Charadrius semipalmatus* Bonaparte, 1825 that appear in the background of WA1944101 and WA1963959, respectively.

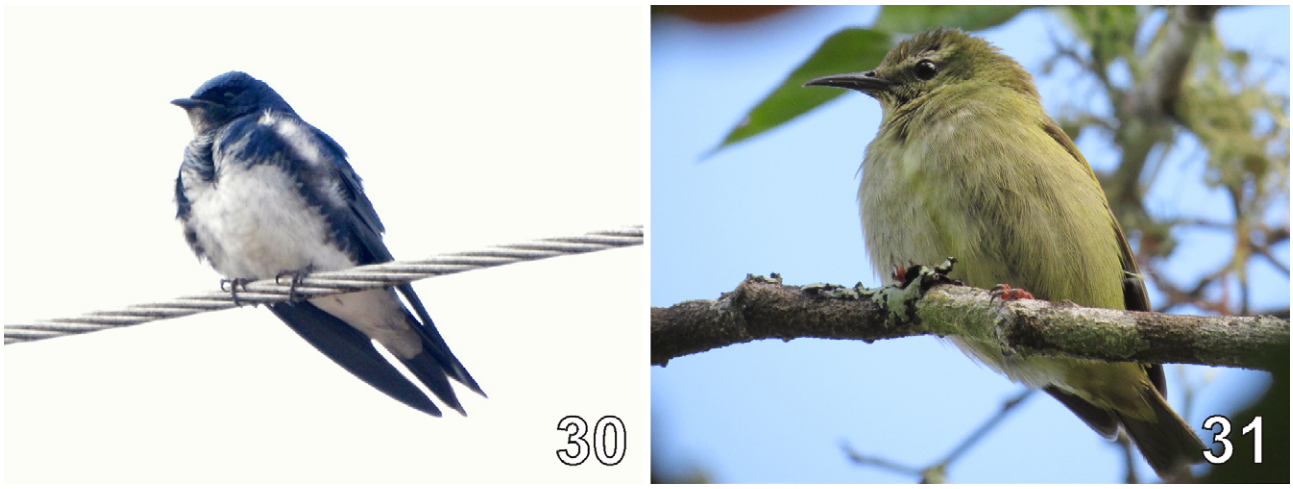
A combination of characteristics, namely lack of a complete white neck collar, single incomplete breast-band, long, relatively large bill and long, dusky legs point to either the Greater Sand Plover *Charadrius leschenaultii* Lesson, 1826 or the Lesser Sand Plover *Charadrius mongolus* Pallas, 1776 (Hayman *et al*., 2011; O'Brien *et al*., 2006). Both species breed in Asia and spend the non-breeding season in



Figs 27–29. Documentation updates for three species previously included in the main list of birds of Rio Grande do Sul, Brazil: 27, *Nannochordeiles pusillus*, presumed female, Itaqui, 27 November 2011 (D. V. Peixoto); 28, *Campephilus leucopogon*, male (right) and female (left), Barra do Quaraí, 28 May 2015 (C. E. Agne); 29, *Fluvicola albiventer*, Uruguaiana, 23 October 2015 (R. O. de Oliveira).

more southern latitudes of the Old World (Hirschfeld *et al*., 2000; Wiersma *et al*., 2017a,b). Vagrancy is common, with both species being recorded in North America and *C. mongolus* also in South America (Abbott *et al*., 2001; Le Nevé & Manzione, 2011; Wiersma *et al*., 2017a,b). Clear separation of these species based on photographs of birds in basic plumage is complex because of the overlap in some diagnostic characteristics between the smaller, slender-billed *C. l. columbinus* Wagler, 1829 and the "*atrifrons*" subspecies group of *C. mongolus*, which have slender and more pointed bills than the subspecies of the "*mongolus*" group (Hirschfeld *et al*., 2000). Identification of the RGS bird is further complicated because important diagnostic field marks of the wing and tail are not visible in the photographs (Hirschfeld *et al*., 2000). Leg color and tibia exposition point to *C. leschenaultii* (Hirschfeld *et al*., 2000). However, some *C. mongolus* may have greenish-grey legs and *C. leschenaultii* may have grayer legs (Hirschfeld *et al*., 2000). Judging the length of tibia exposition from photographs is further complicated because of distortions caused by the bird compressing or fluffing belly feathers in response to air temperature (Hirschfeld *et al*., 2000). The RGS bird not only has compressed body feathers but also has a concave abdomen, which may pass the impression that the tibia is more exposed than it really is. The concolor toe joints in relation to the rest of the legs points to *C. mongolus*, since *C. leschenaultii* often (but not always) has darker toe joints (Hirschfeld *et al*., 2000). The relatively large, pointed bill, which is clearly not blunt-ended, is reminiscent of *C. leschenaultii* (Hirschfeld *et al*., 2000). The maxillary unguis in A. Briso's photographs is approximately half the total bill length, which is within the range of *C. l. columbinus* (Hirschfeld *et al*., 2000). On the other hand, the tarsus-to-bill-length ratio proposed by Millington (1988) to separate these species puts the RGS bird within the range of *C. mongolus*. Although this formula seems to be accurate, the ratio is difficult to determine because the angle from which the photograph is taken must be considered (Hirschfeld *et al*., 2000). Nonetheless, all ratios we calculated were of birds in lateral views and they were far above the range of *C. leschenaultii*, which is 1.43–1.78 (Millington, 1988). Differences in body molt schedules between both species, summarized in Hirschfeld *et al*. (2000), are not applicable because in December both species are not molting and should be in full basic plumage. However, upperparts are relatively paler and sandier – characteristic of *C. leschenaultii* – than in *C. mongolus* (Abbott *et al*., 2001). Although we are inclined to consider the bird as *C. leschenaultii* for presenting a larger set of characters within the range of this taxon, it shows a considerable overlap in some characters with *C. mongolus*. We thus consider the available evidence insufficient for an accurate identification and include the taxon in the RGS list as *Charadrius* sp.

Numenius hudsonicus Latham, 1790 and *N. phaeopus*. Sangster *et al*. (2015) recommended that the New World form *hudsonicus* (American Whimbrel) be treated as a species distinct from the Eurasian Whimbrel *N. phaeopus* based on previously published evidences and a new molecular phylogenetic analysis using available mtDNA datasets. The separation of these two taxa had already been proposed independently by Livezey (2010) based on a cladistic analysis of phenotypic characters. This treatment has recently been adopted by the CBRO (Piacentini *et al*., 2015). Bencke *et*



Figs 30, 31. Photographic records of two species added as hypothetical to the list of birds of Rio Grande do Sul, Brazil: 30, *Progne* **cf.** *sinaloae*, Coxilha, 24 September 2016 (C. E. Agne); 31, *Cyanerpes cyaneus*, female, Santo Antônio da Patrulha, 27 July 2015 (R. Kurz).

al. (2010) provided photographic evidence for the occurrence of *hudsonicus* in RGS and attributed all documented records of whimbrels hitherto known from the state to this form (as *N. phaeopus hudsonicus*). Following the split of *hudsonicus*, this species should replace *N. phaeopus* in the RGS list. However, one individual of the Eurasian Whimbrel was recently photographed on the coast of RGS by a group of birdwatchers (Tab. I), thus justifying the maintenance of this species on the state list. The extensively white rump and uppertail-coverts of the bird rule out the commoner American Whimbrel (O'Brien *et al*., 2006).

Tringa inornata. The separation of *T. inornata* and *T. semipalmata* in basic plumage is based mostly on structural features (O'Brien, 2006; O'Brien *et al*., 2006). *Tringa inornata* is larger and more elegant, with a more elongated body, longer legs and neck, and longer, slimmer, finer-tipped bill. The angle from the bill to the forehead is steeper, and the crown is sometimes distinctively tall or puffy (O'Brien, 2006; O'Brien *et al*., 2006). The bird photographed at São José do Norte (Fig. 4) is readily identified as *T. inornata* based on bill and head features, and is more diagnosable than other individuals mentioned in Martínez-Curci *et al*. (2014).

Calidris pugnax. C. B. Andretti photographed a single bird along the Talha Mar road, Parque Nacional da Lagoa do Peixe, Tavares, on 18 January 2017 (WA2466615). G. R. Peres later photographed what appears to be the same individual on the same locality on 6 February 2017 (WA2462329, WA2477328, WA2477334). The bird is noticeably larger than *C. fuscicollis* and about the same size as or slightly smaller than *Pluvialis dominica* (Statius Muller, 1776), which appear with it in WA2477334. It has a small head, a rounded body with a prominent belly and a humped back. The upperparts look scaled due to distinctive pale fringing on the grayish brown scapulars, wing coverts and tertials, most of which are centered or barred black. Most of the head, hindneck and mantle has a slight sandy-buff wash. The belly, flanks and undertail coverts are white, and the throat and the area around the base of the bill are whitish. The bill is dark and droops slightly toward the tip. The legs are long and yellow-orange. Based on comparisons with *C. fuscicollis* and *P. dominica*, the bird measured approximately 190–230 mm, which is within the range of females or rare faeder males, which measure 200–250 mm (regular males measure 260–320 mm) (Karlionova *et al*., 2007; Hayman *et al*., 2011). This bird is also in definitive plumage, as inferred from the lack of a buff wash on the underparts and of buff fringes on scapulars, wing coverts and tertials (Hayman *et al*., 2011). In addition, juveniles have dull yellowish-brown or greenish legs, never yellow-orange as the RGS bird (Hayman *et al*., 2011). M. Alievi photographed a second individual along the same road on 15 February 2017 (WA2513429; Figs 23, 24). This bird is similar to the first one but its bill is marked orange-yellow and the upper breast has vitiligo-like white blotches, thus suggesting a male. Structural and morphological characteristics visible in photographs separate the birds from any other shorebird occurring in RGS and the somewhat similar *Tringa totanus* (Linnaeus, 1758) and *Calidris acuminata* Horsfield, 1821 from the Old World (Hayman *et al*., 2011).

Nannochordeiles pusillus. The combination of rufous-tinged upperparts, white throat, barred underparts, white bar on primaries, and wings about the same length as the tail when resting are distinctive (Cleere, 1998; Ridgely *et al*., 2015). The Itaqui bird (Fig. 27) appears to be a female, as indicated by the small white marks on the primaries, duller and buffier tips to secondaries, and lack of white tips on the rectrices (Cleere, 1998). The somewhat similar *Chordeiles minor* (Forster, 1771) is larger, less rufous, has wing tips projecting beyond the tail when resting and the white band on the primaries is larger and closer to the base of the wing (Cleere, 1998). The very similar *Chordeiles acutipennis* (Hermann, 1783), which has not been found in RGS, is also larger, with no rufous above, and has the white band on the primaries closer to the base of the wing (Cleere, 1998). As noted by Cleere *et al*. (2017), the race of the birds recently found in northeastern Argentina and RGS has yet to be determined.

Pseudocolopteryx acutipennis. Although Bornschein *et al*. (2017) mention three records of *P. acutipennis* for RGS, there are actually only two. One individual was photographed by P. Fenalti in a wetland on the margin of Lagoa da Custódia, Tramandaí, on 9 December 2012 (WA828480) and another was photographed by P. Fenalti (Fig. 8; WA1972873), V. E. Florencio (WA1979557) and O. A. Fenalti (WA1967150) on the eastern edge of Lagoa dos Patos at Porto do Barquinho, Mostardas, on 28 December 2015 (P. Fenalti, pers. comm.). Records for "Mostardas" and "Lagoa do Peixe" on Table 1 of Bornschein *et al*. (2017) thus refer to the same bird and are mislocated. Diagnostic features visible in the photographs include the yellowish-olive hue to the upperparts, the dusky lores and cheeks, the olive crown concolor with the back, and the bright yellow underparts (Ridgely & Tudor, 2009). The similar *Pseudocolopteryx flaviventris* (d'Orbigny & Lafresnaye, 1837) is duller, has brownish upperparts and a rufescent crown (Ridgely & Tudor, 2009). *Pseudocolopteryx dinelliana* Lillo, 1905, which has not been found in the state (Bencke *et al*., 2010), has a rufescent tone on crown, lores and cheeks (Ridgely & Tudor, 2009).

Tyrannus tyrannus. Photographs taken at Mostardas (Figs 9, 10) show a molting bird with faded and worn flight feathers (except outermost tertials, which are new). It has slaty upperparts and white underparts, with a sharp contrast between the dark head and the white throat. The bill and tail are black, the latter with an evident white tip. Characteristics visible in photographs, especially the white tip to the square tail, separate it from *Tyrannus savana* Daudin, 1802 and *T. dominicensis* (Gmelin, 1788), the latter not found in RGS (Ridgely & Tudor, 2009; Bencke *et al*., 2010). The similar *T. caudifasciatus* D'Orbigny, 1839 is resident in the West Indies and has a larger head, a stronger bill and a grayer back.

Contopus virens. We reidentified a photograph originally assigned to the Tropical Pewee *Contopus cinereus* (Spix, 1825) in the WikiAves website (WA2362350) as being of this species and obtained new photographs of the same individual that confirm the identification (Figs 11–14). The bird was photographed in a small clearing inside coastal *restinga* woodland during a birdwatching tour to the Parque Nacional da Lagoa do Peixe at Tavares (R. Fortes, pers. comm.). The Wood-Pewees (*C. virens* and *C. sordidulus* Sclater, 1859) can be distinguished from the local (nominate) subspecies of the Tropical Pewee by their longer primary extension, more distinct wing bars, heavier bill, and less uniform underparts (Figs 11–14). Tropical is also grayer and darker overall than either, especially on the crown and underparts (Schulenberg *et al*., 2007; Ridgely & Tudor, 2009; Farnsworth & Lebbin, 2017a,b; Farnsworth *et al*., 2017). In addition, this species is restricted to the dense forests of the extreme north in RGS, along the Pelotas and Uruguay rivers (Belton, 1994; Bencke *et al*., 2003). Therefore, its occurrence in the mostly open areas around Lagoa do Peixe is highly unlikely.

Separation of Eastern *C. virens* and Western *C. sordidulus* Wood-Pewees is far more problematic and they are often distinguished with certainty only by voice (McCarty, 1996; Bemis & Rising, 1999; Ridgely & Tudor, 2009). Differences in plumage, structure and bare part colors are subtle and much overlap exists (see review in Lee *et al*., 2008). Consequently, no identification can be regarded as conclusive unless based on a combination of characters. Western tends to be darker (less gray and more dusky-olive) overall, with a more extensive "vest" (broad chest band often not interrupted medially and typically extending down to flanks). Its upper wing bar is duller and fainter than the lower wing bar, showing less contrast with the dark wing, and its lower mandible is duskier, with the pale color usually restricted to the base and seldom extending nearly to the tip. Eastern in turn is generally paler throughout (typically olive-gray above and more extensively whitish below), shows two equally contrasting wing bars and has a proportionately longer tail (because tail extension, or the distance from wing tip to tail tip, is greater than primary extension in this species). The extent of light color on the lower mandible is also greater than in Western and adults often have the bill mostly or entirely orange-yellow underneath (Hilty & Brown, 1986; Stiles & Skutch, 1989; Fjeldså & Krabbe, 1990; McCarty, 1996; Bemis & Rising, 1999; Lee *et al*., 2008; Farnsworth & Lebbin, 2017a,b).

We assume the Tavares bird as being *C. virens* based on its relatively pale overall coloration, rather restricted "vest" (not extending down to flanks) and extensively orange-yellow lower mandible (Figs 11–14). Although the primary extension is not directly visible in any of the available photographs, the length of the tail extension also suggests this species instead of *C. sordidulus*. Evaluation of the relative contrast between the upper and lower wing bars in the Tavares bird is hampered by the high degree of wear of the median secondary coverts. However, although reduced, the upper wing bar appears to be as bright as the lower one, again suggesting *C. virens*. Finally, *C. sordidulus* is thought to winter primarily on the Andean slopes from 400 to 1700 m a.s.l., while *C. virens* is more widespread in the adjacent lowlands, especially in western Amazonia (Stotz *et al*., 1992; Ridgely & Tudor, 2009). Hence, the latter is the most likely species to be expected in eastern South America.

The RGS record of *C. virens* is apparently only the third for the country outside Amazonia. Previous known occurrences in eastern Brazil were at Chapada do Araripe, Ceará (Teixeira *et al*., 1993) and Ubatuba, northern littoral of São Paulo (Silveira & Uezu, 2011). Lagoa do Peixe also appears to be a new southernmost locality for the species within its wintering range, since outside the Brazilian territory there seem to be no published records south of Orán, Salta, in northwestern Argentina (Hoy, 1981; Ridgely & Tudor, 2009).

Catharus **cf.** *swainsoni*. Meyer *et al*. (2014) reported the first record of a migrant North American *Catharus* in RGS from Erechim, where one bird identified as *C. swainsoni* was sighted with the aid of playback on 15 February 2013. Two poor-quality audio recordings documenting this record were deposited in the WikiAves (WA888672, WA914300) and Xeno-Canto (XC127370, XC127519) websites (date

in XC127519 mistakenly given as 15 March). Another RGS record of a *Catharus*, also identified as *C. swainsoni*, occurred on 18 January 2016 at Marques de Souza (Fig. 16; WA2261365, WA2261370). The photographs that document this record are of poor quality but allow the recognition of a *Catharus* thrush with distinct buffy eye-ring and loral stripe ("spectacles"), white underparts and densely spotted breast. The face, lower throat and upper breast are washed with buff (color saturation artificially enhanced by flash), the throat is bordered on each side with a dark stripe and the mandible is extensively pale. In neither case did the authors of records mention the diagnostic characteristics on which the field identification was based, nor did they refer the taxonomic source followed to treat *C. swainsoni* as a species separate from *C. ustulatus* (Nuttall, 1840), which presumably was the latest CBRO list available at the time of each record. These taxa are considered only subspecifically distinct in most recent sources (*e.g.*, AOU, 1998 and supplements) and differ in subtle vocal and morphological features. They also have nearly completely segregated winter ranges, with russet-backed birds (*ustulatus* group) wintering in Mexico and Central America and olive-backed birds (*swainsoni* group) wintering primarily in Panama and western South America, south to northern Argentina (Collar & Christie, 2017). In Brazil, *swainsoni* has been treated as a full species by the CBRO since 2010 and is the only taxon with accepted occurrence (Piacentini *et al*., 2015). However, there are very few specimen records for the country (*e.g.*, Pinto, 1944; Willis *et al*., 1993) and undoubtedly, most modern Brazilian records of a "spectacled" *Catharus* have been automatically assigned to *swainsoni* based solely on the assumption that this is the only likely taxon in Brazil. In our opinion, the available documentation for the RGS records does not contain sufficient information to allow a reliable identification based on diagnostic characters. Consequently, the identity of the birds as *C. swainsoni* can be assumed only on biogeographical grounds. The voice of the individual recorded at Erechim, although reminiscent of that of *C. ustulatus*/*swainsoni*, is barely audible on the recordings, which makes any comparison inconclusive. Likewise, the photographs taken at Marques de Souza do not show the upperparts of the bird, where lies the main difference between the two taxa (Mack & Yong, 2000; Collar & Christie, 2017). Therefore, we chose to cite these records as *Catharus* **cf.** *swainsoni* on the main list until better evidence is available.

Sporophila hypochroma. This seedeater was listed as probable in Bencke *et al*. (2010) because of the possibility of confusion with phenotypically similar individuals of *Sporophila hypoxantha* Cabanis, 1851 and plumage variants of *S. cinnamomea* (Lafresnaye, 1839) when the identification cannot be confirmed by voice, which was the case of the records hitherto known from the state. An audio recording made by M. Repenning at Uruguaiana on 1 February 2015 (WA1645476; Tab. I) is referred to *S. hypochroma* and confirms the occurrence of this species in the west of RGS. A photograph of the same individual (as inferred from information issued by the authors and the date and time of the record) taken by S. Messias is available at the WikiAves website (WA1647035).

Sturnus vulgaris. This Eurasian species became established around Buenos Aires, Argentina, in 1987 and has since been expanding its range in southeastern South America (Peris *et al*., 2005). The first Uruguayan records were in 2008 at Montevideo (Mazzulla, 2013). On 29 October 2014, and again on 23 September 2015, an adult male (Fig. 20) was photographed by V. Souza at his property in Lavras do Sul (Tab. I). These are the first records of this highly invasive species in Brazil.

Species of probable and hypothetical occurrence. A photograph of a *Sporophila* seedeater of the *capuchino* group made by E. Mandarino at Barra do Quaraí (30°12'S; 57°33'W) on 17 November 2013 (WA1155820) matches the color pattern of the recently described *S. iberaensis* from the Iberá marshes in northeastern Argentina and adjacent areas of Paraguay and southwestern Brazil. However, since there is considerable plumage variation among members of this group, and full diagnosis relies on voice characteristics, we consider it as probable in the state until further evidence is available.

Similarly, an atypical martin photographed north of Coxilha (28°07'S; 52°18'W) (Fig. 30), identified as a Grey-breasted Martin *Progne chalybea* (Gmelin, 1789), closely resembles the rare and poorly known Sinaloa Martin *Progne sinaloae* of northwestern Mexico. The bird is glossy steel-blue above, with a deeply forked tail. The flanks, sides of throat and most of the upper breast are also steel-blue, with the lower breast, abdomen and undertail-coverts contrastingly white. The center of the throat is grey and the dark band on the breast is mottled or coarsely scaled whitish to greyish. The Sinaloa Martin is an endemic migrant breeder to the pine-oak woodlands of the Sierra Madre Occidental and Central Volcanic Belt in Mexico (Lethaby & King, 2010). Like the closely related and very similar Caribbean Martin *Progne dominicensis* (Gmelin, 1789), it is suspected to winter primarily in South America, but its wintering range remains unknown (Turner & Sharpe, 2017). It starts departing breeding grounds in late July and is absent from Mexico between early September and mid-February (Lethaby & King, 2010). The RGS record is consistent with this migration schedule and an occurrence of *P. sinaloae* in the state, at least as a vagrant, seems plausible. On the other hand, the species would perhaps be expected to winter much closer to its breeding area and well to the north of southern Brazil. Moreover, both the extent of plumage variation in non-breeding *Progne* martins and the identification criteria used to distinguish the various species are still poorly known (Tobias *et al*., 2006). For these reasons, we regard the identification of the RGS bird as tentative and list the species as hypothetical in the state (Appendix 3).

As for *C. cyaneus*, the reddish legs (visible in Fig. 31) readily separate this species from *Cyanerpes caeruleus* (Linnaeus, 1758), which is not found in eastern and southeastern Brazil (Ridgely & Tudor, 2009). Furthermore,

females of the latter have a blue malar streak and distinctly streaked underparts (Ridgely & Tudor, 2009). However, *C. cyaneus* is not known to occur south of São Paulo (Ridgely *et al*., 2015) and we do not rule out the possibility that the bird photographed at Santo Antônio da Patrulha (29°50'S; 50°31'W) was an escapee or had been intentionally released into the wild. For this reason, we prefer to include it among the species of hypothetical occurrence (Appendix 3) until better evidence is available.

Sicalis citrina is likewise listed as hypothetical because the voice recording that documents the only RGS record (Meyer *et al*., 2014) is considered not diagnosable. Although the species is known to occur in the upland grasslands of southeastern Santa Catarina (Rosário, 1996; WikiAves archive) and is therefore likely to occur in adjacent areas of RGS, the fact that the bird was not seen (Meyer *et al*., 2014) prevents a circumstantiated evaluation of this record. Moreover, we maintain *Laterallus exilis* as hypothetical despite a new evidence (voice recording; WA2053723), which in our opinion also does not allow a precise identification.

Concluding remarks. The rate of new birds added to the RGS list shows no signs of slowing. The addition of 43 species since the last update corresponds to an average increase of over six species per year, which is nearly 30% higher than that recorded for the previous period (44 additions in 2001–2010; Bencke *et al*., 2010). Of the newly incorporated taxa, only 10 to 14 (~23–32%) are known or suspected to be undergoing a recent range expansion in southeastern South America and are thus confirmed or potential newcomers to RGS (nine northerly species plus *S. vulgaris*, and perhaps *P. cirratus*, *M. cactorum*, *D. atricapilla* and *T. sordida*). The remaining are mostly migratory birds recorded as vagrants or irregular visitors (22 species), along with previously overlooked migratory or resident taxa present at low densities or with marginal occurrence in the state (7–11 species). This points to a better coverage – both spatial and temporal – of the state by amateur and professional birders in recent years, leading to an increased detection of unusual species ("rarities").

This greater observer coverage is due in large part to the increasing contribution of citizen science to knowledge on bird occurrence and distribution in RGS. Nearly 60% of the new occurrences reported here resulted from the activity of amateur bird watchers and photographers. This contribution is reflected in the way records are publicized, documented and geographically distributed. Of the 43 additions to the main list, 36 (84%) are based on records documented exclusively by photographs, of which no less than 28 first appeared in the WikiAves website. Common destinations of bird photographers, such as the Lagoa do Peixe and surroundings, account for a relatively high proportion of the new records for the state. In contrast, only three additions were substantiated by the collection of whole or partial specimens. Similarly, half of the documentation updates implemented here is based on photographic records. As a direct consequence of this trend, the proportion of accepted species documented by museum specimens in the state has decreased steadily over time, from 91% in 2001 to 88% in 2010 and 84% in the present review. This leads to a timely reflection: while citizen science is highly welcome and undoubtedly contribute a considerable amount of valuable data to science, it must be remembered that sound science is not only grounded on an adequate amount of information, but gathers strength and reliability from the thorough documentation of facts. Museum specimens allow direct, objective comparison of morphological traits and provide access to genetic resources for molecular studies and biological tissues for chemical analyses, among other things (Wiley *et al*., 2017). The recent record of *C. diomedea* for RGS (Oliveira *et al*., 2017) provides a good example of how important and effective specimens can be for accurate and reliable identification. Investment in scientific research and collection of voucher specimens should keep pace with the increasing interest birds arouse among people. We thus urge professional ornithologists, academic community and governmental organizations to document the biodiversity in RGS as rigorously as possible through responsible and carefully planned collections. In doing so we will be honoring and continuing Belton's landmark work on the birds of RGS, without which the task of updating this list would be at a much earlier stage.

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Appendix 1. List of the birds of Rio Grande do Sul, Brazil, updated through July 2017, with indication of the highest-quality (*i.e.*, most conclusive and reliable) evidence available for each species. More than one evidence is mentioned for species that present identification problems or when the main evidence is unsatisfactory, ambiguous or has uncertain availability (Spec = specimen, a bird skin and its associated parts, if preserved; Skel = skeleton, a complete or partial skeleton, including the skull; Photo = photograph, a diagnostic photograph; Audio = audio recording, a diagnostic voice recording; Spec+Audio = a skin complemented by a diagnostic voice recording of the same individual; Photo+Audio = a photograph complemented by a diagnostic voice recording of the same individual; Sight = sight record, at least one sighting accompanied by written documentation allowing positive identification; Band = band recovery, a banded bird recovered in RGS; Dlog = data-logger recovery, at least one bird deployed with data-logger device tracked to RGS).

Taxa	Evidence
Rheiformes	
Rheidae	
Rhea americana (Linnaeus, 1758)	Spec
Tinamiformes	
Tinamidae	
Tinamus solitarius (Vieillot, 1819)	Spec
Crypturellus obsoletus (Temminck, 1815)	Spec
Crypturellus noctivagus (Wied, 1820)	Spec
Crypturellus parvirostris (Wagler, 1827)	Spec
Crypturellus tataupa (Temminck, 1815)	Spec
Rhynchotus rufescens (Temminck, 1815)	Spec
Nothura maculosa (Temminck, 1815)	Spec
Anseriformes	
Anhimidae	
Chauna torquata (Oken, 1816)	Spec
Anatidae	
Dendrocygna bicolor (Vieillot, 1816)	Spec
Dendrocygna viduata (Linnaeus, 1766)	Spec
Dendrocygna autumnalis (Linnaeus, 1758)	Photo
Cygnus melancoryphus (Molina, 1782)	Spec
Coscoroba coscoroba (Molina, 1782)	Spec
Chloephaga picta (Gmelin, 1789)	Photo
Cairina moschata (Linnaeus, 1758)	Spec
Sarkidiornis sylvicola Ihering & Ihering, 1907	Spec
Callonetta leucophrys (Vieillot, 1816)	Spec
Amazonetta brasiliensis (Gmelin, 1789)	Spec
Anas sibilatrix Poeppig, 1829	Spec
Anas flavirostris Vieillot, 1816	Spec
Anas georgica Gmelin, 1789	Spec
Anas bahamensis Linnaeus, 1758	Spec
Anas versicolor Vieillot, 1816	Spec
Anas discors Linnaeus, 1766	Band
Anas cyanoptera Vieillot, 1816	Spec
Anas platalea Vieillot, 1816	Spec
Netta peposaca (Vieillot, 1816)	Spec
Heteronetta atricapilla (Merrem, 1841)	Spec
Nomonyx dominicus (Linnaeus, 1766)	Spec
Oxyura vittata (Philippi, 1860)	Spec
Galliformes	
Cracidae	
Penelope superciliaris Temminck, 1815	Spec
Penelope obscura Temminck, 1815	Spec
Aburria jacutinga (Spix, 1825)	Spec
Ortalis squamata (Lesson, 1829)	Spec
Odontophoridae	
Odontophorus capueira (Spix, 1825)	Spec
Podicipediformes	
Podicipedidae	
Rollandia rolland (Quoy & Gaimard, 1824)	Spec
Tachybaptus dominicus (Linnaeus, 1766)	Spec
Podilymbus podiceps (Linnaeus, 1758)	Spec
Podicephorus major (Boddaert, 1783)	Spec

Appendix 1. Cont.

Taxa	Evidence
Phoenicopteriformes	
Phoenicopteridae	
Phoenicopterus chilensis Molina, 1782	Spec
Phoenicoparrus andinus (Philippi, 1854)	Photo
Phoenicoparrus jamesi (Sclater, 1886)	Photo
Sphenisciformes	
Spheniscidae	
Aptenodytes patagonicus Miller, 1778	Spec
Spheniscus magellanicus (Forster, 1781)	Spec
Eudyptes chrysolophus (Brandt, 1837)	Spec
Eudyptes chrysocome (Forster, 1781)	Spec
Procellariiformes	
Diomedeidae	
Phoebetria fusca (Hilsenberg, 1822)	Spec
Phoebetria palpebrata (Forster, 1785)	Skel, photo
Thalassarche chlororhynchos (Gmelin, 1789)	Spec
Thalassarche melanophris (Temminck, 1828)	Spec
Thalassarche steadi Falla, 1933	Spec
Diomedea epomophora Lesson, 1825	Spec, skel, band
Diomedea sanfordi Murphy, 1917	Spec
Diomedea exulans Linnaeus, 1758	Spec, band
Diomedea dabbenena Mathews, 1929	Spec
Procellariidae	
Macronectes giganteus (Gmelin, 1789)	Spec
Macronectes halli Mathews, 1912	Spec
Fulmarus glacialoides (Smith, 1840)	Spec
Daption capense (Linnaeus, 1758)	Spec
Lugensa brevirostris (Lesson, 1831)	Spec
Pterodroma deserta Mathews, 1934	Dlog
Pterodroma mollis (Gould, 1844)	Spec
Pterodroma incerta (Schlegel, 1863)	Spec
Pterodroma macroptera (Smith, 1840)	Spec
Halobaena caerulea (Gmelin, 1789)	Spec
Pachyptila vittata (Forster, 1777)	Spec
Pachyptila desolata (Gmelin, 1789)	Spec
Pachyptila belcheri (Mathews, 1912)	Spec
Procellaria cinerea Gmelin, 1789	Spec
Procellaria aequinoctialis Linnaeus, 1758	Spec
Procellaria conspicillata Gould, 1844	Spec
Calonectris diomedea (Scopoli, 1769)	Spec
Calonectris borealis (Cory, 1881)	Spec
Calonectris edwardsii (Oustalet, 1883)	Spec
Puffinus griseus (Gmelin, 1789)	Spec
Puffinus gravis (O'Reilly, 1818)	Spec
Puffinus puffinus (Brünnich, 1764)	Spec
Hydrobatidae	
Fregetta grallaria (Vieillot, 1818)	Photo
Fregetta tropica (Gould, 1844)	Photo
Oceanites oceanicus (Kuhl, 1820)	Spec
Pelecanoididae	
Pelecanoides magellani (Mathews, 1912)	Spec
Ciconiiformes	
Ciconiidae	
Ciconia maguari (Gmelin, 1789)	Spec
Jabiru mycteria (Lichtenstein, 1819)	Photo
Mycteria americana Linnaeus, 1758	Spec

Appendix 1. Cont.

Taxa	Evidence
Suliformes	
Fregatidae Degland & Gerbe, 1867	
Fregata magnificens Mathews, 1914	Spec
Sulidae	
Morus capensis (Lichtenstein, 1823)	Photo
Sula dactylatra Lesson, 1831	Spec
Sula leucogaster (Boddaert, 1783)	Skel
Phalacrocoracidae	
Nannopterum brasilianus (Gmelin, 1789)	Spec
Anhingidae	
Anhinga anhinga (Linnaeus, 1766)	Spec
Pelecaniformes	
Ardeidae	
Tigrisoma lineatum (Boddaert, 1783)	Spec
Botaurus pinnatus (Wagler, 1829)	Spec
Ixobrychus exilis (Gmelin, 1789)	Audio, photo
Ixobrychus involucris (Vieillot, 1823)	Spec
Nycticorax nycticorax (Linnaeus, 1758)	Spec
Nyctanassa violacea (Linnaeus, 1758)	Photo
Butorides striata (Linnaeus, 1758)	Spec
Bubulcus ibis (Linnaeus, 1758)	Spec
Ardea cocoi Linnaeus, 1766	Spec
Ardea alba Linnaeus, 1758	Spec
Syrigma sibilatrix (Temminck, 1824)	Spec
Egretta thula (Molina, 1782)	Spec
Egretta caerulea (Linnaeus, 1758)	Spec
Threskiornithidae	
Plegadis chihi (Vieillot, 1817)	Spec
Mesembrinibis cayennensis (Gmelin, 1789)	Photo
Phimosus infuscatus (Lichtenstein, 1823)	Spec
Theristicus caerulescens (Vieillot, 1817)	Spec
Theristicus caudatus (Boddaert, 1783)	Spec
Platalea ajaja Linnaeus, 1758	Spec
Cathartiformes	
Cathartidae	
Cathartes aura (Linnaeus, 1758)	Spec
Cathartes burrovianus Cassin, 1845	Spec
Coragyps atratus (Bechstein, 1793)	Spec
Sarcoramphus papa (Linnaeus, 1758)	Photo
Accipitriformes	
Pandionidae	
Pandion haliaetus (Linnaeus, 1758)	Photo
Accipitridae	
Leptodon cayanensis (Latham, 1790)	Spec
Chondrohierax uncinatus (Temminck, 1822)	Photo
Elanoides forficatus (Linnaeus, 1758)	Spec
Gampsonyx swainsonii Vigors, 1825	Photo
Elanus leucurus (Vieillot, 1818)	Spec
Harpagus diodon (Temminck, 1823)	Spec
Circus cinereus Vieillot, 1816	Spec
Circus buffoni (Gmelin, 1788)	Spec
Accipiter poliogaster (Temminck, 1824)	Spec
Accipiter superciliosus (Linnaeus, 1766)	Photo
Accipiter striatus Vieillot, 1808	Spec
Accipiter bicolor (Vieillot, 1817)	Spec
Ictinia mississippiensis (Wilson, 1811)	Photo
Ictinia plumbea (Gmelin, 1788)	Spec

Appendix 1. Cont.

Taxa	Evidence
Busarellus nigricollis (Latham, 1790)	Spec
Rostrhamus sociabilis (Vieillot, 1817)	Spec
Geranospiza caerulescens (Vieillot, 1817)	Spec
Heterospizias meridionalis (Latham, 1790)	Spec
Urubitinga urubitinga (Gmelin, 1788)	Spec
Urubitinga coronata (Vieillot, 1817)	Spec
Rupornis magnirostris (Gmelin, 1788)	Spec
Parabuteo unicinctus (Temminck, 1824)	Photo
Parabuteo leucorrhous (Quoy & Gaimard, 1824)	Spec
Geranoaetus albicaudatus (Vieillot, 1816)	Spec
Geranoaetus melanoleucus (Vieillot, 1819)	Spec
Pseudastur polionotus (Kaup, 1847)	Photo
Buteo platypterus (Vieillot, 1823)	Photo
Buteo brachyurus Vieillot, 1816	Spec
Buteo swainsoni Bonaparte, 1838	Spec
Morphnus guianensis (Daudin, 1800)	Spec
Harpia harpyja (Linnaeus, 1758)	Spec
Spizaetus tyrannus (Wied, 1820)	Spec
Spizaetus melanoleucus (Vieillot, 1816)	Spec
Spizaetus ornatus (Daudin, 1800)	Spec
Gruiformes	
Aramidae	
Aramus guarauna (Linnaeus, 1766)	Spec
Rallidae	
Coturnicops notatus (Gould, 1841)	Spec
Aramides ypecaha (Vieillot, 1819)	Spec
Aramides cajaneus (Statius Muller, 1776)	Spec
Aramides saracura (Spix, 1825)	Spec
Laterallus melanophaius (Vieillot, 1819)	Spec
Laterallus leucopyrrhus (Vieillot, 1819)	Spec
Porzana flaviventer (Boddaert, 1783)	Spec
Porzana spiloptera Durnford, 1877	Photo
Mustelirallus albicollis (Vieillot, 1819)	Spec
Neocrex erythrops (Sclater, 1867)	Spec
Pardirallus maculatus (Boddaert, 1783)	Spec
Pardirallus nigricans (Vieillot, 1819)	Spec
Pardirallus sanguinolentus (Swainson, 1838)	Spec
Gallinula galeata (Lichtenstein, 1818)	Spec
Porphyriops melanops (Vieillot, 1819)	Spec
Porphyrio martinicus (Linnaeus, 1766)	Spec
Porphyrio flavirostris (Gmelin, 1789)	Photo
Fulica armillata Vieillot, 1817	Spec
Fulica rufifrons Philippi & Landbeck, 1861	Spec
Fulica leucoptera Vieillot, 1817	Spec
Heliornithidae	
Heliornis fulica (Boddaert, 1783)	Photo
Charadriiformes	
Charadriidae	
Vanellus chilensis (Molina, 1782)	Spec
Pluvialis dominica (Statius Muller, 1776)	Spec
Pluvialis squatarola (Linnaeus, 1758)	Spec
Charadrius semipalmatus Bonaparte, 1825	Spec
Charadrius collaris Vieillot, 1818	Spec
Charadrius falklandicus Latham, 1790	Spec
Charadrius sp.	Photo
Charadrius modestus Lichtenstein, 1823	Spec
Oreopholus ruficollis (Wagler, 1829)	Spec

Appendix 1. Cont.

Taxa	Evidence
Haematopodidae	
Haematopus palliatus Temminck, 1820	Spec
Recurvirostridae	
Himantopus melanurus Vieillot, 1817	Spec
Chionidae	
Chionis albus (Gmelin, 1789)	Spec
Scolopacidae	
Gallinago paraguaiae (Vieillot, 1816)	Spec
Gallinago undulata (Boddaert, 1783)	Spec
Limnodromus griseus (Gmelin, 1789)	Photo
Limosa haemastica (Linnaeus, 1758)	Spec
Numenius hudsonicus Latham, 1790	Photo
Numenius phaeopus (Linnaeus, 1758)	Photo
Bartramia longicauda (Bechstein, 1812)	Spec
Actitis macularius (Linnaeus, 1766)	Spec
Tringa solitaria Wilson, 1813	Spec
Tringa melanoleuca (Gmelin, 1789)	Spec
Tringa semipalmata (Gmelin, 1789)	Spec
Tringa inornata (Brewster, 1887)	Photo
Tringa flavipes (Gmelin, 1789)	Spec
Arenaria interpres (Linnaeus, 1758)	Spec
Calidris canutus (Linnaeus, 1758)	Spec
Calidris alba (Pallas, 1764)	Spec
Calidris pusilla (Linnaeus, 1766)	Spec
Calidris minutilla (Vieillot, 1819)	Spec
Calidris fuscicollis (Vieillot, 1819)	Spec
Calidris bairdii (Coues, 1861)	Spec
Calidris melanotos (Vieillot, 1819)	Spec
Calidris himantopus (Bonaparte, 1826)	Spec
Calidris subruficollis (Vieillot, 1819)	Spec
Calidris pugnax (Linnaeus, 1758)	Photo
Phalaropus tricolor (Vieillot, 1819)	Spec
Thinocoridae	
Thinocorus rumicivorus Eschscholtz, 1829	Photo
Jacanidae	
Jacana jacana (Linnaeus, 1766)	Spec
Rostratulidae	
Nycticryphes semicollaris (Vieillot, 1816)	Spec
Stercorariidae	
Stercorarius chilensis Bonaparte, 1857	Spec
Stercorarius maccormicki Saunders, 1893	Photo
Stercorarius antarcticus (Lesson, 1831)	Spec
Stercorarius pomarinus (Temminck, 1815)	Skel, photo
Stercorarius parasiticus (Linnaeus, 1758)	Spec
Stercorarius longicaudus Vieillot, 1819	Spec
Laridae	
Xema sabini (Sabine, 1819)	Photo
Chroicocephalus maculipennis (Lichtenstein, 1823)	Spec
Chroicocephalus cirrocephalus (Vieillot, 1818)	Spec
Leucophaeus atricilla (Linnaeus, 1758)	Photo
Leucophaeus pipixcan (Wagler, 1831)	Photo
Larus atlanticus Olrog, 1958	Photo
Larus dominicanus Lichtenstein, 1823	Spec
Sternidae	
Anous stolidus (Linnaeus, 1758)	Spec
Sternula antillarum Lesson, 1847	Photo
Sternula superciliaris (Vieillot, 1819)	Spec

Appendix 1. Cont.

Taxa	Evidence
Phaetusa simplex (Gmelin, 1789)	Spec
Gelochelidon nilotica (Gmelin, 1789)	Spec
Chlidonias leucopterus (Temminck, 1815)	Photo
Chlidonias niger (Linnaeus, 1758)	Photo
Sterna hirundo Linnaeus, 1758	Spec
Sterna paradisaea Pontoppidan, 1763	Spec
Sterna hirundinacea Lesson, 1831	Spec
Sterna vittata Gmelin, 1789	Photo
Sterna trudeaui Audubon, 1838	Spec
Thalasseus acuflavidus (Cabot, 1847)	Spec
Thalasseus maximus (Boddaert, 1783)	Spec
Rynchopidae	
Rynchops niger Linnaeus, 1758	Spec
Columbiformes	
Columbidae	
Columbina talpacoti (Temminck, 1810)	Spec
Columbina squammata (Lesson, 1831)	Audio
Columbina picui (Temminck, 1813)	Spec
Claravis pretiosa (Ferrari-Perez, 1886)	Photo
Columba livia Gmelin, 1789	Spec
Patagioenas picazuro (Temminck, 1813)	Spec
Patagioenas maculosa (Temminck, 1813)	Spec
Patagioenas cayennensis (Bonnaterre, 1792)	Spec
Patagioenas plumbea (Vieillot, 1818)	Spec
Zenaida auriculata (Des Murs, 1847)	Spec
Leptotila verreauxi Bonaparte, 1855	Spec
Leptotila rufaxilla (Richard & Bernard, 1792)	Spec
Geotrygon montana (Linnaeus, 1758)	Spec
Cuculiformes	
Cuculidae	
Micrococcyx cinereus (Vieillot, 1817)	Spec
Piaya cayana (Linnaeus, 1766)	Spec
Coccyzus melacoryphus Vieillot, 1817	Spec
Coccyzus americanus (Linnaeus, 1758)	Spec
Coccyzus euleri Cabanis, 1873	Photo
Crotophaga major Gmelin, 1788	Spec
Crotophaga ani Linnaeus, 1758	Spec
Guira guira (Gmelin, 1788)	Spec
Tapera naevia (Linnaeus, 1766)	Spec
Dromococcyx phasianellus (Spix, 1824)	Spec
Dromococcyx pavoninus Pelzeln, 1870	Audio
Strigiformes	
Tytonidae	
Tyto furcata (Temminck, 1827)	Spec
Strigidae	
Megascops choliba (Vieillot, 1817)	Spec
Megascops sanctaecatarinae (Salvin, 1897)	Spec
Pulsatrix perspicillata (Latham, 1790)	Spec
Pulsatrix koeniswaldiana (Bertoni & Bertoni, 1901)	Spec
Bubo virginianus (Gmelin, 1788)	Spec
Strix hylophila Temminck, 1825	Spec
Strix virgata (Cassin, 1849)	Spec
Glaucidium brasilianum (Gmelin, 1788)	Spec
Athene cunicularia (Molina, 1782)	Spec
Aegolius harrisii (Cassin, 1849)	Spec
Asio clamator (Vieillot, 1808)	Spec
Asio stygius (Wagler, 1832)	Spec

Appendix 1. Cont.

Taxa	Evidence
Asio flammeus (Pontoppidan, 1763)	Spec
Nyctibiiformes	
Nyctibiidae	
Nyctibius griseus (Gmelin, 1789)	Spec
Caprimulgiformes	
Caprimulgidae	
Antrostomus rufus (Boddaert, 1783)	Spec
Antrostomus sericocaudatus Cassin, 1849	Audio
Lurocalis semitorquatus (Gmelin, 1789)	Spec
Nyctidromus albicollis (Gmelin, 1789)	Spec
Hydropsalis parvula (Gould, 1837)	Spec
Hydropsalis anomala (Gould, 1838)	Spec
Hydropsalis longirostris (Bonaparte, 1825)	Spec
Hydropsalis torquata (Gmelin, 1789)	Spec
Hydropsalis forcipata (Nitzsch, 1840)	Spec
Nannochordeiles pusillus (Gould, 1861)	Photo
Podager nacunda (Vieillot, 1817)	Spec
Chordeiles minor (Forster, 1771)	Spec
Apodiformes	
Apodidae	
Cypseloides fumigatus (Streubel, 1848)	Spec
Cypseloides senex (Temminck, 1826)	Spec
Streptoprocne zonaris (Shaw, 1796)	Spec
Streptoprocne biscutata (Sclater, 1866)	Spec
Chaetura cinereiventris Sclater, 1862	Audio
Chaetura meridionalis Hellmayr, 1907	Spec
Trochilidae	
Phaethornis pretrei (Lesson & Delattre, 1839)	Photo
Phaethornis eurynome (Lesson, 1832)	Spec
Eupetomena macroura (Gmelin, 1788)	Photo
Aphantochroa cirrochloris (Vieillot, 1818)	Spec
Florisuga fusca (Vieillot, 1817)	Spec
Colibri serrirostris (Vieillot, 1816)	Photo
Anthracothorax nigricollis (Vieillot, 1817)	Spec
Stephanoxis loddigesii (Gould, 1831)	Spec
Lophornis magnificus (Vieillot, 1817)	Spec
Chlorostilbon lucidus (Shaw, 1812)	Spec
Thalurania glaucopis (Gmelin, 1788)	Spec
Hylocharis chrysura (Shaw, 1812)	Spec
Leucochloris albicollis (Vieillot, 1818)	Spec
Polytmus guainumbi (Pallas, 1764)	Photo+audio
Amazilia versicolor (Vieillot, 1818)	Spec
Amazilia fimbriata (Gmelin, 1788)	Spec
Heliodoxa rubricauda (Boddaert, 1783)	Spec
Heliomaster furcifer (Shaw, 1812)	Spec
Calliphlox amethystina (Boddaert, 1783)	Spec
Trogoniformes	
Trogonidae	
Trogon surrucura Vieillot, 1817	Spec
Trogon rufus Gmelin, 1788	Spec
Coraciiformes	
Alcedinidae	
Megaceryle torquata (Linnaeus, 1766)	Spec
Chloroceryle amazona (Latham, 1790)	Spec
Chloroceryle americana (Gmelin, 1788)	Spec
Momotidae	
Baryphthengus ruficapillus (Vieillot, 1818)	Spec

Appendix 1. Cont.

Taxa	Evidence
Galbuliformes	
Bucconidae	
Notharchus swainsoni (Gray, 1846)	Sight
Nystalus chacuru (Vieillot, 1816)	Spec
Nonnula rubecula (Spix, 1824)	Photo
Piciformes	
Ramphastidae	
Ramphastos toco Statius Muller, 1776	Spec
Ramphastos dicolorus Linnaeus, 1766	Spec
Selenidera maculirostris (Lichtenstein, 1823)	Spec
Pteroglossus bailloni (Vieillot, 1819)	Photo
Pteroglossus castanotis Gould, 1834	Photo
Picidae	
Picumnus cirratus Temminck, 1825	Spec
Picumnus temminckii Lafresnaye, 1845	Spec
Picumnus nebulosus Sundevall, 1866	Spec
Melanerpes candidus (Otto, 1796)	Spec
Melanerpes flavifrons (Vieillot, 1818)	Spec
Melanerpes cactorum (d'Orbigny, 1839)	Photo
Veniliornis spilogaster (Wagler, 1827)	Spec
Veniliornis mixtus (Boddaert, 1783)	Spec
Piculus aurulentus (Temminck, 1821)	Spec
Colaptes melanochloros (Gmelin, 1788)	Spec
Colaptes campestris (Vieillot, 1818)	Spec
Celeus galeatus (Temminck, 1822)	Spec
Celeus flavescens (Gmelin, 1788)	Spec
Dryocopus lineatus (Linnaeus, 1766)	Spec
Campephilus robustus (Lichtenstein, 1818)	Spec
Campephilus leucopogon (Valenciennes, 1826)	Photo
Cariamiformes	
Cariamidae	
Cariama cristata (Linnaeus, 1766)	Spec
Falconiformes	
Falconidae	
Caracara plancus (Miller, 1777)	Spec
Milvago chimachima (Vieillot, 1816)	Spec
Milvago chimango (Vieillot, 1816)	Spec
Herpetotheres cachinnans (Linnaeus, 1758)	Audio
Micrastur ruficollis (Vieillot, 1817)	Spec
Micrastur semitorquatus (Vieillot, 1817)	Spec
Falco sparverius Linnaeus, 1758	Spec
Falco rufigularis Daudin, 1800	Photo
Falco deiroleucus Temminck, 1825	Spec
Falco femoralis Temminck, 1822	Spec
Falco peregrinus Tunstall, 1771	Spec
Psittaciformes	
Psittacidae	
Anodorhynchus glaucus (Vieillot, 1816)	Sight
Primolius maracana (Vieillot, 1816)	Spec
Psittacara leucophthalmus (Statius Muller, 1776)	Spec
Pyrrhura frontalis (Vieillot, 1817)	Spec
Myiopsitta monachus (Boddaert, 1783)	Spec
Brotogeris tirica (Gmelin, 1788)	Photo
Brotogeris chiriri (Vieillot, 1818)	Photo
Pionopsitta pileata (Scopoli, 1769)	Spec
Pionus maximiliani (Kuhl, 1820)	Spec
Amazona vinacea (Kuhl, 1820)	Spec

Appendix 1. Cont.

Taxa	Evidence
Amazona pretrei (Temminck, 1830)	Spec
Amazona aestiva (Linnaeus, 1758)	Photo
Triclaria malachitacea (Spix, 1824)	Spec
Passeriformes	
Thamnophilidae	
Myrmotherula unicolor (Ménétriès, 1835)	Spec
Formicivora acutirostris (Bornschein, Reinert & Teixeira, 1995)	Spec
Rhopias gularis (Spix, 1825)	Spec
Dysithamnus mentalis (Temminck, 1823)	Spec
Thamnophilus ruficapillus Vieillot, 1816	Spec
Thamnophilus caerulescens Vieillot, 1816	Spec
Hypoedaleus guttatus (Vieillot, 1816)	Audio
Batara cinerea (Vieillot, 1819)	Spec
Mackenziaena leachii (Such, 1825)	Spec
Mackenziaena severa (Lichtenstein, 1823)	Spec
Myrmoderus squamosus (Pelzeln, 1868)	Spec
Pyriglena leucoptera (Vieillot, 1818)	Spec
Drymophila rubricollis (Bertoni, 1901)	Spec
Drymophila malura (Temminck, 1825)	Spec
Conopophagidae	
Conopophaga lineata (Wied, 1831)	Spec
Grallariidae	
Grallaria varia (Boddaert, 1783)	Spec
Hylopezus nattereri (Pinto, 1937)	Spec
Rhinocryptidae	
Eleoscytalopus indigoticus (Wied, 1831)	Spec
Scytalopus speluncae (Ménétriès, 1835)	Spec
Scytalopus pachecoi Maurício, 2005	Spec
Scytalopus iraiensis Bornschein, Reinert & Pichorim, 1998	Spec
Psilorhamphus guttatus (Ménétriès, 1835)	Photo
Formicariidae	
Formicarius colma Boddaert, 1783	Spec
Chamaeza campanisona (Lichtenstein, 1823)	Spec
Chamaeza ruficauda (Cabanis & Heine, 1859)	Spec
Scleruridae	
Sclerurus scansor (Ménétriès, 1835)	Spec
Geositta cunicularia (Vieillot, 1816)	Spec
Dendrocolaptidae	
Dendrocincla turdina (Lichtenstein, 1820)	Spec
Sittasomus griseicapillus (Vieillot, 1818)	Spec
Xiphorhynchus fuscus (Vieillot, 1818)	Spec
Campylorhamphus falcularius (Vieillot, 1822)	Spec
Drymornis bridgesii (Eyton, 1850)	Spec
Lepidocolaptes angustirostris (Vieillot, 1818)	Spec
Lepidocolaptes falcinellus (Cabanis & Heine, 1859)	Spec
Dendrocolaptes platyrostris Spix, 1825	Spec
Xiphocolaptes albicollis (Vieillot, 1818)	Spec
Xenopidae	
Xenops rutilans Temminck, 1821	Spec
Furnariidae	
Tarphonomus certhioides (d'Orbigny & Lafresnaye, 1838)	Photo
Cinclodes pabsti Sick, 1969	Spec
Cinclodes fuscus (Vieillot, 1818)	Spec
Furnarius rufus (Gmelin, 1788)	Spec
Limnornis curvirostris Gould, 1839	Spec
Phleocryptes melanops (Vieillot, 1817)	Spec
Lochmias nematura (Lichtenstein, 1823)	Spec

Appendix 1. Cont.

Taxa	Evidence
Clibanornis dendrocolaptoides (Pelzeln, 1859)	Spec
Automolus leucophthalmus (Wied, 1821)	Spec
Anabacerthia amaurotis (Temminck, 1823)	Spec
Anabacerthia lichtensteini (Cabanis & Heine, 1859)	Spec
Philydor atricapillus (Wied, 1821)	Spec
Philydor rufum (Vieillot, 1818)	Spec
Heliobletus contaminatus Pelzeln, 1859	Spec
Syndactyla rufosuperciliata (Lafresnaye, 1832)	Spec
Cichlocolaptes leucophrus (Jardine & Selby, 1830)	Audio
Leptasthenura platensis Reichenbach, 1853	Spec
Leptasthenura striolata (Pelzeln, 1856)	Spec
Leptasthenura setaria (Temminck, 1824)	Spec
Spartonoica maluroides (d'Orbigny & Lafresnaye, 1837)	Spec
Pseudoseisura lophotes (Reichenbach, 1853)	Spec
Phacellodomus sibilatrix Sclater, 1879	Photo
Phacellodomus striaticollis (d'Orbigny & Lafresnaye, 1838)	Spec
Phacellodomus ruber (Vieillot, 1817)	Spec
Phacellodomus ferrugineigula (Pelzeln, 1858)	Spec
Anumbius annumbi (Vieillot, 1817)	Spec
Coryphistera alaudina Burmeister, 1860	Spec
Schoeniophylax phryganophilus (Vieillot, 1817)	Spec
Certhiaxis cinnamomeus (Gmelin, 1788)	Spec
Synallaxis ruficapilla Vieillot, 1819	Spec
Synallaxis cinerascens Temminck, 1823	Spec
Synallaxis frontalis Pelzeln, 1859	Spec
Synallaxis albescens Temminck, 1823	Spec
Synallaxis spixi Sclater, 1856	Spec
Asthenes baeri (Berlepsch, 1906)	Spec
Asthenes pyrrholeuca (Vieillot, 1817)	Spec
Asthenes hudsoni (Sclater, 1874)	Spec
Limnoctites rectirostris (Gould, 1839)	Spec
Cranioleuca sulphurifera (Burmeister, 1869)	Spec
Cranioleuca pyrrhophia (Vieillot, 1818)	Spec
Cranioleuca obsoleta (Reichenbach, 1853)	Spec
Pipridae	
Pipra fasciicauda Hellmayr, 1906	Photo
Manacus manacus (Linnaeus, 1766)	Photo
Chiroxiphia caudata (Shaw & Nodder, 1793)	Spec
Oxyruncidae	
Oxyruncus cristatus Swainson, 1821	Photo
Tityridae	
Schiffornis virescens (Lafresnaye, 1838)	Spec
Tityra inquisitor (Lichtenstein, 1823)	Spec
Tityra cayana (Linnaeus, 1766)	Spec
Pachyramphus viridis (Vieillot, 1816)	Spec
Pachyramphus castaneus (Jardine & Selby, 1827)	Spec
Pachyramphus polychopterus (Vieillot, 1818)	Spec
Pachyramphus validus (Lichtenstein, 1823)	Spec
Xenopsaris albinucha (Burmeister, 1869)	Spec
Cotingidae	
Carpornis cucullata (Swainson, 1821)	Spec
Phytotoma rutila Vieillot, 1818	Spec
Phibalura flavirostris Vieillot, 1816	Spec
Pyroderus scutatus (Shaw, 1792)	Spec
Procnias nudicollis (Vieillot, 1817)	Spec
Pipritidae	
Piprites chloris (Temminck, 1822)	Spec
Piprites pileata (Temminck, 1822)	Spec

Appendix 1. Cont.

Taxa	Evidence
Platyrinchidae	
Platyrinchus mystaceus Vieillot, 1818	Spec
Platyrinchus leucoryphus Wied, 1831	Spec
Tachurisidae	
Tachuris rubrigastra (Vieillot, 1817)	Spec
Rhynchocyclidae	
Mionectes rufiventris Cabanis, 1846	Spec
Leptopogon amaurocephalus Tschudi, 1846	Spec
Corythopis delalandi (Lesson, 1830)	Spec
Phylloscartes eximius (Temminck, 1822)	Spec
Phylloscartes ventralis (Temminck, 1824)	Spec
Phylloscartes kronei Willis & Oniki, 1992	Audio
Phylloscartes difficilis (Ihering & Ihering, 1907)	Spec
Tolmomyias sulphurescens (Spix, 1825)	Spec
Todirostrum cinereum (Linnaeus, 1766)	Photo
Poecilotriccus plumbeiceps (Lafresnaye, 1846)	Spec
Myiornis auricularis (Vieillot, 1818)	Spec
Hemitriccus diops (Temminck, 1822)	Spec
Hemitriccus obsoletus (Miranda-Ribeiro, 1906)	Spec
Hemitriccus orbitatus (Wied, 1831)	Spec
Hemitriccus margaritaceiventer (d'Orbigny & Lafresnaye, 1837)	Photo
Tyrannidae	
Hirundinea ferruginea (Gmelin, 1788)	Spec
Euscarthmus meloryphus Wied, 1831	Spec
Tyranniscus burmeisteri (Cabanis & Heine, 1859)	Spec
Camptostoma obsoletum (Temminck, 1824)	Spec
Elaenia flavogaster (Thunberg, 1822)	Spec
Elaenia spectabilis Pelzeln, 1868	Spec
Elaenia chilensis Hellmayr, 1927	Spec
Elaenia parvirostris Pelzeln, 1868	Spec
Elaenia mesoleuca (Deppe, 1830)	Spec
Elaenia obscura (d'Orbigny & Lafresnaye, 1837)	Spec
Suiriri suiriri (Vieillot, 1818)	Spec
Myiopagis caniceps (Swainson, 1835)	Spec
Myiopagis viridicata (Vieillot, 1817)	Spec
Capsiempis flaveola (Lichtenstein, 1823)	Spec
Phaeomyias murina (Spix, 1825)	Photo+audio
Phyllomyias virescens (Temminck, 1824)	Spec
Phyllomyias fasciatus (Thunberg, 1822)	Spec
Phyllomyias griseocapilla Sclater, 1862	Audio
Culicivora caudacuta (Vieillot, 1818)	Photo
Polystictus pectoralis (Vieillot, 1817)	Spec
Pseudocolopteryx sclateri (Oustalet, 1892)	Spec
Pseudocolopteryx acutipennis (Sclater & Salvin, 1873)	Photo
Pseudocolopteryx flaviventris (d'Orbigny & Lafresnaye, 1837)	Spec
Serpophaga nigricans (Vieillot, 1817)	Spec
Serpophaga subcristata (Vieillot, 1817)	Spec
Serpophaga griseicapilla Straneck, 2008	Spec+audio
Serpophaga munda Berlepsch, 1893	Spec
Attila phoenicurus Pelzeln, 1868	Spec
Attila rufus (Vieillot, 1819)	Spec
Legatus leucophaius (Vieillot, 1818)	Spec
Myiarchus swainsoni Cabanis & Heine, 1859	Spec
Myiarchus ferox (Gmelin, 1789)	Spec
Myiarchus tyrannulus (Statius Muller, 1776)	Spec
Sirystes sibilator (Vieillot, 1818)	Spec
Casiornis rufus (Vieillot, 1816)	Photo

Appendix 1. Cont.

Taxa	Evidence
Pitangus sulphuratus (Linnaeus, 1766)	Spec
Machetornis rixosa (Vieillot, 1819)	Spec
Myiodynastes maculatus (Statius Muller, 1776)	Spec
Megarynchus pitangua (Linnaeus, 1766)	Spec
Myiozetetes similis (Spix, 1825)	Photo
Tyrannus melancholicus Vieillot, 1819	Spec
Tyrannus savana Daudin, 1802	Spec
Tyrannus tyrannus (Linnaeus, 1758)	Photo
Griseotyrannus aurantioatrocristatus (d'Orbigny & Lafresnaye, 1837)	Spec
Empidonomus varius (Vieillot, 1818)	Spec
Colonia colonus (Vieillot, 1818)	Spec
Myiophobus fasciatus (Statius Muller, 1776)	Spec
Sublegatus modestus (Wied, 1831)	Spec
Pyrocephalus rubinus (Boddaert, 1783)	Spec
Fluvicola albiventer (Spix, 1825)	Photo
Fluvicola nengeta (Linnaeus, 1766)	Photo
Arundinicola leucocephala (Linnaeus, 1764)	Spec
Gubernetes yetapa (Vieillot, 1818)	Spec
Alectrurus tricolor (Vieillot, 1816)	Spec
Alectrurus risora (Vieillot, 1824)	Spec
Cnemotriccus fuscatus (Wied, 1831)	Spec
Lathrotriccus euleri (Cabanis, 1868)	Spec
Contopus virens (Linnaeus, 1766)	Photo
Contopus cinereus (Spix, 1825)	Spec
Lessonia rufa (Gmelin, 1789)	Spec
Knipolegus cyanirostris (Vieillot, 1818)	Spec
Knipolegus aterrimus Kaup, 1853	Photo
Knipolegus lophotes Boie, 1828	Spec
Knipolegus nigerrimus (Vieillot, 1818)	Spec
Hymenops perspicillatus (Gmelin, 1789)	Spec
Satrapa icterophrys (Vieillot, 1818)	Spec
Muscisaxicola maclovianus (Garnot, 1826)	Photo
Muscisaxicola capistratus (Burmeister, 1860)	Photo
Xolmis cinereus (Vieillot, 1816)	Spec
Xolmis coronatus (Vieillot, 1823)	Spec
Xolmis velatus (Lichtenstein, 1823)	Photo
Xolmis irupero (Vieillot, 1823)	Spec
Xolmis rubetra (Burmeister, 1860)	Photo
Xolmis dominicanus (Vieillot, 1823)	Spec
Agriornis micropterus Gould, 1839	Photo
Agriornis murinus (d'Orbigny & Lafresnaye, 1837)	Photo
Neoxolmis rufiventris (Vieillot, 1823)	Spec
Muscipipra vetula (Lichtenstein, 1823)	Spec
Vireonidae	
Cyclarhis gujanensis (Gmelin, 1789)	Spec
Hylophilus poicilotis Temminck, 1822	Spec
Vireo chivi (Vieillot, 1817)	Spec
Corvidae	
Cyanocorax caeruleus (Vieillot, 1818)	Spec
Cyanocorax chrysops (Vieillot, 1818)	Spec
Hirundinidae	
Pygochelidon cyanoleuca (Vieillot, 1817)	Spec
Alopochelidon fucata (Temminck, 1822)	Spec
Stelgidopteryx ruficollis (Vieillot, 1817)	Spec
Progne tapera (Vieillot, 1817)	Spec
Progne chalybea (Gmelin, 1789)	Spec
Tachycineta albiventer (Boddaert, 1783)	Spec

Appendix 1. Cont.

Taxa	Evidence
Tachycineta leucorrhoa (Vieillot, 1817)	Spec
Tachycineta leucopyga (Meyen, 1834)	Spec
Riparia riparia (Linnaeus, 1758)	Spec
Hirundo rustica Linnaeus, 1758	Spec
Petrochelidon pyrrhonota (Vieillot, 1817)	Spec
Troglodytidae	
Troglodytes musculus Naumann, 1823	Spec
Cistothorus platensis (Latham, 1790)	Spec
Campylorhynchus turdinus (Wied, 1831)	Photo
Donacobiidae	
Donacobius atricapilla (Linnaeus, 1766)	Photo
Polioptilidae	
Polioptila lactea Sharpe, 1885	Spec
Polioptila dumicola (Vieillot, 1817)	Spec
Turdidae	
Catharus **cf.** *swainsoni* (Tschudi, 1845)	Photo
Turdus flavipes Vieillot, 1818	Spec
Turdus leucomelas Vieillot, 1818	Spec
Turdus rufiventris Vieillot, 1818	Spec
Turdus amaurochalinus Cabanis, 1850	Spec
Turdus subalaris (Seebohm, 1887)	Spec
Turdus albicollis Vieillot, 1818	Spec
Mimidae	
Mimus saturninus (Lichtenstein, 1823)	Spec
Mimus triurus (Vieillot, 1818)	Spec
Sturnidae	
Sturnus vulgaris Linnaeus, 1758	Photo
Motacillidae	
Anthus lutescens Pucheran, 1855	Spec
Anthus furcatus d'Orbigny & Lafresnaye, 1837	Spec
Anthus correndera Vieillot, 1818	Spec
Anthus nattereri Sclater, 1878	Spec
Anthus hellmayri Hartert, 1909	Spec
Passerellidae	
Zonotrichia capensis (Statius Muller, 1776)	Spec
Ammodramus humeralis (Bosc, 1792)	Spec
Arremon semitorquatus Swainson, 1838	Spec
Parulidae	
Setophaga pitiayumi (Vieillot, 1817)	Spec
Geothlypis aequinoctialis (Gmelin, 1789)	Spec
Basileuterus culicivorus (Deppe, 1830)	Spec
Myiothlypis leucoblephara (Vieillot, 1817)	Spec
Icteridae	
Procacicus solitarius (Vieillot, 1816)	Photo
Cacicus chrysopterus (Vigors, 1825)	Spec
Cacicus haemorrhous (Linnaeus, 1766)	Spec
Icterus pyrrhopterus (Vieillot, 1819)	Spec
Gnorimopsar chopi (Vieillot, 1819)	Spec
Amblyramphus holosericeus (Scopoli, 1786)	Spec
Agelasticus cyanopus (Vieillot, 1819)	Spec
Agelasticus thilius (Molina, 1782)	Spec
Chrysomus ruficapillus (Vieillot, 1819)	Spec
Xanthopsar flavus (Gmelin, 1788)	Spec
Pseudoleistes guirahuro (Vieillot, 1819)	Spec
Pseudoleistes virescens (Vieillot, 1819)	Spec
Agelaioides badius (Vieillot, 1819)	Spec
Molothrus rufoaxillaris Cassin, 1866	Spec

Appendix 1. Cont.

Taxa	Evidence
Molothrus oryzivorus (Gmelin, 1788)	Photo
Molothrus bonariensis (Gmelin, 1789)	Spec
Sturnella superciliaris (Bonaparte, 1850)	Spec
Sturnella defilippii (Bonaparte, 1850)	Spec
Dolichonyx oryzivorus (Linnaeus, 1758)	Spec
Mitrospingidae	
Orthogonys chloricterus (Vieillot, 1819)	Spec
Thraupidae	
Rhopospina fruticeti (Kittlitz, 1833)	Spec, photo
Pipraeidea melanonota (Vieillot, 1819)	Spec
Pipraeidea bonariensis (Gmelin, 1789)	Spec
Gubernatrix cristata (Vieillot, 1817)	Spec
Hedyglossa diuca (Molina, 1782)	Spec
Stephanophorus diadematus (Temminck, 1823)	Spec
Cissopis leverianus (Gmelin, 1788)	Spec
Paroaria coronata (Miller, 1776)	Spec
Paroaria capitata (d'Orbigny & Lafresnaye, 1837)	Photo
Tangara seledon (Statius Muller, 1776)	Spec
Tangara cyanocephala (Statius Muller, 1776)	Spec
Tangara sayaca (Linnaeus, 1766)	Spec
Tangara cyanoptera (Vieillot, 1817)	Spec
Tangara palmarum (Wied, 1821)	Spec
Tangara ornata (Sparrman, 1789)	Photo
Tangara peruviana (Desmarest, 1806)	Photo
Tangara preciosa (Cabanis, 1850)	Spec
Nemosia pileata (Boddaert, 1783)	Spec
Conirostrum speciosum (Temminck, 1824)	Spec
Sicalis flaveola (Linnaeus, 1766)	Spec
Sicalis luteola (Sparrman, 1789)	Spec
Haplospiza unicolor Cabanis, 1851	Spec
Hemithraupis guira (Linnaeus, 1766)	Spec
Hemithraupis ruficapilla (Vieillot, 1818)	Photo
Volatinia jacarina (Linnaeus, 1766)	Spec
Trichothraupis melanops (Vieillot, 1818)	Spec
Coryphospingus cucullatus (Statius Muller, 1776)	Spec
Tachyphonus coronatus (Vieillot, 1822)	Spec
Tersina viridis (Illiger, 1811)	Spec
Dacnis cayana (Linnaeus, 1766)	Spec
Coereba flaveola (Linnaeus, 1758)	Spec
Sporophila lineola (Linnaeus, 1758)	Photo
Sporophila frontalis (Verreaux, 1869)	Spec
Sporophila beltoni Repenning & Fontana, 2013	Spec
Sporophila collaris (Boddaert, 1783)	Spec
Sporophila caerulescens (Vieillot, 1823)	Spec
Sporophila leucoptera (Vieillot, 1817)	Photo
Sporophila pileata (Sclater, 1865)	Spec
Sporophila hypoxantha Cabanis, 1851	Spec
Sporophila ruficollis Cabanis, 1851	Spec
Sporophila palustris (Barrows, 1883)	Spec
Sporophila hypochroma Todd, 1915	Photo+audio
Sporophila cinnamomea (Lafresnaye, 1839)	Photo
Sporophila melanogaster (Pelzeln, 1870)	Spec
Sporophila angolensis (Linnaeus, 1766)	Spec
Embernagra platensis (Gmelin, 1789)	Spec
Emberizoides herbicola (Vieillot, 1817)	Spec
Emberizoides ypiranganus Ihering & Ihering, 1907	Spec
Saltatricula multicolor (Burmeister, 1860)	Photo

Appendix 1. Cont.

Taxa	Evidence
Saltator coerulescens Vieillot, 1817	Photo
Saltator similis d'Orbigny & Lafresnaye, 1837	Spec
Saltator maxillosus Cabanis, 1851	Spec
Saltator aurantiirostris Vieillot, 1817	Spec
Saltator fuliginosus (Daudin, 1800)	Spec
Poospiza nigrorufa (d'Orbigny & Lafresnaye, 1837)	Spec
Poospiza thoracica (Nordmann, 1835)	Spec
Microspingus cabanisi Bonaparte, 1850	Spec
Microspingus melanoleucus (d'Orbigny & Lafresnaye, 1837)	Spec
Thlypopsis sordida (d'Orbigny & Lafresnaye, 1837)	Photo
Pyrrhocoma ruficeps (Strickland, 1844)	Spec
Donacospiza albifrons (Vieillot, 1817)	Spec
Cardinalidae	
Piranga flava (Vieillot, 1822)	Spec
Habia rubica (Vieillot, 1817)	Spec
Amaurospiza moesta (Hartlaub, 1853)	Spec
Cyanoloxia glaucocaerulea (d'Orbigny & Lafresnaye, 1837)	Spec
Cyanoloxia brissonii (Lichtenstein, 1823)	Spec
Fringillidae	
Chloris chloris (Linnaeus, 1758)	Sight
Carduelis carduelis (Linnaeus, 1758)	Audio
Spinus magellanicus (Vieillot, 1805)	Spec
Euphonia chlorotica (Linnaeus, 1766)	Spec
Euphonia violacea (Linnaeus, 1758)	Spec
Euphonia chalybea (Mikan, 1825)	Spec
Euphonia cyanocephala (Vieillot, 1818)	Spec
Euphonia pectoralis (Latham, 1801)	Spec
Chlorophonia cyanea (Thunberg, 1822)	Spec
Estrildidae	
Estrilda astrild (Linnaeus, 1758)	Spec
Passeridae	
Passer domesticus (Linnaeus, 1758)	Spec

Appendix 2. Bird species of probable occurrence in the state of Rio Grande do Sul, Brazil (*, species added in this study).

Species
Pterodroma lessonii (Garnot, 1826)
Laterallus exilis (Temminck, 1831)
Spiziapteryx circumcincta (Kaup, 1852)
Progne elegans Baird, 1865
Ramphocaenus melanurus Vieillot, 1819
Setophaga striata (Forster, 1772)
Sporophila iberaensis DiGiacomo & Kopuchian, 2016*

Appendix 3. Bird species of hypothetical occurrence in the state of Rio Grande do Sul, Brazil (*, species added in this study).

Species
Thalassarche chrysostoma (Forster, 1785)
Phaethon aethereus Linnaeus, 1758
Cochlearius cochlearius (Linnaeus, 1766)
Buteo nitidus (Latham, 1790)
Chordeiles acutipennis (Hermann, 1783)
Ramphodon naevius (Dumont, 1818)
Glaucis hirsutus (Gmelin, 1788)
Ramphastos vitellinus Lichtenstein, 1823
Forpus xanthopterygius (Spix, 1824)
Tyrannus albogularis Burmeister, 1856
Progne cf. *sinaloae* Nelson, 1898*
Diuca speculifera (Lafresnaye & d'Orbingy, 1837)
Sicalis citrina Pelzeln, 1870*
Cyanerpes cyaneus (Linnaeus, 1766)*