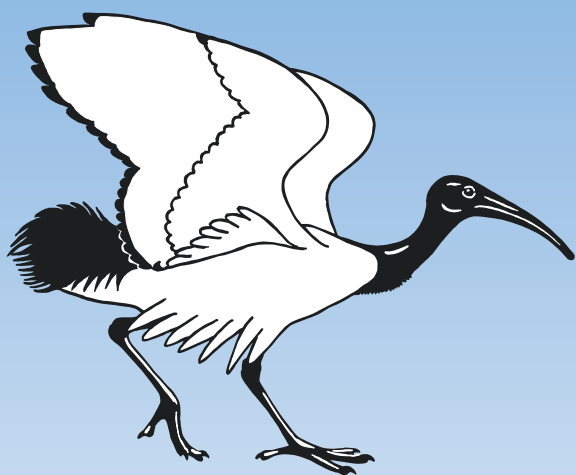


# Bulletin of the British Ornithologists' Club

---



---

Volume 138 No. 2 (Online)  
June 2018

ISSN 2513-9894 (Online)



# Bulletin of the BRITISH ORNITHOLOGISTS' CLUB

---

Vol. 138 No. 2Published 22 June 2018

---

## CLUB ANNOUNCEMENTS

### Chairman's Message

The 989th meeting of the Club was held on Monday 19 March 2018 in the upstairs room at the Barley Mow, 104 Horseferry Road, London SW1P 2EE. Thirteen friends were present and six guests. Friends attending were Miss H. Baker, Mr P. J. Belman, Mr S. Chapman, Mr M. Earp, Mr D. J. Fisher, Mr R. Langley, Mr R. Malin, Dr C. F. Mann, Mr D. J. Montier, Mr R. Pritchett, Dr R. Prÿs-Jones, Mr S. A. H. Statham and Mr C. W. R. Storey (*Chairman*).

Guests attending were Mr A. Bos, Mr G. de Silva, Miss J. Hatton, Mr J. J. F. J. Jansen (*Speaker*), Miss Z. Varley and Miss J. White.

Justin Jansen gave a talk entitled *The ornithology of the Baudin expedition (1800–04)* and provided the following summary. The Baudin expedition to Australia and Timor of 1800–04 has largely been overlooked by the ornithological community, due to the effects of the Napoleonic Wars, personal rivalries, the death of Baudin himself during the expedition, and a lack of curatorial knowledge. The Baudin collection was the first large, significant and relatively complete collection of natural history specimens ever to arrive at the Muséum National d'Histoire Naturelle in Paris. A number of the specimens were to become the types of species 'new to science', and they included at least two taxa that are now extinct. The importance of the collection was at first not fully understood, and its specimens became dispersed all over Europe, ending up in collections such as Blois, La Châtre, Edinburgh, Florence, Geneva, Leiden, Nancy, Paris, Pavia and Vienna. Nevertheless, the expedition paved the way for the 'father of Australian ornithology', John Gould, who embarked on his own journey to Australia almost 40 years later, in 1838.

The talk related the story of the remarkable avian collection acquired during the Baudin expedition, its historical context and importance, and the challenges of its preservation. The vicissitudes of history form the backdrop for the author's fascination with reconstructing the expedition's exploits and the difficulties involved in this. Over the years, only small parts of the Baudin collection have been researched and publicised. The talk aimed to provide a complete, detailed and comprehensive catalogue of the expedition's ornithological exploits. By bringing together what is known about the collection and its dispersal, it will hopefully take research a step further and stimulate the search for the pieces that are still missing.

---

The 990th meeting of the Club was held on Monday 21 May 2018 in the upstairs room at the Barley Mow, 104 Horseferry Road, London SW1P 2EE. Seventeen friends were present and four guests. Friends attending were Miss H. Baker, Mr P. J. Belman, Cdr. M. B. Casement, RN, Mr S. Chapman, Dr R. Cheke, Mr R. Dickey, Mr D. J. Fisher, Mr R. Malin, Dr C. F. Mann, Mr D. J. Montier, Mr A. Pittman, Dr R. Prÿs-Jones, Dr P. Rudge, Dr D. G. D. Russell, Mr S. A. H. Statham, Mr C. W. R. Storey (*Chairman*) and Miss J. White.

Guests attending were Mr O. Crimmon, Mrs M. Montier, Miss J. Springett and Dr B. G. Stokke (*Speaker*).

Dr Bård G. Stokke gave a talk entitled *Host use by the Common Cuckoo*. Dr Stokke's presentation opened with a brief introduction to the Common Cuckoo *Cuculus canorus* and its brood parasitic lifestyle, accompanied by unique photos spanning the whole breeding season, taken by Olda Mikulica. Common Cuckoo is a generalist brood parasite at the species level, known to have utilised more than 100 host species in Europe alone. However, individual females are generally host specific, utilising and often mimicking the eggs of a particular host species. Dr Stokke focused the rest of his talk on the spatial variation in host use in Europe, and he discussed characteristics that are important for parasite utilisation of passerine hosts. The research and results that were described stem mostly from a thorough search for cuckoo parasitism events throughout Europe, which has taken eight years to accomplish and so far has recorded c.65,000 cases of parasitism.

The database discloses that 123 species have been utilised by Common Cuckoos in Europe, although c.30 species are used regularly in larger geographical areas. In addition, 18 more species may be used on a more local spatial scale. Risk of parasitism in host species is dependent on various characteristics like nest placement, habitat, food brought to chicks and female body size of the host. Spatial variation in host use may depend on several factors like host population size, breeding phenology, co-occurrence of several potential host species, habitat composition and spatial scale. The talk ended with a lively and cheerful discussion between the enthusiastic audience and Dr Stokke.

Interested readers are referred to Mikulica, O., Grim, T., Schulze-Hagen, K. & Stokke, B. G. 2017. *The Cuckoo. The uninvited guest*. Wild Nature Press (<http://www.wildnaturepress.com/our-titles/cuckoo-uninvited-guest/>).

---

### 2017 Annual Review Meeting

The 990th meeting was preceded by the Annual Review meeting at which the Chairman presented his Review and the Trustees' Report and Accounts for 2017 (<http://boc-online.org/wp-content/uploads/BOC-Report-and-Accounts-2017.pdf>). The meeting was attended by Miss H. Baker, Cdr M. B. Casement, RN, Mr S Chapman, Mr R. Dickey, Dr R. A. Cheke, Mr D. J. Fisher, Mr R. Malin, Dr C. F. Mann, Mr D. J. Montier, Mrs M. Montier, Mr A. Pittman, Dr R. Prŷs-Jones, Dr D. G. D. Russell, Miss J. Springett, Mr S. A. H. Statham, Dr B. G. Stokke and Mr C. W. R. Storey (*Chairman*).

Introducing the Report and Accounts, Chris Storey reminded the meeting that whilst under the terms of the BOC CIO constitution there was no requirement for a formal AGM, the annual review is an important opportunity for the Trustees to give an account of their stewardship during the past year. Summarising the main events set out in the Report and Accounts, he highlighted:

- BOC CIO and legacy arrangements affecting the final winding-up of the old style BOC (intended for 2018).
- Continuing success of *Bull. Brit. Orn. Cl.* under Guy Kirwan's editorship. (In answer to a question from the floor, it was confirmed that Vol. 137 onwards would be archived on the BioOne site. Previous volumes are archived on the BHL site and the Club is in the process of completing the transfer of Vols. 132–136 to BHL.)
- Publication of Robin Woods' Falkland Islands checklist.
- Celebration on 6 October 2017 of the 125th anniversary of the Club's first meeting. Stephen Chapman produced a suitably decorated cake, which was ceremoniously cut by Dr Claire Spottiswood.

Dr Robert Prŷs-Jones outlined the highly successful meetings programme and said that starting with Dr Nigel Collar's talk the Club intended, with the agreement of speakers, to record the Barley Mow talks and place them on YouTube.

Richard Malin introduced the Accounts. He reported that the Club was in a strong financial position: more than 50% of expenditure in 2017 was accounted for by the one-off costs of the Falkland Islands checklist publication and the final BOU settlement. The Herbert Stevens Trust continued to provide a healthy income stream.

In answer to a question concerning use of funds, the meeting was reminded that in the absence of a paying membership the Club was dependent on income generated by the trust funds. The Checklist series would also require periodic capital expenditure.

Closing the meeting, Chris Storey thanked the many people on whom the Club depends.

---

### Trustees

The Trustees regret to report that Mike Earp has decided to resign as a Trustee of the BOC, owing to other commitments. Chris Storey's Trustee term, due to end in October 2018, was renewed for a further three years as Trustee and Chairman at a Trustees' meeting on 19 March 2018.

---

### FORTHCOMING MEETINGS

See also BOC website: <http://www.boc-online.org>

**BOC MEETINGS** are open to **all**, not just BOC members, **and are free**.

Evening meetings are in **an upstairs room at The Barley Mow, 104 Horseferry Road, Westminster, London SW1P 2EE**. The nearest Tube stations are Victoria and St James's Park; and the 507 bus, which runs from Victoria to Waterloo, stops nearby. For maps, see [http://www.markettaverns.co.uk/the\\_barley\\_mow.html](http://www.markettaverns.co.uk/the_barley_mow.html) or ask the Chairman for directions.

The cash bar opens at **6.00 pm** and those who wish to eat after the meeting can place an order. **The talk will start at 6.30 pm** and, with questions, will last c.1 hour.

---

**Monday 17 September 2018—6.30 pm—Huw Lloyd—Crabs, cranes, and cuckoos: developing bird conservation science in China.**

*Abstract:* China is making tremendous efforts to reach out to the international bird conservation community to help develop its next generation of bird conservationists. Since 2010, Huw Lloyd and colleagues have been



working with Chinese universities and the China Ornithological Society, helping to develop these young scientists. These research collaborations have shed new light on the ecology of migratory Red-crowned Cranes *Grus japonensis*, revealing how they respond to the pressures of habitat change, and what sustains their wintering population. We have discovered how some of China's threatened bird populations are likely to respond to climate change, and how vocal individuality in populations of male Common Cuckoos *Cuculus canorus* can be used as a non-invasive marker for monitoring their population.

*Biography:* Dr Huw Lloyd is Senior Lecturer in Wildlife Biology at the Division of Biology and Conservation Ecology, Manchester Metropolitan University. For the last two decades, he has been conducting research on the ecology and conservation of threatened bird populations in Peru, Brazil, Ethiopia, China, Tonga and the UK.

---

**Monday 12 November 2018—6.30 pm—Joe Tobias—***The shape of birds, and why it matters.*

*Abstract:* Birds vary widely in size from the Bee Hummingbird *Mellisuga helenae* to Common Ostrich *Struthio camelus*, and come in a staggering range of shapes. Last century, the field of ecomorphology began to shed light on the way birds are shaped by habitat preferences and foraging behaviour, but studies focused on relatively few species and left numerous gaps in understanding. This talk will explore recent research based on detailed measurements of almost all of the world's bird species, describing how this new influx of information has been combined with spatial, phylogenetic and ecological data to help answer some fundamental questions, such as how does bird diversity arise, and how can it best be conserved?

*Biography:* Joe Tobias studied the behaviour of the European Robin *Erithacus rubecula* for his Ph.D. at Cambridge University, then worked for ten years in environmental NGOs including BirdLife International, focusing on bird research and conservation projects in South-East Asia, Madagascar and the Neotropics. Returning to academia, he developed a research programme in evolutionary ecology and conservation biology as a Lecturer at Oxford University, before taking up a Senior Lectureship at Imperial College London. His current research focuses on the evolution and conservation of avian diversity.

---

#### Friends of the BOC

The BOC has from 2017 become an online organisation without a paying membership, but instead one that aspires to a supportive network of Friends who share its vision of ornithology—see: <http://boc-online.org/>. Anyone wishing to become a Friend of the BOC and support its development should pay UK£25.00 by standing order or online payment to the BOC bank account:

Barclays Bank, 16 High Street, Holt, NR25 6BQ, Norfolk

Sort Code: 20-45-45

Account number: 53092003

Account name: The British Ornithologists' Club

Friends receive regular updates about Club events and are also eligible for discounts on the Club's Occasional Publications. It would assist our Treasurer, Richard Malin (e-mail: [rmalin21@gmail.com](mailto:rmalin21@gmail.com)), if you would kindly inform him if you intend becoming a Friend of the BOC.

---

#### The Bulletin and other BOC publications

From volume 137 (2017), the *Bulletin* of the BOC has become an online journal, published quarterly, that is available to all readers without charge. Furthermore, it does not levy any publication charges (including for colour plates) on authors of papers and has a median publication time from receipt to publication of six months. Prospective authors are invited to contact the *Bulletin* editor, Guy Kirwan ([GMKirwan@aol.com](mailto:GMKirwan@aol.com)), to discuss prospective submissions or look at <http://boc-online.org/bulletin/bulletin-contributions>. Back numbers up to volume 132 (2012) are available via the Biodiversity Heritage Library website: [www.biodiversitylibrary.org/bibliography/46639#/summary](http://www.biodiversitylibrary.org/bibliography/46639#/summary); vols. 132–136 are available on the BOC website: <http://boc-online.org/>

BOC Occasional Publications are available from the BOC Office or online at [info@boc-online.org](mailto:info@boc-online.org). Future BOC-published checklists will be available from NHBS and as advised on the BOC website. As its online repository, the BOC uses the British Library Online Archive (in accordance with IZCN 1999, Art. 8.5.3.1).

# Songs of Rusty Tinamou *Crypturellus brevirostris* and duetting in *Crypturellus* species

by Peter Boesman, Olivier Claessens, Thiago V. V. Costa, Vincent Pelletier, Johan Ingels & Alexandre Renaudier<sup>†</sup>

Received 15 October 2017; revised 8 March 2018; published 22 June 2018

<http://zoobank.org/urn:lsid:zoobank.org:pub:2ECA55F-A3C2-4A61-B359-40FA8A663E28>

**SUMMARY.**—Rusty Tinamou *Crypturellus brevirostris* is an elusive, ground-dwelling bird of *terra firme* forest. Although widespread across Amazonian Brazil, the Guiana Shield and extreme south-east Colombia, it is everywhere uncommon. Frequently, only its distinctive voice betrays its presence and therefore most contacts with this tinamou are auditory. Here, we analyse the vocalisations of Rusty Tinamou, a primary and secondary song, which may represent duetting between male and female of a mated pair. We also compare and discuss this vocal behaviour with duetting in other *Crypturellus* species.

Tinamous are sombre-coloured birds of the Neotropical forest floor, retiring and therefore difficult to observe for prolonged periods. More often heard than seen, their elusive behaviour and similar coloration among species make identification difficult when they are observed. Usually, only their distinctive songs betray their presence and permit identification (Davies 2002).

Rusty Tinamou *Crypturellus brevirostris*, which inhabits pristine Amazonian *terra firme* forest, is a poorly known species for which almost nothing is known concerning even basic aspects of its biology. The first record of its voice dates from December 1989, when T. A. Parker recorded a singing tinamou near Manaus, in the Brazilian state of Amazonas. Given that Bartlett's Tinamou *C. bartletti* had not been recorded north of the Amazon, that the type locality of *C. brevirostris* is Manaus, and that the voices of all other tinamou species in the area were already known, it was believed that the recorded song belonged to *C. brevirostris*, although in subsequent years there were no visual observations confirming this (Cohn-Haft *et al.* 1997). Once its voice was known, other birdwatchers and ornithologists obtained new records, but it remains a rarely recorded species even now. The observations and photographs published by Rufray *et al.* (2014) became the first irrefutable evidence that the above-mentioned songs were of *C. brevirostris*, which was not observed singing but heard close to the observers and then watched and photographed while foraging.

Here, we analyse and discriminate primary and secondary songs of this tinamou, and compare the secondary song with the similar-sounding, primary song of Cinereous Tinamou *C. cinereus*. We also discuss whether both songs are of a duetting male and female Rusty Tinamou, in view of duetting by Little *C. soui* and Variegated Tinamous *C. variegatus*. We also report observations of Rusty Tinamous responding to singing Variegated Tinamous.

## Methods

For simplicity, we term all vocalisations that consist of more than a single note 'songs', even in the case of well-separated single whistles. This terminology does not assign any function to the vocalisation. For our analysis, we used eight available recordings of *C. brevirostris* song from different sources: four from French Guiana, one from Guyana and

three from Brazil. We rejected a doubtful record from Tefé, Brazil (Appendix 1; WA1258816), for being outside its known range and probably referable to Bartlett’s Tinamou. We also checked eBird records of *C. brevirostris*, but because none provides details of voice or is accompanied by a sound-recording, they are not considered herein (eBird 2018).

For a comparison of the secondary song of *C. brevirostris* with the song of *C. cinereus*, we used seven [www.xeno-canto.org](http://www.xeno-canto.org) (XC) recordings of the latter, all from the Guianan region: two from French Guiana, three from Suriname and two from Venezuela. For duetting behaviour of *C. soui*, we selected five recordings from the XC database: two each from Colombia and French Guiana, and one from Venezuela, while for *C. variegatus* we used XC221943 and XC284911, both from Brazil (Appendix 1), to supplement OC’s observations.

Observations of *C. brevirostris*, *C. soui* and *C. variegatus* by OC were made in French Guiana during personal field work and studies for the Office National des Forêts and for the Groupe d’Étude et de Protection des Oiseaux en Guyane between 2005 and 2017. Observations of *C. brevirostris* by TVVC were made in *terra firme* forest north of Manaus, Brazil, in 2005–09. Observations of vocal interactions between *C. brevirostris* and *C. variegatus* were made in French Guiana by VP during field work for the Bureau d’Études Biotope in 2015–16, and by OC as above.

Results

**Songs of *Crypturellus brevirostris*.**—Rusty Tinamou has a characteristic song, typically commencing with a whistled note, followed by a series of more rapidly delivered whistles that rise slightly in pitch (Fig. 1). Occasionally, having reached its highest frequency, the series continues with additional notes that decrease in pitch and pace. Basic sound parameters of all eight recordings of this characteristic vocalisation, which we term primary song, were measured and these are summarised in Table 1. On average, the song comprises

TABLE 1  
Measurements of basic voice parameters for three species of *Crypturellus* tinamous. Recordings used for the analysis (see Appendix 1): Rusty Tinamou *C. brevirostris*. Primary song (*n* = 8): ML80423 and 134458, WA47191, audio CD with two recordings (Naka *et al.* 2009), XC81200, 81202 and 253198, unpublished recording by VP. Secondary song (*n* = 5): ML80423 and 134458, WA47191, audio CD with one recording (Naka *et al.* 2009), unpubl. recording by VP. Cinereous Tinamou *C. cinereus* (*n* = 7): XC122487, 139218, 221821, 225380, 271934, 272430 and 272431.

	Mean	Standard deviation	Range
<i>Crypturellus brevirostris</i> : primary song ( <i>n</i> = 8)			
No. of notes	16.3	5.0	12–27
Total length (seconds)	8.03	2.75	5.65–14.3
Fastest pace (notes/second)	2.43	0.17	2.22–2.70
Longest note (seconds)	0.40	0.13	0.28–0.54
Shortest note (seconds)	0.24	0.04	0.18–0.27
Longest pause (seconds)	0.60	0.19	0.38–0.85
Shortest pause (seconds)	0.185	0.025	0.15–0.22
Minimum frequency (Hz)	1,770	105	1,660–1,950
Max. frequency (Hz)	1,970	108	1,800–2,100
Frequency rise (Hz)	86	18	60–120
<i>Crypturellus brevirostris</i> : secondary song ( <i>n</i> = 5)			
Note length (seconds)	0.50	0.10	0.38–0.62
Frequency (Hz)	2002	67	1,890–2,100
Minimum pause (seconds)	1.62	1.06	0.43–2.80
<i>Crypturellus cinereus</i> : primary song ( <i>n</i> = 7) (monotypic, but all samples from Guianan Shield)			
Note length (seconds)	0.9	0.17	0.7–1.2
Frequency (Hz)	1,778	77	1,650–1,870
Minimum pause (seconds)	4.0	1.2	2.7–5.8

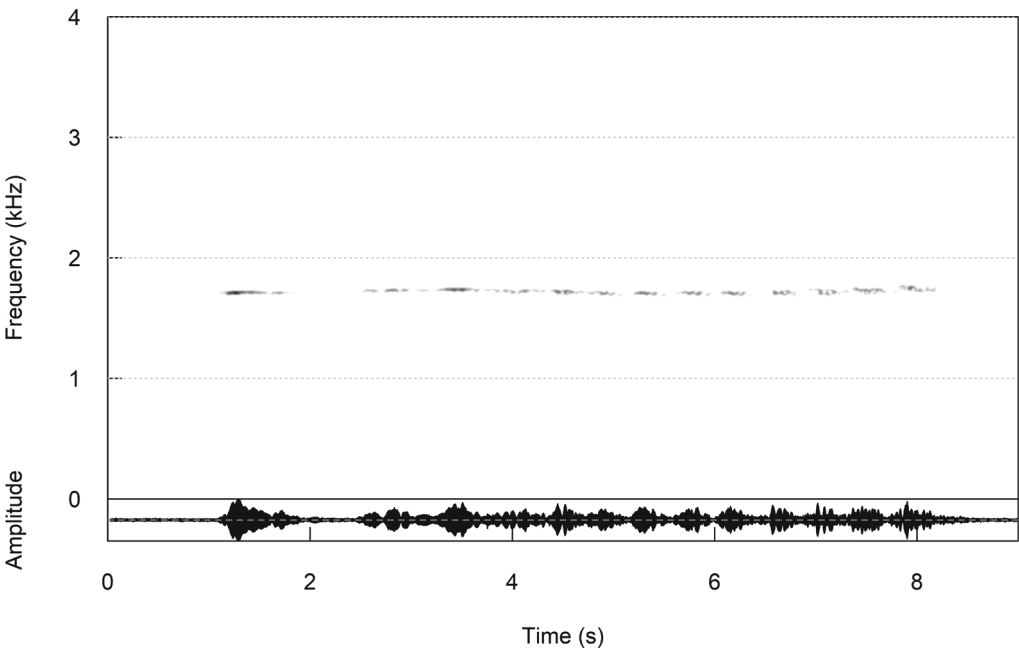


Figure 1. Typical primary song of Rusty Tinamou *Crypturellus brevirostris*, recorded by C. B. Andretti in terra firme forest north of Manaus, and published on the audio CD *Vozes da Amazônia brasileira / Voices of Brazilian Amazon* (Naka et al. 2009).

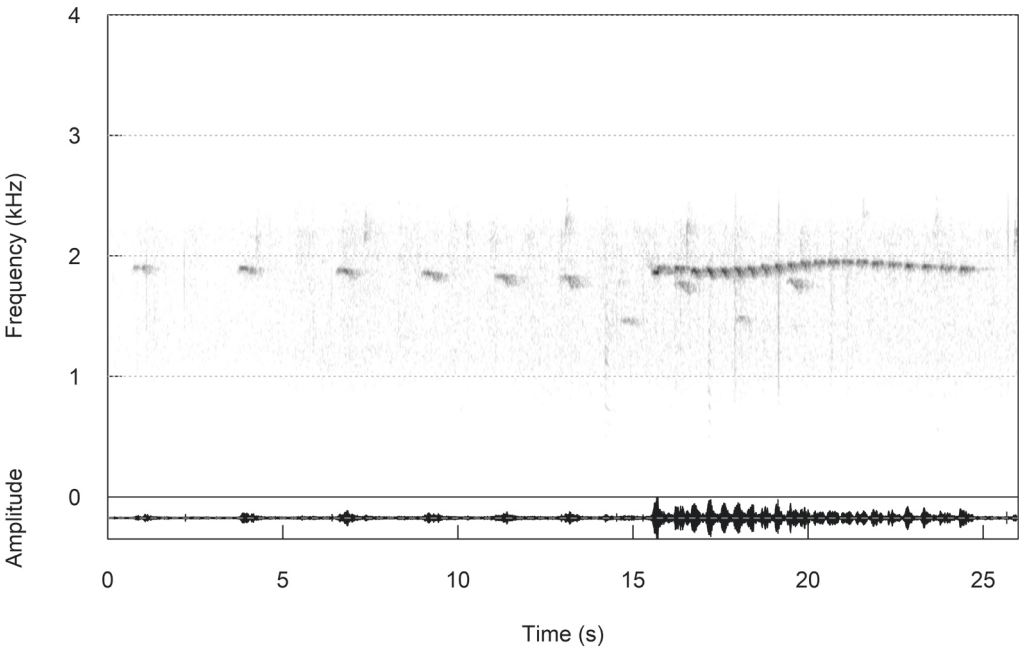


Figure 2. Secondary song followed by primary song of Rusty Tinamou *Crypturellus brevirostris*, recorded by Brian O'Shea in the Acary Mountains (Guyana), on 14 October 2006, and deposited in the Macaulay Library (ML134458).

c.16 notes with a total length of c.8 seconds, starting at a pitch of c.1,800 Hz, and rising to c.1,950 Hz. At its fastest pace, approximately 2.5 notes per second are delivered.

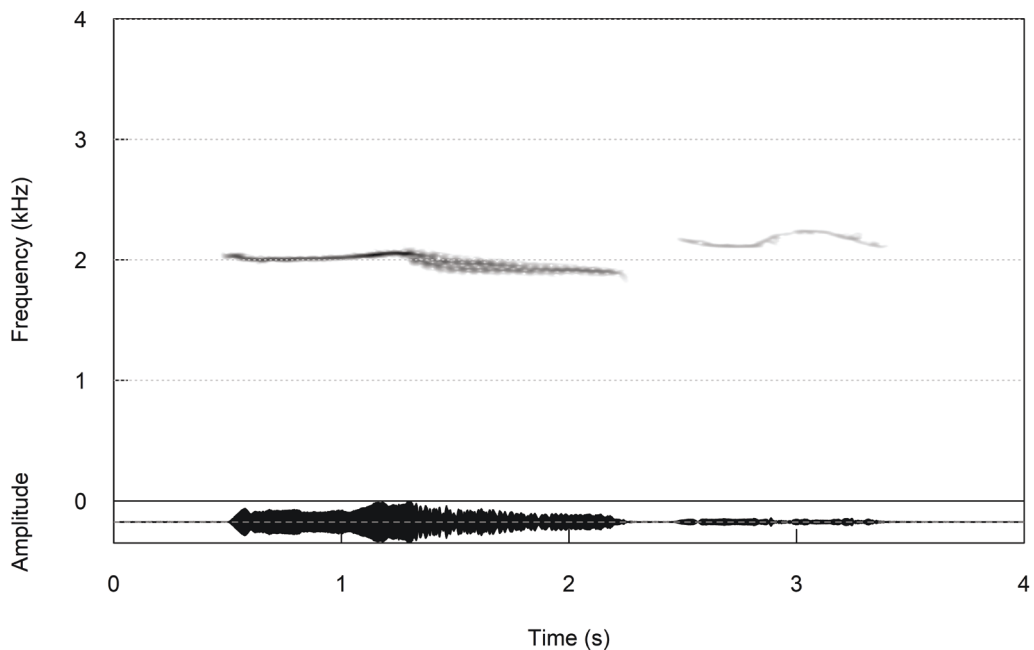


Figure 3. Typical duet of Little Tinamou *Crypturellus soui*, recorded by OC at the Piste de l'Anse, near Sinnamary, French Guiana, on 20 September 2015, and deposited on [www.xeno-canto.org](http://www.xeno-canto.org) (XC282306).

In five of the eight recordings, a second tinamou sings a different song in the background (Fig. 2). This latter consists of a rather irregular series of well-spaced short whistles. This song, which we term secondary song, has been recorded only in combination with primary song, and does not reach the lowest frequencies of the latter. Nevertheless, both primary and secondary songs cover a similar frequency range, but either one can start lower or higher, or end similarly, or display different mean frequencies.

Secondary song is produced before, simultaneously with, or following primary song, and therefore apparently constitutes an asynchronous duet in its simplest form, i.e. both members of a mated pair answering each other. It is also quite irregular in rhythm, sometimes being a series of very slightly accelerating whistles, while at other times it consists only of 1–2 well-spaced whistles. Tinamous of the Guianan and Amazonian lowlands generally vocalise mainly around dawn and dusk (Cabot 1992, Davies 2002). Rusty Tinamou does not sing frequently. Usually individuals sing just once, although they sometimes give a series of 2–4 songs, and once even a series of five songs over a period of two hours and 35 minutes was heard. The earliest song was heard before dawn at 05.45 h and the latest after sunset around 20.00 h; only rarely has the species been heard to sing in the middle of the night (OC, TVVC pers. obs.). Sometimes, individuals of *C. brevirostris* also respond to each other's primary song. However, they do not react readily to playback of song, on only one of many attempts did the bird in question react (OC pers. obs.).

**Duetting in other *Crypturellus*.**—On 20 September 2005, OC observed an individual of *C. soui* crossing a trail just a few metres ahead of him on the Piste de l'Anse at Sinnamary, French Guiana (05°21'N, 52°53'W). Following brief playback, the bird immediately began singing, and was answered by a second individual on the opposite side of the trail and c.10 m apart. The first to sing gave only the loudest song, a drawn-out pure whistle with a quavering terminus. The second bird answered with a pure whistle, slightly modulated and of weaker amplitude. Recordings XC282306 and XC282307 document this observation

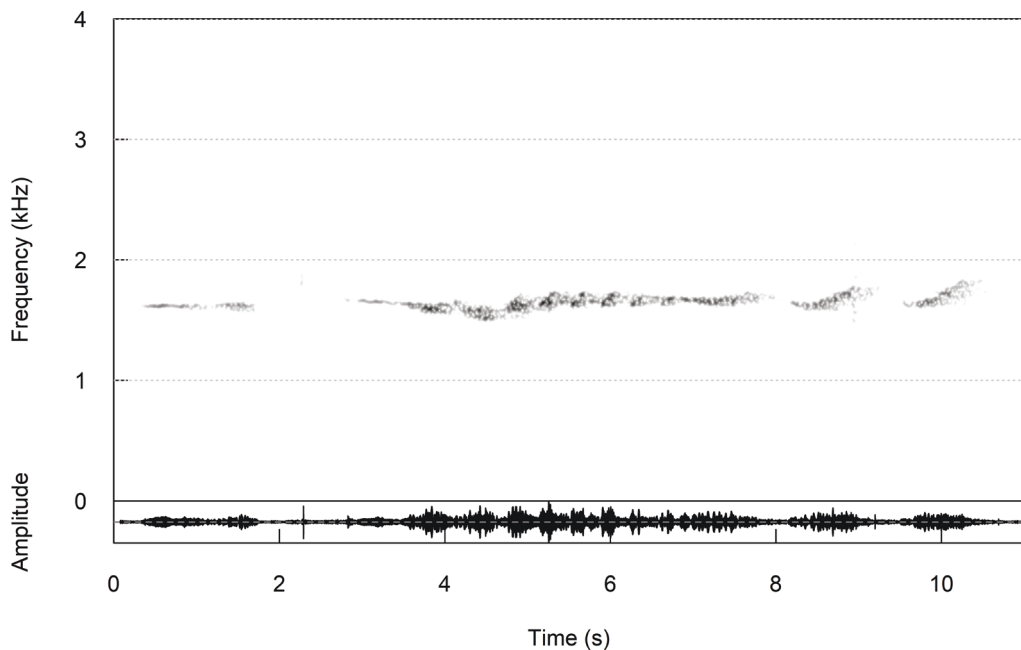


Figure 4. Typical duet of Variegated Tinamou *Crypturellus variegatus*, with the primary song by female followed by three notes by the male, recorded by PB at Rio Cristalino Jungle Lodge, Mato Grosso, Brazil, on 24 July 2005, and deposited on [www.xeno-canto.org](http://www.xeno-canto.org) (XC221943).

(Fig. 3). This asynchronous duet, of which we have noted additional similar recordings, e.g. XC221883, XC273513 and XC275171, appears to be fairly common in *C. soui* (Appendix 1).

The primary song of *C. variegatus* comprises a single introductory flat whistle followed by a pause of up to c.3–4 seconds, then a rapid series of c.5–12 shorter, quavering notes (Fig. 4). This song is frequently answered by another individual that gives 2–5 interrogative whistles, the secondary song. On 11–20 April 2016 in the nature reserve of La Trinité, French Guiana (04°35'N, 53°18'W) OC took detailed notes concerning songs of *C. variegatus*. Of 140 songs, 73 (52%) comprised primary song alone, 15 (11%) secondary song alone, 44 (31%) were duets with the primary song heard first, and eight (6%) were duets with the secondary song given initially. These proportions may vary with season, time of day, and paired (or unpaired) status of the individual birds. Only clear songs given from nearby were counted, to be certain whether there was an answer or not. Sometimes both birds were so vocal that it was difficult to assess which bird was answering which. Once, a primary song was answered by another primary song, and sometimes a third bird vocalised too. Duets appear more frequent in early morning and evening.

**Vocal interactions between *Crypturellus brevirostris* and *C. variegatus*.**—On several occasions in French Guiana, a Rusty Tinamou started singing a few seconds after a Variegated Tinamou sang in the same area. Song of *C. brevirostris* obviously triggered by a singing *C. variegatus* was heard on 8 February 2015 at Crique Léopard (04°57'N, 53°48'W) (VP pers. obs.), and again on 16 April, 9 July 2016 and 6 November 2017 near camp Aya in La Trinité reserve (04°35'N, 53°18'W) and along the forest track to Crique Naï near Mana (c.05°21'N, 53°47'W), respectively (OC pers. obs.). On 15 November 2016 along the Piste de Paul Isnard, near Saint-Laurent-du-Maroni (c.05°09'N, 53°57'W), a *C. variegatus* started to sing around 18.00 h. Immediately it was answered by a *C. brevirostris* on one side of



the track, and seconds later a second and third *C. brevirostris* answered with the species' primary song from the opposite side of the track (V. Rufray *et al.* pers. obs.) (Appendix 2).

## Discussion

Rusty Tinamou appears to have a primary song, and a secondary song uttered by another individual (Fig. 2). The following points support this hypothesis. We can exclude with a high level of certainty that secondary song is given by another tinamou species. In the Guianan region, only the song of *C. cinereus* resembles this slow, secondary song. However, *C. cinereus* gives a repeated single whistle at a slower but more even pace (Fig. 5). Furthermore, the whistles fade, are longer in duration and slightly lower pitched (Table 1). Given that *C. cinereus* prefers somewhat different habitat, *várzea* forest and forest edges, rather than *terra firme* and forest interior, the possibility that it is present in precisely the same localities as *C. brevirostris* in five of nine recordings appears very small indeed. The secondary song is thus likely to be *C. brevirostris*. A territorial bird of the same species would probably respond with a similar territorial song. If the secondary song of *C. brevirostris* is triggered by primary song, the most likely option is that it represents response by a mate. The reason why secondary song of *C. brevirostris* has not been recorded individually might be because this song resembles that of *C. cinereus*. Another possibility is that being secondary song, it is heard much less frequently than territorial primary song, or it has simply been overlooked hitherto.

It would appear logical to assume that primary song represents male territorial song, while secondary song is given by a paired female. However, in *Crypturellus* tinamous roles are reversed between the sexes, i.e. courtship is initiated by females and incubation and care of chicks are male tasks (Cabot 1992). We therefore searched for data on the voice of males and females of other *Crypturellus*. Surprisingly, differences in voice between the sexes have

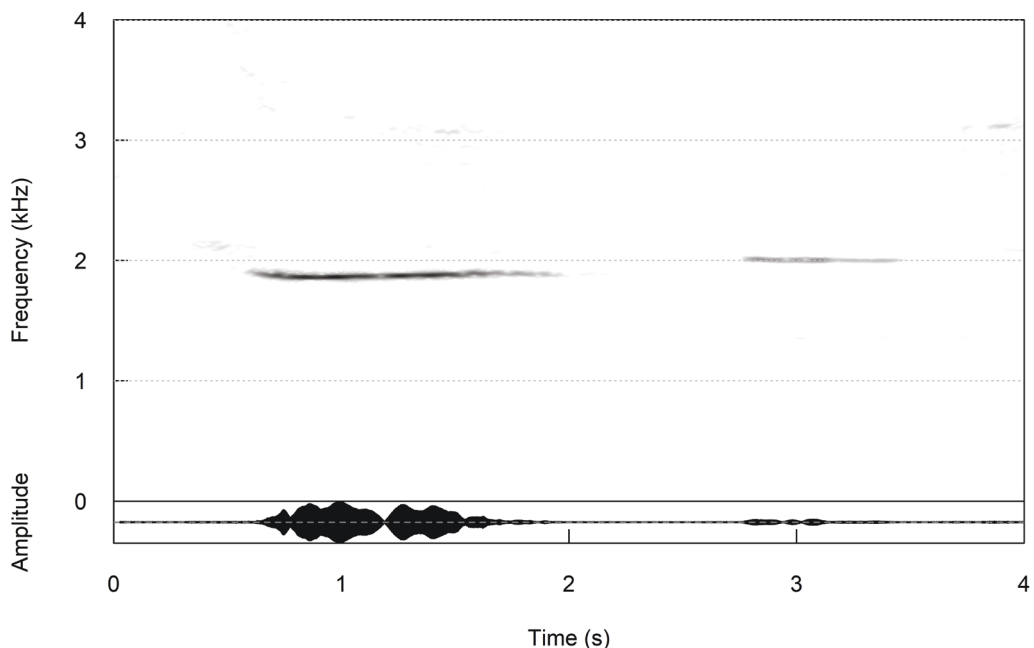


Figure 5. Duet of Cinereous Tinamou *Crypturellus cinereus*, recorded by PB at Peperpot, Commewijne, Suriname, on 14 March 2007, and deposited on [www.xeno-canto.org](http://www.xeno-canto.org) (XC272432).

been documented for only a few *Crypturellus* (Cabot 1992, Sick 1993, Magalhães 1999, Cabot *et al.* 2014) and firm evidence that *Crypturellus* perform male–female duets is mentioned in the literature only for Tataupa Tinamou *C. tataupa* (Davies 2002).

The life history of *C. variegatus* was studied in detail by Beebe (1925). This species appears to be polyandrous, with courtship initiated by the female and primary song is always given by the female. In this species, the most vocal sex is the female, with the male only occasionally answering with secondary song.

Thicket Tinamou *C. cinnamomeus* was thoroughly studied by Leopold (1959). Very different from *C. variegatus*, this species appears to be monogamous, and although males incubate the eggs and provision the chicks, they are also the primary singers. Twelve singing birds that were collected were all males.

Lancaster (1964a,b) reported on Slaty-breasted Tinamou *C. boucardi*. In this species, the male is again the primary singer, the female having a different, more nasal, whining and subdued vocalisation, typically uttered in response to the male. This species is polygamous, with males incubating several broods belonging to different females.

Magalhães (1999) reported vocal differences related to sex in Brown *C. obsoletus* and Small-billed Tinamous *C. parvirostris*, but without much detail.

For the widespread and common *C. soui*, surprisingly, the literature is less clear. Schäfer (1954) indicated that both sexes utter the drawn-out tremulous whistle. In a study of *C. soui* by Skutch (1963), he observed that ‘when a male started whistling in the evening a female would respond and this would go on for longer than about 20 minutes, it came across as if it were a call to the female initially then when the response was received a sing-song melody proceeded as if they were ‘talking to each other’. How Skutch identified male and female in the field in the twilight is less clear. In two pairs studied in captivity, females initiated courtship behaviour (Brooks 2015). Duet calls were more frequently initiated by females than higher-pitched males, and were elicited on separation of paired birds. Both

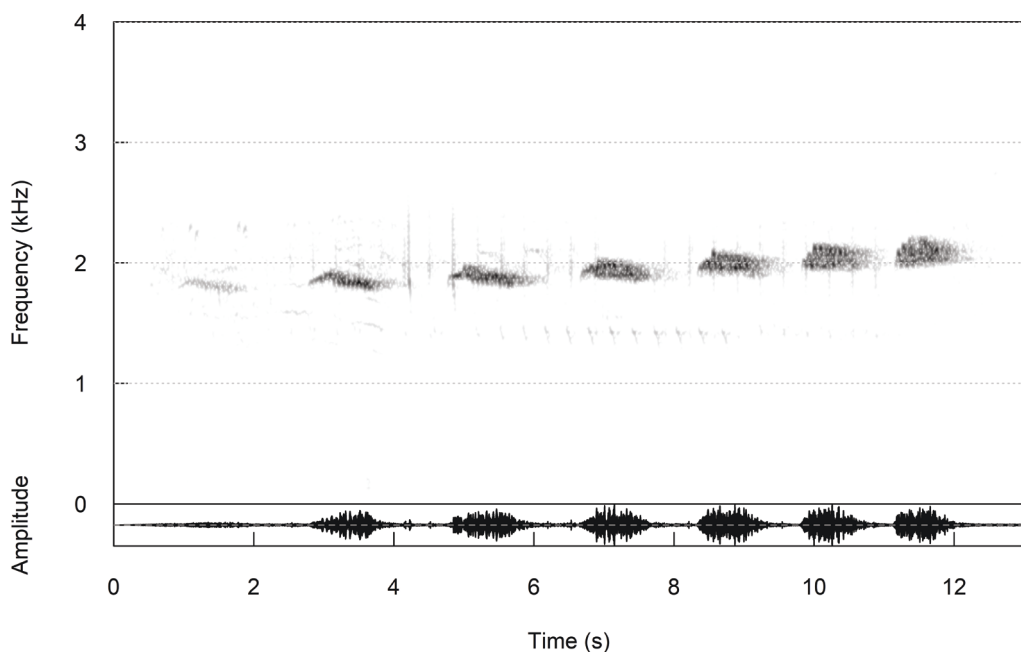


Figure 6. Typical primary song of Little Tinamou *Crypturellus soui*, recorded by PB at Zanderij, Suriname, on 14 March 2014, and deposited on [www.xeno-canto.org](http://www.xeno-canto.org) (XC272579).



sexes uttered the drawn-out whistle with a tremulous ending (D. M. Brooks *in litt.* 2017). Consequently, the vocal repertoire of *C. soui* appears quite diverse, including a rising series of whistles typically given at dawn and dusk, and often considered to represent the primary song of unknown sex (Ridgely & Greenfield 2001, Schulenberg *et al.* 2007; Fig. 6), a drawn-out whistle with tremulous ending sometimes termed daytime song and either given by one bird, a pair or possibly two territorial birds, and a pure whistle mainly given in a duet by birds of unknown sex.

Of the 21 *Crypturellus*, most species have been studied in even less detail, but for several species at least there are also indications of duetting and vocal differences between the sexes. For example, *C. cinereus* regularly can be heard counter-singing on slightly different pitches, either by two territorial birds or a duetting pair, e.g. XC221826 (Appendix 1). Both *C. obsoletus* and *C. parvirostris* possess two distinct and frequently heard vocalisations.

In the four species discussed above (Sick 1993), we have examples of principally female singers, principally male singers, species in which the sexes appear almost equally vocal, and breeding systems ranging from polygamy to polyandry.

Among tinamou species for which vocal behaviour are available, *C. brevirostris* is closely related to *C. variegatus*, but this does not necessarily mean that their vocal behaviour is identical, as *C. variegatus* may or may not represent an exceptional case. At present, we can conclude only that there is no evidence that either the male or female of *C. brevirostris* is the primary singer.

Another question raised by our observations concerns *C. brevirostris* responding to the song of *C. variegatus*. Both species possess a similar introductory whistle, albeit on a slightly different pitch. Whether this similarity is sufficient to trigger a Rusty Tinamou to sing, or whether this behaviour indicates true interspecific territoriality, is unclear and also merits further investigation.

Tinamous in the forested lowlands are more frequently heard than seen and, when seen, observations are often limited to a brief glimpse barely sufficient to identify the species, let alone to determine the sex involved. It is thus unsurprising that duetting and identification of the sex of each singer has very rarely been appropriately documented with evidence. In the case of *C. brevirostris*, it would require intensive and dedicated field work to confirm that secondary song is uttered by this species and to determine the sex. Because the sexes are similar in coloration, study of marked birds, the sexes of which could be inferred by in-hand anatomical examination or using chromosomes, would be necessary. Alternatively, birds in captivity could be studied, as performed with Elegant Crested Tinamou *Eudromia elegans* (Schuster *et al.* 2012) and Little Tinamou *C. soui* (Brooks 2015) for other purposes. To what extent vocal behaviour in captivity is representative of natural conditions requires clarification. Apparently, in many *Crypturellus*, e.g. *C. obsoletus*, *C. parvirostris*, *C. tataupa* and *C. soui*, vocalisations in captivity appear virtually identical to those given by wild individuals (L. F. Silveira pers. comm.).

Careful sexing of specimens collected after their voice has been recorded is also desirable to clarify possible sexual differences in the vocalisations of *C. brevirostris*, as well as among other tinamous that duet. It is clear that there is still much to be learned concerning the vocal behaviour of *Crypturellus* tinamous.

#### Acknowledgements

This paper is a tribute to our late friend Alexandre Renaudier, who made an impressive contribution to our knowledge of the regional avifauna during his eight years in French Guiana, especially via his recordings and study of bird vocalisations. We thank Christian B. Andretti, Tanguy Deville, Charles Gosset, Jon King, Joe Klaiber, Guillaume Léotard, Clément Lermyte, Brian O'Shea, Fernando Pacheco, Theodore A. Parker, Vincent Ruffray, Tho Thai and Patricio N. Valenzuela for use of their recordings, and the Xeno-Canto Foundation for easy access to many of these recordings. OC thanks the Office National des Forêts for permitting and funding

field work in the nature reserve of La Trinité, and TVVC thanks Mario Cohn-Haft, the Tropical Ecology, Assessment and Monitoring (TEAM) Network, and the Instituto Nacional de Pesquisas da Amazônia (INPA) for supporting his field work north of Manaus. We thank the Comité d'Homologation de Guyane for access to its database. We received additional information from Daniel Brooks and Mark Robbins, and we greatly appreciate comments by Des Jackson and Luís Fábio Silveira on a draft of this paper. Guy M. Kirwan, Brian O'Shea and Christopher J. Sharpe made useful comments on the submitted manuscript.

#### References:

- Beebe, W. 1925. The variegated tinamou *Crypturus variegatus variegatus* (Gmelin). *Zoologica* 6: 195–227.
- Brooks, D. M. 2015. Behavior, reproduction, and development in Little Tinamou (*Crypturellus soui*). *Wilson J. Orn.* 127: 761–765.
- Cabot, J. 1992. Family Tinamidae (tinamous). Pp. 111–128 in del Hoyo, J., Elliott, A. & Sargatal, J. (eds.) *Handbook of the birds of the world*, vol. 1. Lynx Edicions, Barcelona.
- Cabot, J., Christie, D. A., Jutglar, F. & Sharpe, C. J. 2014. Rusty Tinamou (*Crypturellus brevirostris*). In del Hoyo, J., Elliott, A., Sargatal, J., Christie, D. A. & de Juana, E. (eds.) *Handbook of the birds of the world Alive*. Lynx Edicions, Barcelona (retrieved from <http://www.hbw.com/node/52433> on 16 August 2017).
- Cohn-Haft, M., Whittaker, A. & Stouffer, P. C. 1997. A new look at the “species-poor” central Amazon: the avifauna north of Manaus, Brazil. Pp. 205–235 in Remsen, J. V. (ed.) *Studies in Neotropical ornithology honoring Ted Parker*. *Orn. Monogr.* 48.
- Davies, S. J. J. F. 2002. *Ratites and tinamous*. Oxford Univ. Press.
- eBird. 2018. Online database of bird distribution and abundance. eBird, Ithaca, NY. <https://ebird.org/map/rustin1?neg=true&env.minX=&env.minY=&env.maxX=&env.maxY=&zh=false&gp=false&ev=Z&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2018> (accessed on 15 February 2018).
- Lancaster, D. A. 1964a. Life history of the Boucard Tinamou in British Honduras: Part I: distribution and general behaviour. *Condor* 66: 165–181.
- Lancaster, D. A. 1964b. Life history of the Boucard Tinamou in British Honduras: Part II: breeding biology. *Condor* 66: 253–276.
- Leopold, A. S. 1959. *Wildlife of Mexico: the game birds and mammals*. Univ. of California Press, Berkeley.
- Magalhães, J. C. R. 1999. *As aves na Fazenda Barreiro Rico*. Plêiade, São Paulo.
- Naka, L. N., Stouffer, P. C., Cohn-Haft, M., Marantz, C. A., Whittaker, A. & Bierregaard, R. O. 2009. *Vozes da Amazônia brasileira / Voices of the Brazilian Amazon*. CDs. Instituto Nacional de Pesquisas da Amazônia, Manaus.
- Ridgely, R. S. & Greenfield, P. J. 2001. *The birds of Ecuador*. Christopher Helm, London.
- Rufay, V., Pelletier, V. & Ingels, J. 2014. First photographs and new records of the Rusty Tinamou *Crypturellus brevirostris* from French Guiana. *Neotrop. Birding* 15: 15–19.
- Schäfer, E. 1954. Zur Biologie des Steissshuhnes, *Nothocercus bonapartei*. *J. Orn.* 95: 219–232.
- Schulenberg, T. S., Stotz, D. F., Lane, D. F., O'Neill, J. P. & Parker, T. A. 2007. *Birds of Peru*. Princeton Univ. Press.
- Schuster, S., Zollinger, S. A., Lesky, J. & Brumm, H. 2012. On the evolution of noise-dependent vocal plasticity in birds. *Biol. Lett.* 8: 913–916.
- Sick, H. 1993. *Birds in Brazil: a natural history*. Princeton Univ. Press.
- Skutch, A. F. 1963. Life history of the Little Tinamou. *Condor* 65: 224–231.
- Addresses:* Peter Boesman, Duinenweg 3, BE-2820 Rijmenam, Belgium. Olivier Claessens, Résidence Clos de Bénédicte, 2510 route de Montabo, FR-97300 Cayenne, French Guiana. Thiago V. V. Costa, Museu de Zoologia da Universidade de São Paulo (MZUSP), Av. Nazaré 481, Ipiranga, CEP 04218-970, São Paulo, SP, Brazil. Vincent Pelletier, P.K. 1.2, route de Tonnégrande – CD 12, FR 97356 Montsinéry-Tonnégrande, French Guiana. Johan Ingels (corresponding author), Galgenberglaan 9, BE-9070 Destelbergen, Belgium, e-mail: [johan.ingels@skynet.be](mailto:johan.ingels@skynet.be). Alexandre Renaudier<sup>†</sup>.

#### Appendix 1: voice recordings of *Crypturellus* species

Given are: source and reference number (ML: Macaulay Library; WA: Wikiaves; XC: xeno-canto), locality of recording, date of recording, recordist, type of song.

##### Rusty Tinamou *Crypturellus brevirostris*

- ML80423, Manaus (Amazonas, Brazil), January 1990 (?), T. A. Parker. Primary and secondary song.
- WA1258816, Tefé, on right bank of Solimões River (Amazonas, Brazil), 2 July 1993, J. F. Pacheco. Secondary song?
- ML134458, Acary Mountains (Guyana), 14 October 2006, B. O'Shea. Primary and secondary song.
- WA47191, km 34 along road ZF-2 in Cuieiras Reserve, north of Manaus (Amazonas, Brazil), 11 March 2007, T. V. V. Costa (this recording is the same as that on *Vozes da Amazônia brasileira*, see below). Primary and secondary song.

Audio CD, *Vozes da Amazônia brasileira / Voices of the Brazilian Amazon*, vol. 1, INPA, Manaus (Naka *et al.* 2009).  
 Two recordings: one by T. V. V. da Costa, km 34 along road ZF-2 in Cuieiras Reserve north of Manaus (Amazonas, Brazil), 11 March 2007 (same as WA47191), primary and secondary song, and one by C. B. Andretti, in *terra firme* forest north of Manaus, primary song.  
 XC81200 and XC81202, inselberg Savane-roche Virginie near Régina, French Guiana, 29 May 2011, A. Renaudier. Primary song.  
 XC253198, Aya, Réserve Naturelle de la Trinité, French Guiana, 18 April 2015, O. Claessens. Primary song.  
 XC386694, Crique Moussinga, Bassin du Maroni, Apatou, French Guiana, 12 August 2013, V. Pelletier. Primary and secondary song.

#### **Cinereous Tinamou** *Crypturellus cinereus*

XC221821, Junglaven area, Amazonas, Venezuela, 11 January 1993, P. Boesman.  
 XC221826, Serra dos Carajás, Salobo area, Pará, Brazil, 17 January 2005, P. Boesman.  
 XC272430 and 272431, Peperpot, Commewijne, Suriname, 14 March 2007, P. Boesman.  
 XC225380, Río Caura south of Maripa, Bolívar, Venezuela, 4 March 2010, J. Klaiber.  
 XC122487, track to the Crique Dardanelles, Mana, French Guiana, 25 December 2012, J. King.  
 XC139218, village of Cacao, Roura, French Guiana, 19 June 2013, T. Thai.  
 XC271934, Cola Creek, Para, Suriname, 22 March 2014, P. Boesman.

#### **Little Tinamou** *Crypturellus soui*

XC221883, El Pauji road, Bolívar, Venezuela, 31 July 2002, P. Boesman.  
 XC272579, Zanderij, Suriname, 14 March 2014, P. Boesman.  
 XC273513, Reserva Natural de las Aves El Paujil, Santander, Colombia, 2 February 2011, P. Boesman.  
 XC275171, Playa de Oro, Esmeraldas, Ecuador, 10 May 1996, P. N. Valenzuela.  
 XC282306 and XC282307, Piste de l'Anse, Sinnamary, French Guiana, 20 September 2015, O. Claessens.

#### **Variegated Tinamou** *Crypturellus variegatus*

XC221943, Rio Cristalino Jungle Lodge, Mato Grosso, Brazil, 24 July 2005, P. Boesman. Duet, the female first, answered by the male who sings three times.  
 XC284911, Carauari, Amazonas, Brazil, 28 July 2015, G. A. Leite. Duet.

#### **Appendix 2:** vocal interactions between *Crypturellus brevirostris* and *C. variegatus* in French Guiana.

Given are: reference in database Faune-Guyane, locality of observation, date of observation, observer(s) and no. of CHG record.

[http://www.faune-guyane.fr/index.php?m\\_id=54&id=448161](http://www.faune-guyane.fr/index.php?m_id=54&id=448161), Crique Léopard, Saint-Laurent-du-Maroni (04°57'N, 53°48'W), 8 February 2015, V. Pelletier, CRYBRE 2015-4.

[http://www.faune-guyane.fr/index.php?m\\_id=54&id=348630](http://www.faune-guyane.fr/index.php?m_id=54&id=348630), nature reserve of La Trinité (04°35'N, 53°18'W), 16 April 2016, O. Claessens, CRYBRE 2016-3.

[http://www.faune-guyane.fr/index.php?m\\_id=54&id=362262](http://www.faune-guyane.fr/index.php?m_id=54&id=362262), forest track to Crique Naï, Mana (c.05°21'N, 53°47'W), 9 July 2016, O. Claessens, CRYBRE 2016-4.

[http://www.faune-guyane.fr/index.php?m\\_id=54&id=383582](http://www.faune-guyane.fr/index.php?m_id=54&id=383582), Piste de Paul Isnard, Saint-Laurent-du-Maroni (c.05°09'N, 53°57'W), 15 November 2016, T. Deville, C. Gosset, G. Léotard, C. Lermite, V. Rufray, CRYBRE 2016-7.

# The ambiguous identity of *Turdus mustelinus* Wilson, and a neotype designation for the Veery *Catharus fuscescens* (Stephens)

by Matthew R. Halley

Received 23 October 2017; revised 13 April 2018; published 22 June 2018

<http://zoobank.org/urn:lsid:zoobank.org:pub:30C37132-7B59-435B-A85B-B74D808ECFFE>

**SUMMARY.**—The long-recognised name of the Veery *Catharus fuscescens* (Stephens 1817) was intended to replace Tawny Thrush *Turdus mustelinus* Wilson, 1812, which was preoccupied by *T. mustelinus* J. F. Gmelin, 1789. Herein, I demonstrate that *T. mustelinus* Wilson is unidentifiable because it was based on attributes shared by more than one species, including some features that are a better match to other *Catharus* species than to Veery. None of the specimens mentioned in Wilson's description is extant. To maintain traditional nomenclature and to prevent destabilising confusion arising from alternative identifications, I designate a neotype for *Turdus mustelinus* Wilson and its replacement names, including *T. fuscescens* Stephens, fixing the name to the taxon to which it has been traditionally applied. The neotype is a colour-banded male that was tracked over two consecutive years with light-level geolocator and GPS tracking units. To my knowledge, it is the first bird specimen in any collection for which migratory data were collected with either device.

The taxonomic history of the forest-dwelling thrushes of eastern North America (*Catharus*) ranks among the most obscure and confusing chapters of American ornithology. Repeatedly, multiple names were unknowingly applied to a single species, or conversely, attributes of multiple species were combined to form a composite species (Coues 1878). Today, in addition to Wood Thrush *Hylocichla mustelina*, which has sometimes been placed in *Catharus*, ornithologists recognise nine taxa of five species that breed in and / or migrate through the Mid-Atlantic region of eastern North America: *C. guttatus faxoni* (Bangs & T. E. Penard, 1921), *C. g. crymophilus* (Burleigh & J. L. Peters 1948), Hermit Thrush; *C. ustulatus swainsoni* (J. Cabanis in Tschudi, 1845), *C. u. clarescens* (Burleigh & J. L. Peters 1948), Swainson's Thrush; *C. fuscescens fuscescens* (Stephens 1817), *C. f. fuliginosus* (Howe, 1900), Veery; *C. minimus minimus* (Lafresnaye, 1848), *C. m. aliciae* (S. F. Baird, 1858), Grey-cheeked Thrush; *C. bicknelli* (Ridgway, 1882), Bicknell's Thrush.

However, when Alexander Wilson (1766–1813) first became acquainted with William Bartram (1739–1823) in winter 1803, they distinguished only two members of the complex in eastern North America: (1) a relatively larger species called Wood Thrush or Wood Robin *Turdus melodus* (Wilson 1808), now known as Wood Thrush *Hylocichla mustelina* (Gmelin 1789: 817), and (2) a relatively smaller, composite species called Little Thrush *Turdus minor* (Gmelin 1789: 809). However, Bartram, who in his time had a more advanced knowledge of birds than any other American (Allen 1951), was not yet convinced that *T. melodus* and *T. minor* were different species. It was Wilson, in 1807, who first convinced him that they were different by comparing fresh specimens to Edwards' (1760) plate, which depicted a specimen collected in 1756 by Bartram himself (Wilson 1808: 33–34):

'But Mr. Edwards has also described and delineated the Little Thrush, and has referred to Catesby as having drawn and engraved it before. Now this Thrush of Edwards I know to be really a different species [than the Wood Thrush]; one not resident in Pennsylvania, but passing to the north in May, and returning the same way in October, and may be distinguished from the true Song Thrush (*Turdus Melodus*) [i.e., Wilson's (1808) name for the Wood Thrush, adapted from Bartram's (1791) *T. melodes*] by the spots being much broader, brown, and not descending below the breast. It is also an inch shorter, with the cheeks of a bright tawny color. Mr. William Bartram, who transmitted this bird, more than 50 years ago, to Mr. Edwards, by whom it was drawn and engraved, examined the two species in my presence; and on comparing them with the one in Edwards, was satisfied that the bird there figured and described is not the Wood Thrush (*Turdus Melodus*), but the tawny cheeked species above mentioned. This species I have never seen in Pennsylvania but in spring and fall. It is still more solitary than the former, and utters, at rare times, a single cry, similar to that of a chicken which has lost its mother. This very bird I found numerous in the Myrtle swamps of Carolina in the depth of winter, and I have not a doubt of its being the same which is described by Edwards and Catesby<sup>1</sup>... A figure and description of this passenger Thrush will appear in an early part of the present work.'

The objectives of the present paper are to (1) explain how and when *T. minor* J. F. Gmelin became a taxonomic composite; (2) demonstrate that the material and descriptive basis of *T. mustelinus* Wilson was insufficient to distinguish the species now known as Veery (*C. fuscescens*) from the composite *T. minor* (i.e. Wilson's Tawny Thrush was also an amalgamation); (3) show that Charles Lucien Bonaparte (1803–57) and John James Audubon (1785–1851), who had opportunities to see Wilson's type material, also failed to distinguish Veery from the composite *T. minor*; and (4) resolve and stabilise the nomenclature of Veery by designating a neotype that restricts the name *fuscescens* Stephens, 1817, to those of its breeding populations in eastern North America which have traditionally borne this name.

### Taxonomic amalgamation in *Turdus minor*

To evaluate Wilson's (1808: 33–34) comments, it is first necessary to understand how *T. minor* J. F. Gmelin became taxonomically composite. According to references in Gmelin's original description, the story traces back to the very beginnings of American ornithology, to the English naturalist Mark Catesby (1683–1749), who described the Little Thrush in 1731 and gave it the pre-Linnaean name '*Turdus minimus*' (Fig. 1). This was the first and only small spotted thrush known from North America before 1756, when Bartram, aged 17 years, collected a specimen of another small thrush near his family home (Bartram's Garden) near Philadelphia, Pennsylvania (Trotter 1907). Bartram included that specimen in a shipment to London, to the English naturalist George Edwards (1694–1773), who subsequently illustrated and described it in the second volume of *Gleanings of natural history* (1760; Fig. 2). Edwards presumed that Bartram's specimen was synonymous with Catesby's (1731) Little Thrush.

The identity of the Little Thrush that Catesby had encountered in 1722–24 on the coastal plain of South Carolina and Georgia is questionable. An examination of Catesby's plate reveals a thoroughly ambiguous species (Fig. 1), probably because it was illustrated from memory, without reference to a specimen; Little Thrush was not included in specimen

<sup>1</sup> This remark was absent from Wilson's original (1808) description, but was added to the 300 additional copies of Vol. 1 that were printed in 1809, after Wilson returned to Philadelphia from the south-eastern USA (see Faxon 1901).





Figure 1. Cropped image of Little Thrush from Pl. 31 of Catesby (1731), probably illustrated without reference to a specimen (see text). Image reproduced courtesy of the Library of the Academy of Natural Sciences of Drexel University (QH41.C35).



Figure 2. Cropped image of Little Thrush from Pl. 296 of Edwards (1760), depicting the specimen collected in 1756 by William Bartram (see text). A medallion in the illustration bears the initials 'GE' (George Edwards) and the year 1757, indicating that the image was drawn from a fresh specimen, not more than one year old. Image reproduced courtesy of the Library of the Academy of Natural Sciences of Drexel University (QL674.E261).

lists sent by Catesby to Hans Sloane in May 1723 and March 1724 (see Nelson 2017). Nevertheless, his descriptive text provides useful clues to its identity:

'In shape and colour it agrees with the Description of the European Mavis, or Song-Thrush, differing only in Bigness; this weighing no more than one Ounce and a quarter. It never sings, having only a single Note, like the Winter-Note of our Mavis. It abides all the Year in Carolina. They are seldom seen, being but few, and those abiding only in dark Recesses of the thickest Woods and Swamps. Their Food is the Berries of Holly, Haws, &c.' (Catesby 1731, pl. 31)

Although some authors have suggested that Catesby's Little Thrush was a Wood Thrush, or a Grey-cheeked Thrush, or simply unidentifiable (e.g., Feduccia 1985, Stanton 2013), there is no *Catharus* with a breeding distribution that includes coastal South Carolina and Georgia, and only one species that occurs there in winter: eastern Hermit Thrush *C. guttatus faxoni*. Wood Thrush *H. mustelina* occurs on the Atlantic coastal plain of South Carolina during the breeding season, but the weight provided by Catesby for his Little



Thrush ('no more than one Ounce and a quarter' [i.e. < 35 g]) is too light for that species, which weighs on average 45.2 g with fat, and 38.8 g without ( $n = 35$ ; Yong & Moore 1993). The weight recorded by Catesby, however, is just right for a Hermit Thrush that has been gorging on berries, as Catesby (1731) described ('Their Food is the Berries of Holly, Haws, &c.'). Furthermore, Hermit Thrushes primarily communicate with calls during winter (i.e. song is uncommon), matching Catesby's observation that 'It never sings, having only a single Note.' This last point is also inconsistent with Wood Thrush, which uses multiple 'notes' on its breeding grounds. Catesby's assertion that the bird 'abides all the year' in Carolina was probably a reflection of his ignorance of its migration, as later explained by Bartram (1791: 284, 300–301).

However, Edwards' (1760) pl. 296 and text description of Bartram's specimen do not match Hermit Thrush, but rather, either Veery *C. fuscescens* or Grey-cheeked Thrush *C. minimus*: 'The head, upper side of the neck, back, wings, and tail, are all of a reddish-brown or clay colour, not at all varying in the shades of the feathers, as they do in our English thrushes.' Therefore, Edwards' (1760) Little Thrush is a composite: the first artistic depiction of a Veery or Grey-cheeked Thrush, accompanied by information from Catesby (1731) about wintering Hermit Thrushes, and field notes from Bartram that could have applied to any of these species. Thereafter, Brisson (1760: 212) and Forster (1771: 11) copied Catesby's description without any additional knowledge.

A further source used by Gmelin (1789) in his circumscription of *T. minor* came via Pennant (1785: 338) from the English naturalist Joseph Banks (1743–1820), who collected a small thrush on his expedition in 1766 to Newfoundland and Labrador. The specimen that Pennant (1785: 338) referred to Catesby's (1731) Little Thrush is no longer extant, but his inclusion of the detail 'eyelids encircled with white' led Lysaght (1971: 383) to identify it as *Catharus ustulatus clarescens*. However, this identification is far from conclusive because the other *Catharus* species from Newfoundland also have a pale eye-ring, albeit fainter.

Therefore, when Little Thrush was given the Linnaean binomial *Turdus minor* by Gmelin (1789: 809), it was apparently a grand amalgamation of the taxa now known as *C. g. faxoni* (in Catesby 1731), *C. u. clarescens* (in Pennant 1785, via Banks), and either *C. f. fuscescens* or *C. m. minimus* (in Edwards 1760, via Bartram). Without any extant original material to typify the name, *Turdus minor* J. F. Gmelin is effectively unidentifiable and a *nomen dubium* under the Code (ICZN 1999). Fortunately, it is not in use.

## The material basis of *Catharus fuscescens* (Stephens 1817)

Wilson (1812) took the unprecedented step of recognising not one small spotted species of thrush in North America, but two. One was Hermit Thrush *T. solitarius*, an amalgamation based on Edwards' composite Little Thrush (i.e. Hermit Thrush, plus either Veery or Grey-cheeked Thrush) and attributes of Swainson's Thrush *C. u. swainsoni* (see Brewer 1844). The other was the Tawny Thrush *T. mustelinus*, which Wilson considered new to science. Wilson did not specify a holotype for *T. mustelinus*, but he cited the number of a specimen in the Peale Museum (5570) and more casually referred to many other specimens, any of which could be considered part of the type series. When the Peale Museum closed in 1846, a portion of the collection was sold to the showman and circus promoter P. T. Barnum (1810–91), and was presumably displayed on the third floor of Barnum's American Museum in New York City. Shortly after midnight on 13 July 1865, a fire broke out in the bird department and the entire building including its ornithological contents were destroyed (Anon. 1865).

The rest of the Peale Museum collection was sold to Moses Kimball (1809–95) of the Boston Museum in 1850, then passed to the Boston Society of Natural History (Faxon 1915). Some of the specimens were thereafter destroyed, and others sold to Charles J. Maynard



(1845–1929), who stored them in his barn in Newtonville, Massachusetts. The specimens were subsequently transferred again, and finally accessioned in the collection at Harvard University, Cambridge, MA, where they are stored today. However, what remained of the original Peale Museum labels was lost during the process. All that now survives of Wilson's types are some specimens without original labels (no specimens of Veery or Grey-cheeked Thrush are among them) and some secondary (Boston Museum) labels unattached to specimens. Among the loose labels are two that read 'Wilson's Thrush. *Turdus fuscescens* Shaw' (= Stephens), a replacement name for *T. mustelinus* that was not restored to this species until decades after Wilson's death. These secondary labels now constitute the only physical evidence that the types of Wilson's Tawny Thrush existed (Faxon 1915). Thus, without any extant specimen from the type series, we must depend solely on Wilson's (1812: 98) descriptive text and illustration to identify his *T. mustelinus*:

'This species makes its appearance in Pennsylvania from the south regularly about the beginning of May, stays with us a week or two, and passes on to the north and to the high mountainous districts to breed. It has no song, but a sharp chuck. About the twentieth of May I met with numbers of them in the Great Pine swamp, near Pocano; and on the twenty-fifth of September, in the same year, I shot several of them in the neighbourhood of Mr. Bartram's place. I have examined many of these birds in spring, and also on their return in Fall, and found very little difference among them between the male and female. In some specimens the wing coverts were brownish yellow; these appeared to be young birds. I have no doubt but they breed in the northern high districts of the United States; but I have not yet been able to discover their nests.'

'The Tawny Thrush is ten inches long, and twelve inches in extent; the whole upper parts are a uniform tawny brown; the lower parts white; sides of the breast and under the wings slightly tinged with ash; chin white; throat and upper parts of the breast cream colored, and marked with pointed spots of brown; lores pale ash, or bluish white; cheeks dusky brown; tail nearly even at the end, the shafts of all, as well as those of the wing quills, continued a little beyond their webs; bill black above and at the point, below at the base flesh colored; corners of the mouth yellow; eye large and dark, surrounded with a white ring; legs long, slender and pale brown.'

'Tho I have given this bird the same name that Mr. Pennant has applied to one of our Thrushes, it must not be considered as the same; the bird which he has denominated the *Tawny Thrush* being evidently from its size, markings, &c. the *Wood Thrush*, described in the first volume of the present book.'

'No description of the bird here figured, has, to my knowledge, appeared in any former publication.'

Wilson's comment that 'the whole upper parts are a uniform tawny brown; the lower parts white,' has been taken by most authors as sufficient evidence that the species was a Veery (e.g., Coues 1878, Burt & Davis 2013). However, that description applies just as well to some Grey-cheeked thrushes from Newfoundland and Labrador (*C. m. minimus*), which are also a uniform tawny-brown over the upperparts (Fig. 3; see also Wallace 1939, Marshall 2000, FitzGerald *et al.* 2017). 'Brown phase' individuals of *C. minimus* were unknown to Coues (1878: 27), who wrote of Veery, 'it appears to have been first adequately described by Alexander Wilson, in 1812...'. There is considerable variation in colour among extant first edition copies of the plates of *American ornithology*, where Wilson first published *T. mustelinus*, partly because of poor paper quality, and partly because the hand-coloured plates in different copies have been subject to different environmental conditions over time

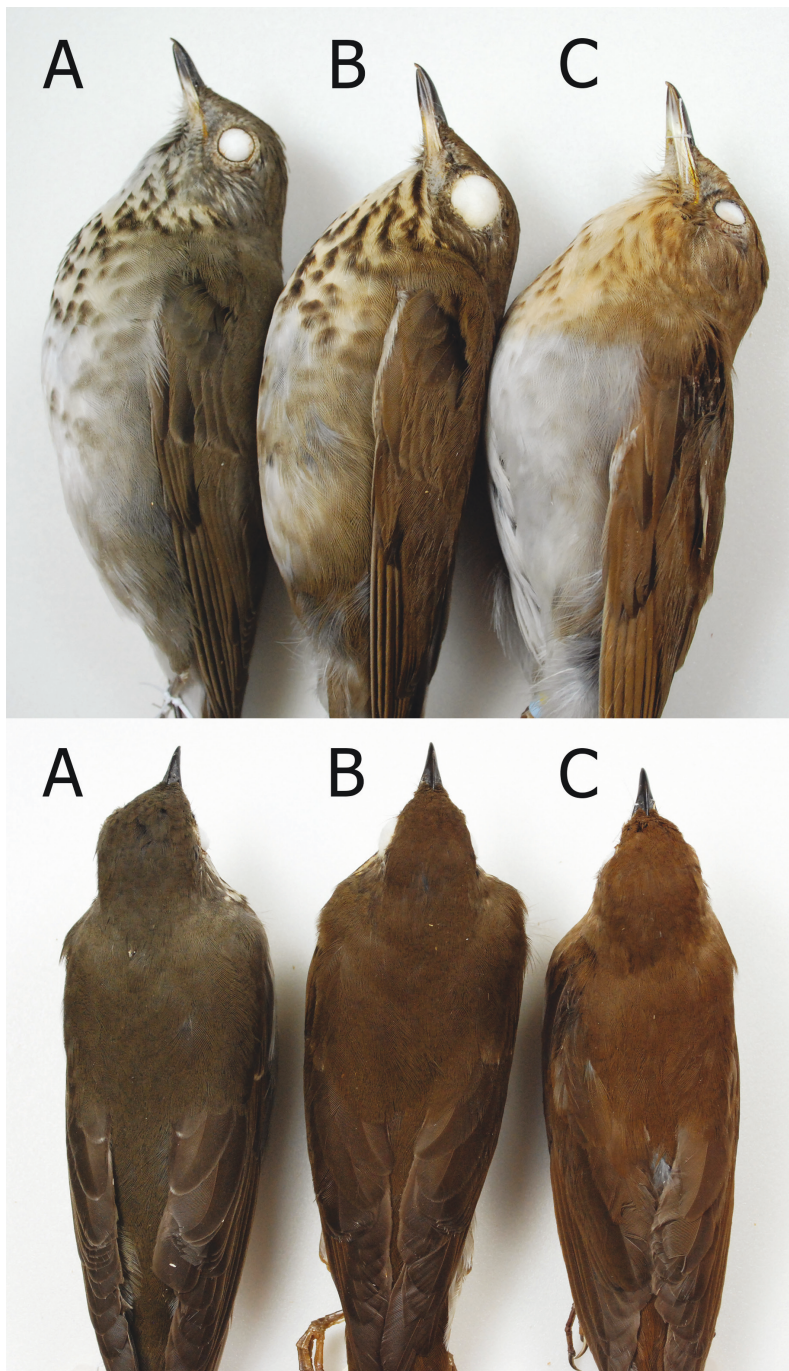


Figure 3. Relatively fresh specimens of Veery *Catharus fuscescens* and Grey-cheeked Thrush *C. minimus* photographed on the same date, under identical lighting conditions, for comparison of plumage coloration: (A) *C. m. aliciae*, ANSP 204020: a male that died in a window collision at Villanova University, Delaware County, PA, salvaged 8 October 2014 and prepared by N. H. Rice; (B) *C. m. minimus*, ANSP 191610: a male that died in a window collision at Cape May Courthouse, Cape May County, NJ, salvaged on 13 October 2002 and prepared by C. Goldman; (C) neotype of *C. f. fuscescens*, ANSP 204310: a colour-banded male (YARX) that died at its breeding site at White Clay Creek State Park, New Castle County, Delaware, USA, salvaged on 9 May 2017 and prepared by M. R. Halley (Matthew R. Halley)





Figure 4. Comparison of cropped images of Tawny Thrush *T. mustelinus* Wilson, in two different original pressings of *American ornithology*, vol. 5, Pl. 43 (1812). The image on left is from Bartram's personal copy, given to him by Wilson and now stored in the library at Bartram's Garden in Philadelphia. It is noticeably dirtier than other plates from the same volume (J. Fry pers. comm.). The image on right, reproduced from a copy of uncertain provenance in the Library of the Academy of Natural Sciences of Drexel University (QL681. W732), is even more discoloured.

(Fig. 4). However, neither the plates, nor the unpublished watercolour and pencil drawing that served as their basis (see Burt & Davis 2013 for a reproduction), bring clarity to the problem that dorsal coloration is shared by more than one species.

Wilson's description of the call of Tawny Thrush ('a sharp chuck') does not clearly match any vocalisation of Veery (Heckscher *et al.* 2017; pers. obs.) and is actually a better match for three other *Catharus* species. One call of Hermit Thrush has often been described as a 'chuck' (e.g., Gross 1949). Marshall (2000) described the introductory note of Grey-cheeked Thrush song as a 'chuck,' and Brewster (1883) likewise wrote that Bicknell's Thrush utters 'a low cluck much like that of the Hermit Thrush.' Veery occasionally gives a 'chatter' call on its breeding grounds, and partial chatter calls sound like a 'chuck' (see Heckscher 2007), but it is highly unlikely that Wilson was referring to this relatively rare (partial) vocalisation. Chatter calls are given by Veery early in the breeding season, and then with reduced frequency as the season progresses (Heckscher 2007), but Wilson's only experience with Tawny Thrush was during migration, when Veery is usually either silent or utters onomatopoeic 'veer' calls (Heckscher *et al.* 2017).

Inexplicably, Wilson (1812) described Tawny Thrush as 'ten inches long, and twelve inches in extent,' which is longer than Wood Thrush by two inches (see Wilson 1808: 29). Bonaparte (1824: 34), who never knew Wilson, but presumably examined specimen no. 5570 in the Peale Museum during his residency in Philadelphia during 1824–26, proclaimed Wilson's measurement a typographical error and gave the 'real length [as] seven inches.' However, this brings us no closer to a conclusive identification because the body sizes of the confused species overlap. The points given by Wilson about timing of migration, and that the breeding grounds of Tawny Thrush were likely 'in the northern districts,' are likewise ambiguous, as were his remarks about there being 'very little difference' between males and females, and that immatures had 'brownish yellow' wing-coverts. These features are shared

by all species of *Catharus* in eastern North America, and all of the specimens cited by Wilson were collected during the migration period, when multiple *Catharus* species would have been passing through Pennsylvania.

That Wilson knowingly gave this species the same English name (Tawny Thrush) that Pennant (1785) gave to Wood Thrush, and the same binomial (*T. mustelinus*) that Gmelin (1789) used for Wood Thrush, further complicates the picture with respect to its true identity. Interestingly, this was not a mistake on Wilson's part, or committed in ignorance of those naturalists; he had in fact cited them in his first volume (Wilson 1808). Wilson simply disagreed with the names that they had chosen. On 29 April 1807, just three weeks after the first plate for *American ornithology* was in Wilson's hands, and five years before his accounts of *T. mustelinus* and *T. solitarius* were published, he discussed the nomenclature of these thrushes in a letter to Bartram:

'The more I read and reflect upon the subject, the more dissatisfied I am with the specific names which have been used by almost every writer. A name should, if possible, be expressive of some peculiarity in colour, conformation, or habit; if it will equally apply to two different species, it is certainly an improper one. Is *migratorious* an epithet peculiarly applicable to the robin? Is it not equally so to almost every species of *turdus* we have?...*Turdus minor* seems also improper; in short I consider this part of the business as peculiarly perplexing; and I beg to have your opinion on the matter, particularly with respect to the birds I have mentioned, whether I shall hazard a new nomenclature, or, by copying, sanction what I do not approve of.' (Transcribed by Hunter 1983: 262.)

## Confusion continues

Wilson died on 23 August 1813, 18 months after his account of Tawny Thrush was published on 12 February 1812. In the following years, several European taxonomists noticed Wilson's nomenclatural 'error' and offered replacement names for Tawny Thrush. Stephens (1817, *Turdus fuscescens*) was followed by Vieillot (Bonnaterre & Vieillot 1823: 647, *Turdus silens*) and Bonaparte (1824: 34, *T. Wilsoni*). With the probable exception of Bonaparte, who was temporarily based in Philadelphia, these authors had not seen Wilson's types at the Peale Museum. Bonaparte's replacement name (and its later alternate *wilsonii*) was widely used in America during the early 19th century, giving rise to the colloquial name Wilson's Thrush, but eventually *wilsoni* joined the other synonyms of *fuscescens* Stephens (Baird *et al.* 1858: 214).

Audubon visited the Peale Museum with Wilson in early December 1811, and again when he visited Philadelphia in summer 1824 (Holt 2009, Halley 2015). His original painting of a Tawny Thrush, from which Pl. 164 in *The birds of America* (1827–38) was produced, and to which he applied Bonaparte's (1824) replacement name *T. Wilsonii*, shows a bird that is far greyer than eastern Veery. Rather, it bears a close resemblance to Grey-cheeked Thrush *C. m. aliciae* (Fig. 5). Audubon apparently executed the painting in 1832, although it is undated, from a specimen procured in Maine. In 1863, after his death, the painting was sold to the New-York Historical Society (N-YHS) by his widow Lucy (N-YHS no. 1863.17.164), where it was thereafter stored in almost perpetual darkness, being displayed in the gallery only rarely; and so the grey coloration of the bird is unlikely to be the result of fading. Interestingly, the bird in Pl. 164 of *The birds of America* is not as grey as Audubon's original (Fig. 5), apparently because it was altered by the team of colourists employed by Audubon's engraver, Robert Havell Jr. (1793–1878), to more closely resemble the bird depicted by Wilson (1812).





Figure 5. Comparison of cropped images of Tawny Thrush *T. Wilsonii* (= *T. mustelinus* Wilson) in Audubon's original painting (left) and Pl. 164 of *The birds of America* (right). The original painting (N-YHS no. 1863.17.164) was executed with watercolour, graphite, gouache, black ink, black chalk, pastel, and selective glazing on paper, laid on card. It is reproduced here courtesy of the New-York Historical Society; digital image created by Oppenheimer Editions. The image in Pl. 143 was engraved by Robert Havell Jr. in 1833, with the original painting as a reference, and then hand-coloured by a team of colorists. Reproduced courtesy of the John James Audubon Center at Mill Grove in Audubon, PA, and the Montgomery County Audubon Collection.

Audubon's (1834) account of Tawny Thrush is just as perplexing. He claimed to have heard a Tawny Thrush singing in March 1834, in Charleston, South Carolina! This is within the winter range of Hermit Thrush *C. g. faxoni*, at a time of year when a Veery would be in South America (Heckscher *et al.* 2015). Because Audubon (1831: 303) previously asserted that Hermit Thrush 'has no song, and only utters a soft plaintive note, seldom heard at a greater distance than twenty-five or thirty yards,' the most likely explanation is that he heard a singing Hermit Thrush on its winter grounds, but incorrectly attributed the song to Tawny Thrush. Recall that Wilson (1812) wrote that Tawny Thrush 'has no song, but a sharp chuck.' Thus, Audubon's encounter in March 1834 with a species that gives 'chuck' calls just like Wilson described, presented a coveted opportunity for him to describe a bird song that Wilson had missed. This probably explains why Audubon's description of Tawny Thrush's song is a poor match for Veery, and a better match to Hermit Thrush, the songs of which, unlike Veery, have long been compared to Wood Thrush *H. mustelina* (Stein 1956):

'The song of this species [Tawny Thrush], although resembling that of the Wood Thrush in a great degree, is less powerful, and is composed of continued trills repeated with different variations, enunciated with great delicacy and mellowness, so as to be extremely pleasing to one listening to them in the dark solitudes where the sylvan songster resides. It now and then tunes its throat in the calm of evening, and is heard sometimes until after the day has closed.' (Audubon 1834: 363)

Furthermore, because these shy species are often detected at a distance and identified by voice, Audubon's mistaken attribution of the song probably affected his estimate of Tawny Thrush breeding range during his 1833 expedition to the north shore of the Gulf of St. Lawrence. Audubon's assertion that 'from Massachusetts eastward to Labrador, [Tawny Thrushes] become more and more abundant,' does not accurately describe the modern breeding range of Veery, which does not extend into far eastern Québec ('Labrador' to Audubon); neither does Veery increase in abundance as one travels farther north-east,



Figure 6. Cropped image of Audubon's original painting of Hermit Thrush *T. solitarius* (= *Catharus guttatus faxoni*), showing his mistaken identification ('Tawny Thrush,' crossed out). The painting was executed with watercolour, graphite, pastel, black ink and gouache on paper, laid on card (N-YHS no. 1863.17.58). The inscription in the lower left reads: 'No 12. Plate 58. / Published 1829. / Hermit Thrush Male 1. F. 2. Tawny Thrush [crossed out] / *Turdus solitarius*. Wilson pl. 43. fig. 3. p. 95. / Plant *Bromelia lycis* ... [crossed out]'. The painting was signed below in graphite: 'John. J. Audubon.' Reproduced here courtesy of the New-York Historical Society; digital image created by Oppenheimer Editions.

as Audubon claimed. But the breeding range of Hermit Thrush extends all the way to far eastern Labrador, matching Audubon's description of Tawny Thrush range. This discrepancy supports the hypothesis that when Audubon heard Hermit Thrushes (*C. g. faxoni*) sing in the distance, he incorrectly identified them as Tawny Thrushes; recall, he thought Hermit Thrush was mute (Audubon 1831: 303). Audubon's original painting of Hermit Thrush (N-YHS no. 1863.17.58) provides further evidence that he confused these species: below the image, Audubon initially labelled his illustration 'Tawny Thrush,' but sometime later crossed it out and wrote 'Hermit Thrush' (Fig. 6).

In summary, although Audubon had multiple opportunities to see Wilson's types, his original painting of *T. mustelinus* Wilson looks more like a Grey-cheeked Thrush than a Veery, and he apparently attributed the song of Hermit Thrush *C. g. faxoni* to *T. mustelinus* Wilson. We can therefore conclude that Audubon did not distinguish the species now known as Veery from the amalgamation of *T. minor*, and neither did Wilson (1812), who merely split one amalgamation (*T. minor*) into two (*T. solitarius*, *T. mustelinus*).

### Neotype designation for *Turdus mustelinus* Wilson and its replacement names, including *T. fuscescens* (Stephens)

The name *fuscescens* Stephens, 1817, has been in universal use for Veery in New World and global ornithological literature for c.160 years, at least since Baird *et al.* (1858). It is also a replacement name for *Turdus mustelinus* Wilson, 1812, preoccupied by *Turdus mustelinus* J. F. Gmelin, 1789, and is therefore typified by the type material of *mustelinus* Wilson under





Figure 7. ANSP 204310, the neotype of *Turdus mustelinus* Wilson (= *Catharus f. fuscescens*), see text for detail of the specimen's provenance (Matthew R. Halley)

Art. 72.7 of the *Code* (ICZN 1999). It is not, however, unambiguously identifiable because none of its type material is extant or traceable, and the attributes described in the original description of *T. mustelinus* Wilson are shared by more than one species. To fix the taxonomic identity of *Turdus fuscescens* Stephens, 1817, so that traditional nomenclature is maintained and to prevent destabilising confusion arising from alternative identifications, I hereby designate as its neotype ANSP 204310, a colour-banded male deposited in the collection of the Academy of Natural Sciences of Drexel University, Philadelphia. This action fulfills the requirements for neotype designation in the *Code* (ICZN 1999) by: clarifying the taxonomic application (status) of the name, as explained above (Art. 75.3.1), describing, illustrating and referencing the defining characters of Veery and its neotype (Art. 35.3.2), providing data sufficient to ensure recognition of the specimen designated (Art. 75.3.3), providing grounds for believing that all original type material has been lost and is untraceable (Art. 75.3.4), showing that traits of the neotype are included in the original description (Art. 75.3.5), choosing the neotype from a locality in the same physiographic province (second-growth Mid-Atlantic Piedmont forest) where Wilson collected some of his type material (Art. 75.3.6), and recording that the neotype is preserved as the property of a recognised scientific institution (Art. 75.3.7).

The neotype of *C. fuscescens* is one of the most data-rich specimens of any migratory bird, because the geographic coordinates of its breeding territory in northern Delaware, USA (39°73'98.27"N, 75°75'66.63"W) and of its first wintering site in Mato Grosso, Brazil (10°74'21.50"S, 56°45'99.83"W), were estimated in 2015 using a GPS tracking device attached with a harness. The bird was also tracked in 2016 with a light-level geolocator (C. M. Heckscher unpubl. data; methods in Heckscher *et al.* 2011). To my knowledge, this is the only bird specimen in any collection for which migratory data have been collected using either tracking device. The neotype was banded on 9 June 2015 by M. Mancuso (YARX; left: yellow / azure, right: red / aluminum, with USGS serial no. 271151219) at a long-term research site in Delaware, USA, where it bred in second-growth Mid-Atlantic Piedmont forest. This breeding population has been studied by C. M. Heckscher and his students (including myself) since 1998 (see Heckscher 2007, Halley & Heckscher 2012, Halley *et al.* 2016).

YARX was recaptured by M. Mancuso on 9 May 2017, close to where it had been detected during previous breeding seasons. However, when YARX was extracted from the mist-net, its left wing was found to be wounded near the carpal joint. The wound was not fresh, but also did not appear to be more than a day or two old. The bird was lethargic and died en route to a nearby bird rescue facility. A tick was removed from the edge of the eye and stored in 95% ethanol. The body of YARX was frozen and transported to the Delaware Museum of Natural History, Wilmington, and from there legally transferred to ANSP, where I prepared it as a study skin (prep. = MRH114), extracted frozen tissue samples (liver, heart, muscle: ANSP Tissue 33456), and excised the syrinx (initially stored in 95% ethanol, transferred to 10% neutral buffered formalin). Body mass with no fat was 27.4 g. The skull was 90% ossified and there was no bursa. Both testes were enlarged (10 × 8 mm) and dark grey. There was no discernible moult, and black insect parts were found in its stomach.

Through neotypification, the name *fuscescens* is now restricted to populations of Veery that breed in eastern North America, to which the name *C. f. fuscescens* has traditionally been applied. The breeding range of *C. f. fuscescens* has been amended to include the region 'from Ontario east to New Brunswick and southern Nova Scotia and south through the Appalachians to northwestern Georgia' (Heckscher *et al.* 2017). Thus, nomenclature has been resolved and stabilised, and new light has been thrown on a particularly obscure chapter in the history of American ornithology.

#### Acknowledgements

I am grateful to Christopher M. Heckscher, Jason D. Weckstein, Robert M. Peck, Nathan H. Rice, Gary Rosenberg, Guy M. Kirwan, and two anonymous reviewers for advice and guidance. Vitor de Q. Piacentini inspired this work with his discovery of a *C. m. minimus* specimen from Chupinguaia, Rondônia, in the bird collection at the Universidade Federal de Mato Grosso, Cuiabá, Brazil. Therese M. Catanach, Emily Ostrow and Janice Dispoto provided invaluable assistance and camaraderie in the specimen preparation lab. Joel Fry furnished a digital image of Bartram's copy of Wilson's (1812) plate of *T. mustelinus*. The neotype was colour-banded by Melanie Mancuso under US federal banding permit 23711, granted to Christopher M. Heckscher. It was salvaged under the permit of Jean Woods at the Delaware Museum of Natural History. This work was supported by the Delaware Division of Parks and Recreation, and the staff of White Clay Creek State Park. Finally, I thank Jennifer Vess, Alexandria Capone and Kelsey Manahan for assistance in the Library and Archives of the ANSP.

#### References:

- Anon. 1865. Disastrous fire. *The New York Times* 14 July 1865: 1.
- Audubon, J. J. 1831. *Ornithological biography*, vol. 1. Adam Black, Edinburgh.
- Audubon, J. J. 1834. *Ornithological biography*, vol. 2. Adam & Charles Black, Edinburgh.
- Allen, E. G. 1951. The history of American ornithology before Audubon. *Proc. Amer. Phil. Soc.* 41: 532–534.
- Baird, S. F., Cassin, J. & Lawrence, G. 1858. *Explorations and surveys for a railroad route from the Mississippi River to the Pacific Ocean*, vol. 9(2). Beverly Tucker, Washington DC.
- Bangs, O. & Penard, T. E. 1921. The name of the eastern Hermit Thrush. *Auk* 38: 432–434.
- Bartram, W. 1791. *Travels through North and South Carolina, Georgia, east and west Florida, the Cherokee country, the extensive territories of the Muscogulges or Creek Confederacy, and the country of the Chactaws. Containing an account of the soil and natural productions of those regions; together with observations on the manners of the Indians*. James & Johnson, Philadelphia, PA.
- Bonaparte, C. L. 1824. Observations on the nomenclature of Wilson's ornithology. *J. Acad. Nat. Sci. Philadelphia* 4: 25–66.
- Bonnaterre, P. J. & Vieillot, L. P. 1823. *Tableau encyclopédique et méthodique des trois règnes de la nature. Ornithologie*, vol. 4. Second edn. Panckoucke, Paris.
- Brewer, T. M. 1844. Minutes of the July 17 meeting. *Proc. Boston Soc. Nat. Hist.* 1: 190–191.
- Brewster, W. 1883. Bicknell's Thrush (*Turdus aliciae bicknelli*) in New England. *Bull. Nuttall Orn. Cl.* 8: 12–17.
- Brisson, A. D. 1760. *Ornithologia sive synopsis methodica sistens avium divisionem in ordines, sectiones, genera, species, ipsarumque varietates*, vol. 2. Joannem-Baptistam Bauche, Paris.
- Burleigh, T. D. & Peters, J. L. 1948. Geographic variation in Newfoundland birds. *Proc. Biol. Soc. Wash.* 61: 111–126.
- Burt, E. H. & Davis, W. E. 2013. *Alexander Wilson: the Scot who founded American ornithology*. Belknap Press, Harvard Univ., Cambridge, MA.



- Catesby, M. 1731. *Natural history of Carolina, Florida and the Bahama Islands*, vol. 1. Privately published, London.
- Coues, E. 1878. *Birds of the Colorado Valley*. US Geological Survey, Dept. of the Interior Misc. 11. Washington DC.
- Edwards, G. 1760. *Gleanings of natural history, exhibiting figures of quadrupeds, birds, fishes, insects, &c.*, pt. II. Royal College of Physicians, London.
- Faxon, W. 1901. Early editions of Wilson's ornithology. *Auk* 18: 216–218.
- Faxon, W. 1915. Relics of Peale's Museum. *Bull. Mus. Comp. Zool.* 59: 119–148.
- Feduccia, A. 1985. *Catesby's birds of colonial America*. Univ. of North Carolina Press, Chapel Hill, NC.
- FitzGerald, A. M., Whitaker, D. M., Ralston, J., Kirchman, J. J. & Warkentin, I. G. 2017. Taxonomy and distribution of the imperilled Newfoundland Gray-cheeked Thrush, *Catharus minimus minimus*. *Avian Conserv. & Ecol.* 12(1): 10.
- Forster, J. R. 1771. *A catalogue of the animals of North America*. B. White, London.
- Gmelin, J. F. 1789. *Caroli a Linne, Systema naturae per regna tria natural, secundum classes, ordines, genera, species cum characteribus differentiis, synonymis, locis*, vol. 1(2). J. B. Delamollière, Lyon.
- Gross, A. O. 1949. Hermit Thrush *Catharus guttatus*. Pp. 143–162 in Bent, A. C. (ed.) *Life histories of North American thrushes, kinglets, and their allies*. US Natl. Mus. Bull. 196.
- Halley, M. R. 2015. The heart of Audubon: five unpublished letters (1825–1830) reveal the ornithologist's dream and how he (almost) achieved it. *Common-place.org* 16(1).
- Halley, M. R. & Heckscher, C. M. 2012. Multiple male feeders at nests of the Veery. *Wilson J. Orn.* 124: 396–399.
- Halley, M. R., Heckscher, C. M. & Kalavacharla, V. 2016. Multi-generational kinship, multiple mating, and flexible modes of parental care in a breeding population of the Veery (*Catharus fuscescens*), a trans-hemispheric migratory songbird. *PLoS ONE* 11(6): e0157051.
- Heckscher, C. M. 2007. Use of the Veery (*Catharus fuscescens*) call repertoire in vocal communication. Ph.D. thesis. Univ. of Delaware, Newark.
- Heckscher, C. M., Taylor, S. M., Fox, J. W. & Afanasyev, V. 2011. Veery (*Catharus fuscescens*) wintering locations, migratory connectivity, and a revision of its winter range using geolocator technology. *Auk* 128: 531–542.
- Heckscher, C. M., Halley, M. R. & Stampul, P. M. 2015. Intratropical migration of a Nearctic-Neotropical migratory songbird (*Catharus fuscescens*) in South America with implications for migration theory. *J. Trop. Ecol.* 31: 285–289.
- Heckscher, C. M., Bevier, L. R., Poole, A. F., Moskoff, W., Pyle, P. & Patten, M. A. 2017. Veery (*Catharus fuscescens*), version 3.0. In Rodewald, P. G. (ed.) *The birds of North America*. Cornell Lab of Ornithology, Ithaca, NY. <https://doi.org/10.2173/bna.veery.03>.
- Holt, J. 2009. Wilson, Audubon, Ord and a flycatcher. *Cassinia* 70: 11–21.
- Howe, R. H. 1900. A new subspecies of the genus *Hylocichla*. *Auk* 17: 271.
- Hunter, C. (ed.) 1983. *Life and letters of Alexander Wilson*. American Philosophical Society, Philadelphia, PA.
- ICZN (International Commission on Zoological Nomenclature). 1999. *International code of zoological nomenclature*. Fourth edn. The International Trust for Zoological Nomenclature, London.
- Lafresnaye, M. F. de. 1848. Description de quelques oiseaux nouveaux de Caracas (province de Venezuela) et de Bogota. *Rev. Zool. Soc. Cuvierienne* 11: 2–12.
- Lysaght, A. M. 1971. *Joseph Banks in Newfoundland and Labrador, 1766*. Univ. of California Press, Berkeley & Los Angeles.
- Marshall, J. T. 2000. *The Gray-cheeked Thrush Catharus minimus, and its New England subspecies, Bicknell's Thrush, Catharus minimus bicknelli*. Smithsonian Press, Washington DC.
- Nelson, E. C. 2017. "Honored Sir": Mark Catesby's letters from Carolina, 1722–1725. *Carologue* (spring 2017): 18–23.
- Pennant, T. 1785. *Arctic zoology*, vol. 2. Henry Hughs, London.
- Ridgway, R. 1882. Descriptions of two new thrushes from the United States. *Proc. US Natl. Mus.* 4: 374–379.
- Stanton, L. 2013. Thomas Jefferson and Virginia's natural history. *Banisteria* 41: 5–16.
- Stein, R. C. 1956. A comparative study of "advertising song" in the *Hylocichla* thrushes. *Auk* 73: 503–512.
- Stephens, J. F. 1817. *General zoology, or Systematic natural history*, vol. 10(1). London.
- Trotter, S. 1907. Type birds of eastern Pennsylvania and New Jersey. *Cassinia* 11: 17–27.
- Tschudi, J. J. von. 1845. *Untersuchungen über die Fauna Peruana*. Scheitlin & Zollikofer, St. Gallen.
- Wallace, G. J. 1939. Bicknell's Thrush, its taxonomy, distribution, and life history. *Proc. Boston Soc. Nat. Hist.* 41: 211–402.
- Wilson, A. 1808. *American ornithology, or, the natural history of the birds of the United States*, vol. 1. Bradford & Inskeep, Philadelphia, PA.
- Wilson, A. 1812. *American ornithology, or, the natural history of the birds of the United States*, vol. 5. Bradford & Inskeep, Philadelphia, PA.
- Yong, W. & Moore, F. R. 1993. Relation between migratory activity and energetic condition among thrushes (Turdinae) following passage across the Gulf of Mexico. *Condor* 95: 934–943.

Address: Academy of Natural Sciences of Drexel University, Dept. of Biodiversity, Earth & Environmental Science, Drexel Univ., Philadelphia, Pennsylvania 19104, USA.

# Nest architecture and parental care in Ruddy Treerunner *Margarornis rubiginosus*

by Julio E. Sánchez<sup>†</sup>, Karla Conejo-Barboza, César Sánchez,  
Ariel A. Fonseca Arce, Javier Tenorio & Luis Sandoval

Received 15 November 2017; revised 20 April 2018; published 22 June 2018

<http://zoobank.org/urn:lsid:zoobank.org:pub:C42F7B53-62CC-445C-80AB-24C0C74BBCE4>

**SUMMARY.**—We complement the only existing nest description for Ruddy Treerunner *Margarornis rubiginosus* and include observations of nestbuilding and breeding behaviour. We also compare our data with existing information on nest architecture and breeding biology of the closely related Pearled Treerunner *M. squamiger* and Spotted Barbtail *Premnoplex brunnescens*. The nest of Ruddy Treerunner was a pendant closed nest below a single tree branch and was mostly constructed of moss. In the nest base there was a circular entrance and a second cavity. The inner chamber was spherical and the egg cup was mostly constructed of roots, fern scales and other plant fibres. Both adults build the nest and care for chicks. We observed a nest helper and removal of faecal sacs by both adults. Many aspects of nest structure and parental behaviour are similar to those of its sister species, thereby supporting existing genetic data.

Ovenbirds (Furnariidae) exhibit a high diversity of nest architecture (Zyskowski & Prum 1999, Remsen 2003). Some adopt or excavate cavities in trees, subterranean burrows or other animal constructions (i.e., *Xenops*, *Philydor* and *Pseudocolaptes*). Others construct platforms (i. e., *Sclerurus*) and cups (i.e., *Thripadectes*) inside cavities (Zyskowski & Prum 1999). *Furnarius*, *Synallaxis* and *Cranioleuca* build domes ('closed nest' *sensu* Simon & Pacheco 2005) using clay, sticks or moss (Zyskowski & Prum 1999, Greeney 2008a). These features and others that describe nest design, such as materials and perch type, reflect phylogenetic relationships between genera and species of Furnariidae, and other bird families (Sheldon & Winkler 1999, Zyskowski & Prum 1999, Irestedt *et al.* 2006, Greeney *et al.* 2013). Thus, complete and detailed nest descriptions are necessary to help establish such relations (Sheldon & Winkler 1999, Simon & Pacheco 2005).

Within the *Premnoplex*–*Margarornis* clade (Rudge & Raikow 1992, Derryberry *et al.* 2011) Spotted Barbtail *Premnoplex brunnescens* and Pearled Treerunner *Margarornis squamiger* share similar architecture and parental behaviour. Adults of both species construct large mossy oval or ball-shaped nests, usually with an entrance followed by a tunnel that leads to a nest chamber (Greeney 2008a,b, Greeney & Gelis 2011). Another species within this clade is Ruddy Treerunner *M. rubiginosus*. Data on its breeding biology are limited to a single event where possible bi-parental care was observed. The nest, however, was not collected and data on the internal structure were not provided (Mennill & Doucet 2005).

Ruddy Treerunner is endemic to the highlands of Costa Rica and western Panama, occurring in premontane and montane forests above 1,000 m (Stiles & Skutch 1995). Here we describe the nest structure and include details of nestbuilding and breeding behaviour based on two collected nests and field observations at two active nests. Additionally, we compare our data with nest architecture and breeding biology of the closely related Pearled Treerunner and Spotted Barbtail.

## Methods

We found three nests, all in Costa Rica. The first (nest 1; Fig. 1) was found inactive on 20 May 2003, at Jaboncillo, Dota, San José province (09°35'55"N, 83°47'55"W; elevation 2,910 m) in a mature forest fragment. It was collected and deposited at the Museo Nacional de Costa Rica (MNCR 269), San José. We observed active nest 2 on 22 March 2009 at Villa Mills, Paraíso, Cartago province (09°34'06"N, 83°42'20"W; 2,775 m) in secondary forest. We found and observed the active nest 3 (Figs. 2–3) between March and June 2015, at Cerro Chompipe, Heredia province (10°05'25"N, 84°04'45"W; 1,885 m) in a secondary forest adjacent to pasture. This nest was collected after the juvenile fledged and deposited at the Museo de Zoología, Universidad de Costa Rica (MZUCR AN419), San José. Habitats where we observed the three nests involved premontane and montane forest dominated by trees and shrubs of *Alnus acuminata* (Betulaceae), *Quercus* sp. (Fagaceae), *Ocotea* sp. (Lauraceae), *Drimys granadensis* (Winteraceae), *Cyathea* sp. (Cyatheaceae), *Citharexylum donnell-smithii*, *Blakea grandiflora* (Melastomataceae) and introduced *Cupressus lusitanica* (Cupressaceae). We found a dead chick and no eggs inside nest 1 and we heard two chicks each in nests 2 and 3.

From nests 1 and 3 we took nine measurements (in cm; Figs. 1, 3): (1) max. external height, (2) max. external diameter, (3) max. entrance diameter, (4) minimum entrance diameter, (5) tunnel depth from the entrance to the ceiling of the inner chamber, (6) tunnel depth from the entrance to the front rim of the egg cup, (7) max. height of the inner chamber and (8) max. horizontal diameter of the inner chamber. For nest 1 we also measured (9) an extra max. external height and, max. (3) and minimum (4) entrance diameter and tunnel depth (5) to accurately describe the shape of the second cavity (Fig. 1A). We recorded nest measurements using a metallic ruler (BEIFA  $\pm 0.025$ ) and digital callipers (OEM 25363,  $\pm 0.01$  mm). We used a camera (PEC-VE300) with an articulation probe (Baito) to visualise egg cup materials inside nest 1. We made two radial cuts in the inferior part of nest 3 to analyse the

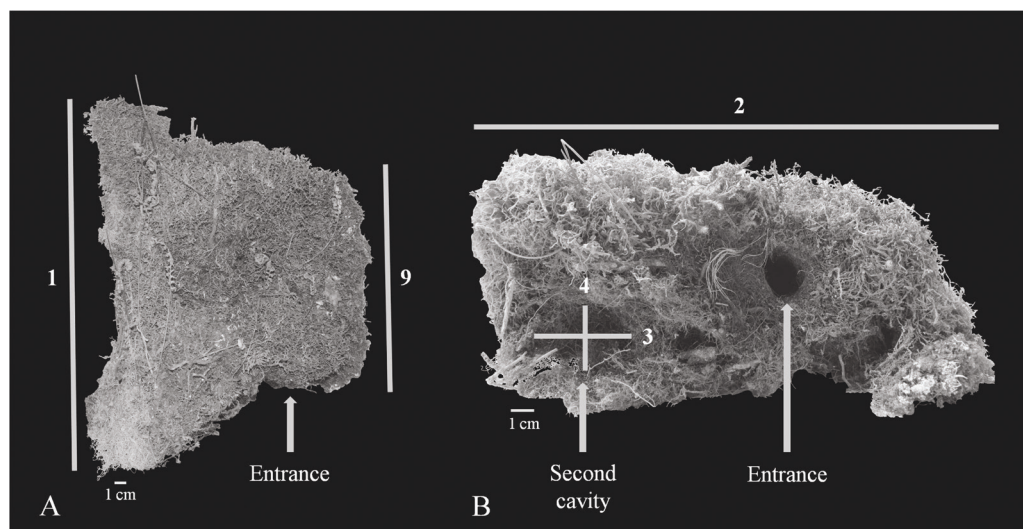


Figure 1. (A) Lateral and (B) underside views of a Ruddy Treerunner nest *Margarornis rubiginosus*, collected on 20 May 2003 at Jaboncillo, Dota, San José province, Costa Rica (nest 1). Only the entrance is connected to the inner chamber. Numbers correspond to (1) max. external height, (2) max. external diameter of the nest, (3) entrance or cavity max. diameter (4) entrance or cavity minimum diameter, and (9) extra max. external height (Karla Conejo-Barboza)





Figure 2. Nest of Ruddy Treerunner *Margarornis rubiginosus*, collected on June 2015, at Cerro Chompipe, Heredia province, Costa Rica (nest 3) (Ariel A. Fonseca-Arce)

materials of the inner chamber and tunnel, study the wall surroundings and measure the inner chamber dimensions (measurements 7–8, Fig. 3).

We observed nest 2 for *c.*15 minutes and observed nest 3 at 10–30-minute intervals over nine days (13 total hours). At nest 3, we observed nest construction (17–22 March 2015), parental care and adult behaviour (14 April–26 May 2015).

## Results

**Nest architecture.**—All three nests were pendant structures attached to the main trunks of trees, always below a single branch. Height above ground was not available for nest 1. Nest 2 was *c.*7 m above ground and nest 3 was sited at *c.*10 m. According to the nest classification system of Simon & Pacheco (2005), nests 1 and 2 had an ovoid external shape. Nest 1 had straight sides; however, the external shape was more similar to a rectangle than an ovoid (Fig 1A). The opposite external sides of nest 1 differed (Fig. 1A). The longest side was 54.8 cm corresponding to max. external height (measurement 1). The shorter side was 34.0 cm (measurement 9), opposite to the longest side and next to the entrance to the inner chamber. We could not determine the shape of nest 3 because it was embedded in a large aggregation of mosses, liverworts, multiple epiphytic orchids and ferns on a branch (Fig. 3). In addition to mosses, live epiphytes and ferns, the external layer of all three nests contained small sticks and roots.

Nest 1 had a circular entrance, connected directly to the inner chamber by a tubular tunnel, and a second cavity at the nest base. The entrance and the cavity were separated by an 8.0 cm-wide wall (Table 1, Fig 1B). Nest 3 had a circular entrance connected directly to

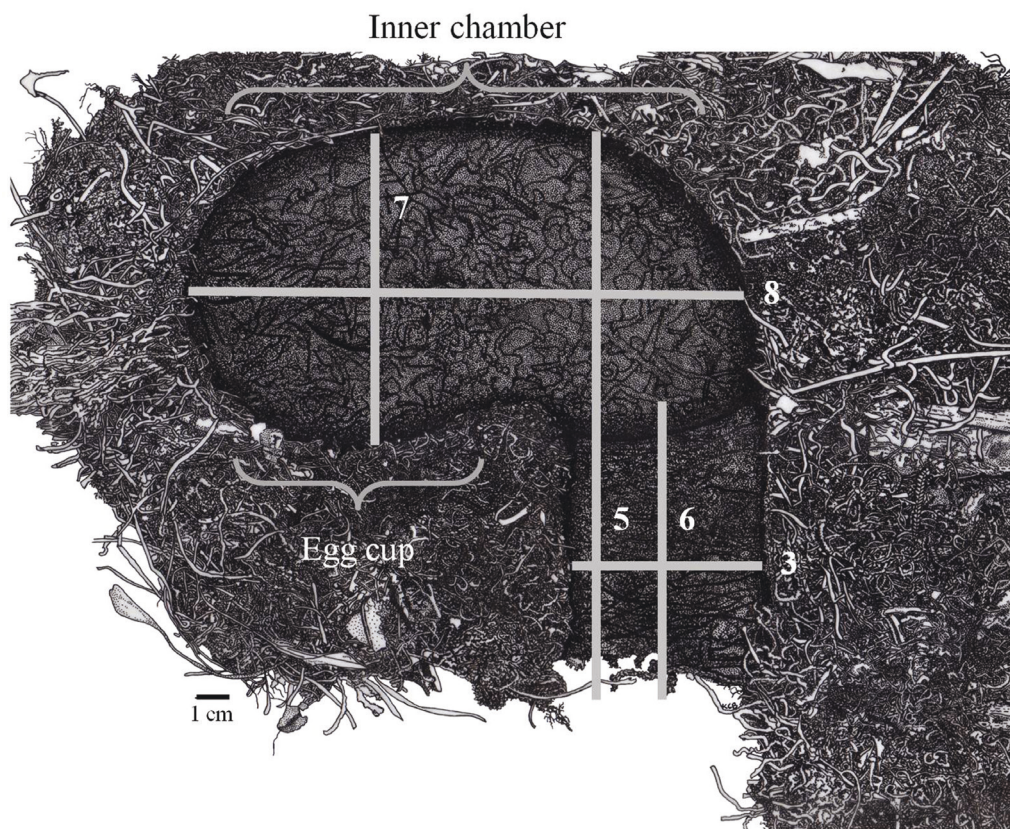


Figure 3. Internal view (inner chamber, egg cup and tunnel) of a nest of Ruddy Treerunner *Margarornis rubiginosus*, collected on June 2015, at Cerro Chompipe, Heredia province, Costa Rica (nest 3). Numbers correspond to (3) entrance max. diameter, (5) tunnel depth from the entrance to the ceiling of the inner chamber, (6) tunnel depth from the entrance to the front rim of the egg cup, and (7) max. height and (8) max. horizontal diameter of the inner chamber (Karla Conejo-Barboza)

the inner chamber via a tubular tunnel but no visible external cavities. The interior lining of the tunnel of nest 3 comprised dark plant fibres and fern scales (Fig. 2).

The inner chambers of nests 1 and 3 were spherical (Fig. 3). In nest 3, the inner chamber was surrounded by a discontinuous layer, 1.0–2.5 cm thick, of tightly compacted mosses, roots and dark vegetal fibres (Fig. 3). This layer was strongly adhered to the nest's walls and to the vegetation surrounding the nest (moss, ferns and epiphytes). The egg cups of nests 1 and 3 were sited in the basal portion of the inner chamber (Fig. 3), they were constructed of roots, fern scales, mosses and black fibres of unknown origin, and in the egg cup of nest 3 we also found some fibres of lichens (*Usnea* sp., Parmeliaceae) and sticks. In nest 3, the egg cup could not be separated structurally from the inner chamber.

**Nest construction.**—Nest construction behaviour is based on our observations at nest 3. At 12.00 h on 17 March 2015 we observed three Ruddy Treerunners simultaneously, near a large mass of moss (Fig. 3). We determined that all three were adults as they had whitish throat feathers and none had throat feathers with faint sooty fringes as in juvenile plumage (Stiles & Skutch 1995). The three adults were carrying fine mosses and lichens in their bills, which they deposited in a cavity within the moss. The birds entered the cavity with the material one at a time. On 22 March 2015 we observed three adults carrying mosses and lichens into the same cavity, but occasionally adults exited with apparently the same



TABLE 1  
Dimensions of Ruddy Treerunner *Margarornis rubiginosus* nests observed in Costa Rica. Nest 1 was collected at Jaboncillo, Dota, San José province (MNCR 269), nest 3 was collected at Cerro Chompipe, Heredia province (MZUCR AN419) and dimensions estimated by Mennill & Doucet (2005), named nest 4 herein. All measurements in cm. Only the entrance is connected to the inner chamber. Measurements taken as described in the text. Diam. = diameter, Hori. = horizontal, Max. = maximum, Min. = minimum, Tun. = tunnel.

Nest	External		Entrance				Inner chamber		Second cavity		
	Height	Max. diam.	Max. diam.	Min. diam.	Tun. Depth5	Tun. Depth6	Max. height	Max. hori. diam.	Max. diam.	Min. diam.	Tun. Depth5
1	54.8	36.4	4.6	3.8	7.7	-	-	-	4.4	4.1	2.0
3	-	-	5.5	3.3	12.7	5.1	9.2	11.1	-	-	-
4	30.0	20.0	10.0	-	-	-	-	-	-	-	-

material they had carried inside. Ten days later, we observed just two adults entering the nest without material, and we assumed that construction had been completed. One of the adults spent more time inside the nest than the other.

**Parental care.**—Our information concerning parental care was based on nests 2 and 3. On 22 March 2009, we observed two adults arriving simultaneously with food at nest 2. Both perched on different branches of the nest tree (close to the nest). One flew to the nest entrance and introduced the anterior half of the body into the nest; three seconds later it flew to the main trunk of the nest tree and perched without food in its bill. Meanwhile, the second bird waited until the first had flown away before visiting the nest entrance. After two seconds, the second bird flew to another tree without food in its bill and the first one followed it. We heard chicks calling inside when the adults arrived at the nest.

Between 1 April and 26 June 2015 we conducted observations at nest 3 at different times on six days. On six occasions, we observed both adults enter the nest and after a few minutes only one left, to forage in the same patch of secondary forest where we had observed both adults foraging previously. On several occasions after 9 May we observed adults spend between five and seven minutes foraging in the same secondary forest near the nest before entering. If both adults arrived simultaneously, as occurred at nest 2, one perched next to the nest and waited until the other had departed before delivering food (no. of observations = 25). Prey included beetles, spiders and unidentified arthropods. Both adults introduced the anterior half of the body into the nest entrance. During one feeding bout, an adult brought food to the nest on three occasions, while the other remained inside (we are certain it was the same individual as it never entered completely). On three occasions we observed both adults leave the nest with faecal sacs immediately after provisioning the chicks. The last time that we heard the chicks vocalising inside the nest was on the morning of 26 May 2015. We visited the nest on 26 June but did not see activity inside or near it.

Discussion

Our observations of three Ruddy Treerunner nests augment the previous description (Mennill & Doucet 2005), providing detailed nest measurements (Table 1), a description of nest materials, the structure of the egg chamber, and observations of parental behaviour. In general, the nest structure of this species is similar to that of nests of its sister species, Pearled Treerunner and Spotted Barbtail, which also construct closed nests of moss attached below a single branch (Meyer de Schauensee & Phelps 1978, Stiles *et al.* 2000, Remsen 2003, Greeney

2008a, Greeney & Gelis 2011). The external shape of the nest of Ruddy Treerunner appears variable, as also reported for Spotted Barbtail (Greeney 2008a). External nest variation can be related to site characteristics (Nickell 1958, Pacheco & Simon 1995), or to the ontogeny of nest construction (Greeney 2008a, Greeney & Gelis 2011). Nest 3 was completely embedded in the vegetation that surrounded it, suggesting that it was constructed within a natural, pre-existing mass of moss. This behaviour has been reported previously for Pearled Treerunner and Spotted Barbtail, although these species might also transplant and compact moss to construct their nest (Greeney 2008a, Greeney & Gelis 2011). In both scenarios, the moss can continue to grow and provide a substrate for epiphytic plants such as orchids and ferns, which partially determine the external shape of the nest.

Although we did not witness the construction of nest 1, the presence of a second cavity in the nest has been reported previously in some species of Furnariidae (Zyskowski & Prum 1999, Greeney 2008a). In Pearled Treerunner nests there can be a second cavity that functions as an adult dormitory during the breeding season (H. F. Greeney pers. comm.) and in one nest of Spotted Barbtail the second cavity led to an inner, inactive nest chamber (Greeney 2008a; Table 2). In Plain Softtail *Thripophaga fusciceps* the second cavity served as an additional nest entrance (Zyskowski & Prum 1999). In one Rufous-fronted Thornbird *Phacellodomus rufifrons* nest, Skutch (1969) found more than two cavities each with an individual chamber at the end. These might be old nests or dormitories (Skutch 1969, Carrara & Rodrigues 2001, Rodrigues & Carrara 2004). We suggest that the second cavity in nest 1 might have served as an adult dormitory. It is unlikely that the second cavity was created by a predator (despite that we found a dead chick inside nest 1) because the nest exhibited no signs of damage. Contrary to the external structure, the shape and materials of the nest chamber and egg cup were similar in the two collected nests and among sister

TABLE 2  
Summary of the reproductive biology, specifically nest architecture and parental breeding behaviour for Spotted Barbtail *Premnoplex brunnescens* (Greeney 2008a,b), Pearled Treerunner *Margarornis squamiger* (Greeney & Gelis 2011) and Ruddy Treerunner *M. rubiginosus* (Mennill & Doucet 2005). <sup>1</sup>Based on Meyer de Schauensee & Phelps (1978), Stiles *et al.* (2000) and Remsen (2003). <sup>2</sup>Based on Simon & Pacheco (2005). <sup>3</sup>Except one nest that was reused (Greeney 2008a). <sup>4</sup>Some nests, H. F. Greeney pers. comm. <sup>5</sup>Not confirmed.

	Spotted Barbtail	Pearled Treerunner	Ruddy Treerunner
Nest architecture			
Perch	Rocks, trees or roots	Horizontal branch	Horizontal branch
Nest position <sup>1</sup>	Pendant and bottom	Pendant <sup>1</sup> and bottom	Pendant
Substrate (mass of mosses)	Built or modified natural mass	Built or modified natural mass?	Built or modified natural mass?
Nest form <sup>2</sup>	Globular	Globular	Globular, ovoid or irregular
Principal material	Moss	Moss	Moss
Number of entrances	One <sup>3</sup>	One or two <sup>4</sup>	Two
Entrance position	Below	Below	Below
Entrance form	Tubular	Tubular	Tubular
Inner chamber form	Spherical	Spherical	Spherical
Breeding behaviour			
Bi-parental nestbuilding	Yes	Yes	Yes
Bi-parental nestling care	Yes	Yes	Yes
Parental removal of faecal sacs	Yes	Unknown <sup>5</sup>	Yes

species (Greeney 2008a, Greeney & Gelis 2011; Table 2). The only difference between the egg cup of Ruddy Treerunner and those of its sister species is that in both Pearled Treerunner and Spotted Barbtail the structure is independent of the inner chamber (Greeney & Gelis 2011, Greeney 2008a; Table 2).

The third bird observed during the construction of nest 3 was perhaps a helper. Such behaviour during the breeding season is widespread among Neotropical birds (Skutch 1935), enhancing the fitness of kin offspring (Brouwer *et al.* 2012). Among Furnariidae, Rufous-fronted Thornbird appears to have more than two helpers that assist in nestbuilding, territory defence or feeding nestlings (Skutch 1935, Rodrigues & Carrara 2004). Based on our observations, it is probable that Ruddy Treerunner also employs a helper during nest construction. Similar to Pearled Treerunner and Spotted Barbtail, in Ruddy Treerunner both adults build the nest, feed the nestlings and remove faecal sacs; the latter is also reported in Spotted Barbtail (Greeney 2008b), but has not been confirmed for Pearled Treerunner (Areta 2007, Greeney & Gelis 2011; Table 2). For incubation behaviour, we could not confirm whether one of the adults spent more time incubating than the other, but it is probable that both adults incubate the eggs, as is true for Spotted Barbtail (Greeney 2008b).

Many aspects of nest structure and parental behaviour are similar among Spotted Barbtail, Pearled and Ruddy Treerunners (i.e. nest placement, materials, nest entrance position, the shape of the inner chamber, bi-parental care and removal of faecal sacs by both adults; Table 2). Until now, some nest characteristics were shared by just two species of the *Margarornis*–*Premnoplex* clade. For example, Pearled Treerunner and Spotted Barbtail nests can be placed over a horizontal branch (Greeney 2008a, Greeney & Gelis 2011), and some Ruddy and Pearled Treerunners nests possess a second cavity in the base (H. F. Greeney pers. comm.; Table 2). Based on our observations, only Ruddy Treerunner employs a helper during nest construction. Information concerning breeding biology reinforces the genetic relationships reported previously for the *Margarornis*–*Premnoplex* clade (Derryberry *et al.* 2011).

#### Acknowledgements

We thank H. F. Greeney for his comments concerning the structure of nest 3, and M. Corrales-Ugalde, E. Macadam, A. Masters, G. M. Kirwan, K. Zyskowski and an anonymous reviewer for their comments that improved the manuscript. For permitting access to their collections we also thank the Departamento de Historia Natural, Museo Nacional de Costa Rica, and Museo de Zoología, Universidad de Costa Rica, especially to C. Pineda, G. Alvarado, S. Bolaños and G. Barrantes.

#### References:

- Areta, J. 2007. Behavior and phylogenetic position of *Premnoplex* barbtails (Furnariidae). *Condor* 109: 399–407.
- Brouwer, L., Richardson, D. & Komdeur, J. 2012. Helpers at the nest improve late-life offspring performance: evidence from a long-term study and a cross-foster experiment. *PLoS One* 7: e33167.
- Carrara, L. A. & Rodrigues, M. 2001. Breeding biology of the Rufous-fronted Thornbird *Phacellodomus rufifrons*, a Neotropical ovenbird. *Intern. J. Orn.* 4: 209–217
- Derryberry, E., Claramunt, S., Derryberry, G., Chesser, R. T., Cracraft, J., Aleixo, A., Perez-Emán, J., Remsen, J. V. & Brumfield, R. 2011. Lineage diversification and morphological evolution in a large-scale continental radiation: the Neotropical ovenbirds and woodcreepers (Aves: Furnariidae). *Evolution* 65: 2973–2986.
- Greeney, H. & Gelis R. 2011. The nest of the Pearled Treerunner (*Margarornis squamiger*). *Orn. Colombiana* 11: 32–36.
- Greeney, H. 2008a. Nest construction behavior and variability in nest architecture and nest placement of the Spotted Barbtail (*Premnoplex brunescens*). *Bol. Soc. Antioqueña Orn.* 18: 26–37.
- Greeney, H. 2008b. The Spotted Barbtail (*Premnoplex brunescens*): a review of taxonomy, distribution and breeding biology with additional observations from northeastern Ecuador. *Bol. Soc. Antioqueña Orn.* 18: 1–9.
- Greeney, H., Sánchez, C., Sánchez, J. E. & Carman, E. 2013. A review of nest and egg descriptions for the genus *Myrmeciza*, with the first description of nests and eggs of the dull-mantled antbird (*M. laemosticta*). *J. Orn.* 154: 1049–1056.



- Irestedt, M., Fjeldså, J. & Ericson, P. G. P. 2006. Evolution of the ovenbird-woodcreeper assemblage (Aves: Furnariidae) - major shifts in nest architecture and adaptive radiation. *J. Avian Biol.* 37: 260–272.
- Mazar Barnett, J. & Kirwan, G. M. 2005. Notes on the nest of the Striated Softtail (*Thripophaga macroura*), with comments on a nest of Plain Softtail (*T. fusciceps*) and relationships of the genus based on nest architecture. *Orn. Neotrop.* 15: 257–263.
- Mennill, D. & Doucet, S. 2005. First description of the nest of a Ruddy Treerunner (*Margarornis rubiginosus*). *Cotinga*. 24: 109–110.
- Meyer de Schauensee, R. & Phelps, W. H. 1978. *A guide to the birds of Venezuela*. Princeton Univ. Press.
- Nickell, W. P. 1958. Variations in the engineering features of the nest of several species of birds in relation to nest sites and nesting materials. *Buttler Univ. Bot. Stud.* 13: 121–140.
- Pacheco, S. & Simon, E. 1995. Variações no padrão de nidificação de *Fluvicola nengeta* Linnaeus, 1766 (Aves, Tyrannidae). *Rev. Bras. Biol.* 55: 609–615.
- Remsen, J. V. 2003. Family Furnariidae (ovenbirds). Pp. 162–357 in del Hoyo, J., Elliott, A. & Christie, D. A. (eds.) *Handbook of the birds of the world*, vol. 8. Lynx Edicions, Barcelona.
- Rodrigues, M. & Carrara, L. A. 2004. Co-operative breeding in the Rufous-fronted Thornbird *Phacellodomus rufifrons*: a Neotropical ovenbird. *Ibis* 146: 351–354.
- Rudge, D. & Raikow, R. 1992. The phylogenetic relationships of the *Margarornis* assemblage (Furnariidae). *Condor* 94: 760–766.
- Sheldon, F. & Winkler, D. 1999. Nest architecture and avian systematics. *Auk*. 116: 875–877.
- Simon, J. E. & Pacheco, S. 2005. On standardization of nest descriptions of neotropical birds. *Rev Bras. Orn.* 13: 143–154.
- Skutch, A. F. 1935. Helpers at the nest. *Auk*. 52: 257–273.
- Skutch, A. F. 1969. A study of the Rufous-fronted Thornbird and associated birds. *Wilson Bull.* 81: 5–43.
- Stiles, F. G. & Skutch, A. 1995. *Guía de aves de Costa Rica*. Instituto Nacional de Biodiversidad, Heredia.
- Stiles, F. G., Bohórquez, C. I., Cadena, C. D., de la Zerda, S., Hernández, M., Rosselli, L., Kelsey, M., Valencia, I. D. & Knapp, D. 2000. *Aves de la sabana de Bogotá*. Asociación Bogotana de Ornitología, Bogotá.
- Zyskowski, K., & Prum, R. O. 1999. Phylogenetic analysis of the nest architecture of Neotropical ovenbirds (Furnariidae). *Auk* 116: 891–911.
- Addresses:* Julio E. Sánchez†, Asociación de Ornítólogos Unidos de Costa Rica, San José, Costa Rica, 11695-1000. Karla Conejo-Barboza, Escuela de Biología, Universidad de Costa Rica, Montes de Oca, San José, Costa Rica, 11501-2090, e-mail: k.conejobarboza@gmail.com. César Sánchez, Asociación de Ornítólogos Unidos de Costa Rica, San José, Costa Rica, 11695-1000, and Dept. of Biological Sciences & Museum of Natural Science, Louisiana State University, Baton Rouge, LA 70803, USA. Ariel A. Arce, Asociación Ornitológica de Costa Rica, San José, Costa Rica, 572-1250, and Escuela de Ciencias Biológicas, Universidad Nacional de Costa Rica, Heredia, Costa Rica, 86-3000. Javier Tenorio, Escuela de Ciencias Biológicas, Universidad Nacional de Costa Rica, Heredia, Costa Rica, 86-3000. Luis Sandoval, Asociación de Ornítólogos Unidos de Costa Rica, San José, Costa Rica, 11695-1000, and Escuela de Biología, Universidad de Costa Rica, Montes de Oca, San José, Costa Rica, 11501-2090.

# Notable recent records of terns, gulls and skuas in southern Mozambique including the first country records of Black Tern *Chlidonias niger*

by Gary Allport

Received 24 January 2018; revised 4 May 2018; published 22 June 2018

<http://zoobank.org/urn:lsid:zoobank.org:pub:247B1A20-DC1C-41F8-88F4-D7A555149F5E>

**SUMMARY.**—Interesting sightings in southern Mozambique of 13 species of terns, gulls and skuas are reported, the result of regular observations between October 2010 and September 2017 while I was based in the capital, Maputo. These include the first two records of Black Tern *Chlidonias niger*, the first fully documented record of Lesser Noddy *Anous tenuirostris* and the first observations of live Arctic Terns *Sterna paradisaea* for Mozambique, as well as status updates for Kelp Gull *Larus dominicanus*, Lesser Black-backed Gull *L. fuscus*, Sabine's Gull *Xema sabini*, Gull-billed Tern *Gelochelidon nilotica*, Swift Tern *Thalasseus bergii*, Sooty Tern *Onychoprion fuscatus*, Common Tern *S. hirundo*, Black-naped Tern *S. sumatrana*, Roseate Tern *S. dougallii* and Subantarctic Skua *Stercorarius antarcticus* in southern Mozambique.

Regular bird observations were made in the environs of Maputo, Mozambique, from October 2010 until September 2017. Casual observations ranging between Ponta d'Ouro and the Maputo Special Reserve in Maputo Province, in the south, through Gaza Province to the Bazaruto archipelago in Inhambane Province, in the north (see Fig. 1), were recorded in

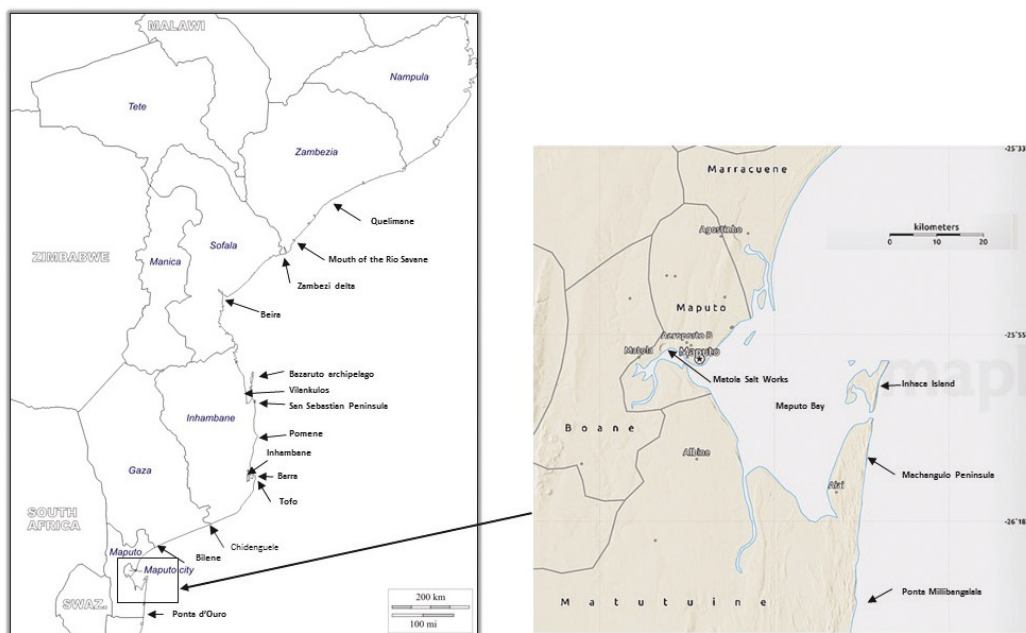


Figure 1. The localities referred to in the text in southern Mozambique (left) and the Maputo Bay area (right).

eBird ([www.eBird.com](http://www.eBird.com)), and informally reported on the Facebook site Birds Mozambique and in the Recent Reports section of *Bull. Afr. Bird Cl.* My purpose here is to place sightings of terns, gulls and skuas on formal record, as part of an ongoing effort to publish all interesting bird records from this part of the country. A sibling publication covering other seabirds is planned.

The primary area covered was the hinterland of Maputo, but with nine visits to Inhambane and Tofo, one to Pomene and two to Bazaruto. Pelagic trips were made from Maputo ( $n = 15$ ), Tofo ( $n = 6$ ) and Bazaruto ( $n = 1$ ). From Tofo and Bazaruto these trips traversed waters due east to c.10–15 km offshore. From Maputo, pelagic trips crossed Maputo Bay and ranged north of Inhaca Island, reaching the continental shelf edge. Two trips ventured further south off the Machangulo Peninsula. For locations see Fig. 1. Birds were observed using binoculars and telescope, but digital photography was an important means of documenting records, especially at sea.

Southern Mozambique is here defined as that part of the country that falls within the Southern Africa ornithological region, and its northern boundary in Mozambique is delineated by the Zambezi River, as well as waters within Mozambique's Exclusive Economic Zone (Hockey *et al.* 2005).

The status of all of the species included here was described by Hockey *et al.* (2005) and many were treated in more detail by *The atlas of the birds of Mozambique* in the two volumes covering southern and central Mozambique (Parker 2000, 2005). Parker (2005) covered the provinces of Sofala and Manica, both of which fall within the Southern African region, but he also covered all of Tete, whereas only the southern part of this province, south of the Zambezi River and the Cahora Bassa Dam, forms part of the Southern Africa ornithological region. All of the data from Parker's studies were included within the Southern African Bird Atlas Project (SABAP) dataset, which were analysed in their entirety at the time by Hockey *et al.* (2005). However, data from Mozambique have continued to be added by observers since 2005 (<http://sabap2.adu.org.za/>). Clancey (1996) also remains an important work underpinning our knowledge of southern Mozambique's avifauna.

For seabirds, Clancey (1971) provided the first list of sighting localities in southern Mozambique, while Brooke *et al.* (1981) compiled both published and unpublished data 'from the coast or within sight of it' to supplement Clancey's study. Lambert (2005) is the most important work on seabirds in southern Mozambique, based on 350 days of observations from prawn trawling vessels in Mozambican waters. Rollinson (in press) documented seabirds from a fishing vessel in Mozambican waters off southern and central Mozambique over the course of 79 days, between 1 August and 17 October 2015. As many of the sightings reported herein pre-date those of Rollinson (in press), his findings are discussed alongside those reported here (with his permission).

The main reference for the region is Hockey *et al.* (2005) wherein a short review of the status and records for all species is presented. Only those species for which my records augment knowledge of their status are included herein, and I have not attempted to comprehensively analyse SABAP, eBird and other major data sources for additional material. Taxonomy and nomenclature follow Dickinson & Renssen (2013).

### LESSER NODDY *Anous tenuirostris*

Breeds on tropical and subtropical Indian Ocean islands (Safford & Hawkins 2013) and is a seasonal visitor to East Africa, albeit in very variable numbers (Britton 1980, Urban *et al.* 1986). Only a rare vagrant to southern Africa (Urban *et al.* 1986) with four published records (Hockey *et al.* 2005) of which one is from Mozambique and the others are from the east coast of South Africa. No records in the SABAP database. Unsubstantiated reports exist from the

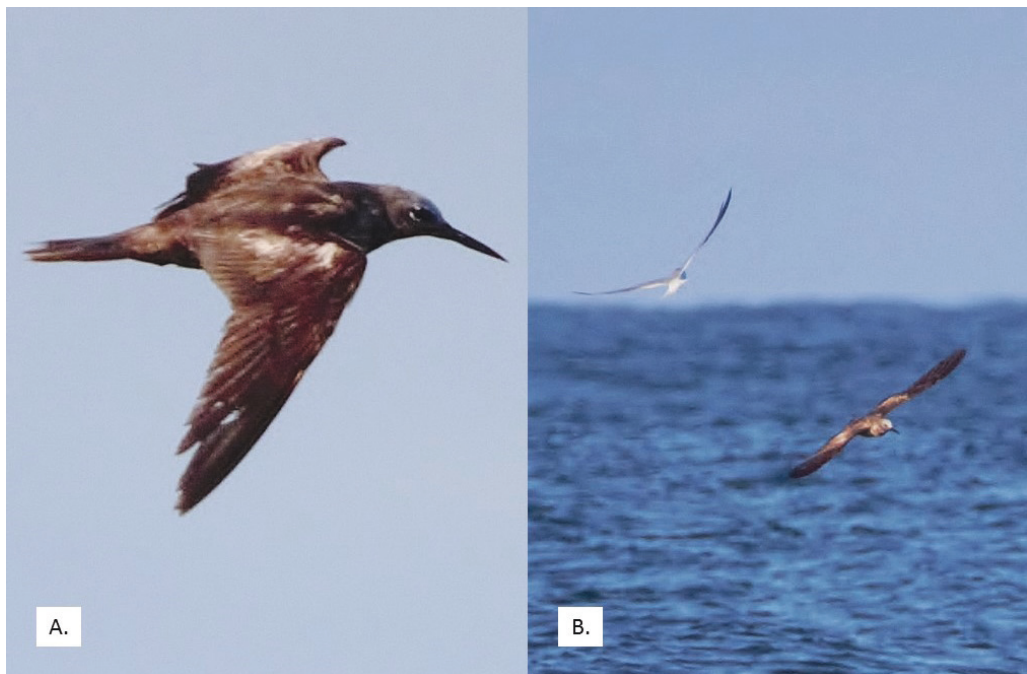


Figure 2. Lesser Noddy *Anous tenuirostris*, off Inhaca Island, Mozambique, 25 April 2013; note the long thin bill with shallow gonydeal angle (A) and pale lores and size relative to the Little Tern *Sterna albifrons* (at left, in B) (Gary Allport)

Bazaruto archipelago and San Sebastian Peninsula.

On 25 April 2013 a noddy sp. was seen briefly in the early morning en route by boat to outer Maputo Bay. It was relocated within a group of Little Terns *Sterna albifrons* later in the day north of Inhaca Island and some poor-quality photographs (Fig. 2) were taken. Its smaller size than Brown Noddy *A. stolidus* (compared to the adjacent Little Terns), long narrow bill with shallow gonydeal angle, and pale lores confirm the identification (Harrison 1983). This is the second record for Mozambique and the first for which published details exist.

#### SABINE'S GULL *Xema sabini*

Breeds in the Holarctic and migrates south through the Atlantic Ocean to spend the austral summer off southern Africa (Hockey *et al.* 2005). Rare in Mozambique, the first record was by Lambert (1983), followed by another four, all in February–April north of Inhaca Island (Lambert 2005), including one



Figure 3. Second-calendar-year Sabine's Gull *Xema sabini*, north of Inhaca Island, Mozambique, 10 May 2015 (Gary Allport)



immature. Note that Lambert's first record (1983) was not mentioned by Clancey (1996), but was cited as being in press by Griffiths & Sinclair (1982) and subsequently incorrectly attributed to the latter authors by Hockey *et al.* (2005).

One north of Inhaca Island on 10 May 2015 (Fig. 3) is the sixth record for Mozambique. It was considered to be in its second-calendar year (CY) having nearly completed moulting its juvenile plumage, with the exception of some brownish wing-coverts and outer primaries, but sporting an adult non-breeding plumage neck collar (P. Morris pers. comm.).

### **KELP GULL** *Larus dominicanus*

Subspecies *vetula*, known as Cape Gull, breeds in the austral summer on coasts of South Africa as far east as the Riet Keiskamma River, Eastern Cape (Tree 2006), and disperses north along the east and west coasts post-breeding (Crawford *et al.* 1997). Hockey *et al.* (2005) noted that it occurs as far north as Maputo. Parker (2000) described Kelp Gull as an uncommon non-breeding winter visitor to coasts, where it was seen alone or in groups of up to ten, estimating the number visiting this region as unlikely to exceed 300, and the mapped distribution shows records confined to the region of Maputo Bay. Parker (2005) did not record it in central Mozambique. Clancey (1996) noted records from Beira harbour, but these have not been substantiated subsequently and now appear very unlikely (see Lesser Black-backed Gull *L. fuscus*).

Observed annual pattern of occurrence in Maputo Bay follows Parker (2000: 95), but first arrivals in January–February often involve recently fledged juveniles still growing their primaries. Birds of all ages arrive in March, and all depart in August–September. Up to 70 have been observed in Maputo Bay. Considering its confident behaviour on the breeding grounds, *L. dominicanus* is surprisingly discreet in Maputo Bay, feeding 1–2 km offshore, following prawn trawlers, and roosting on inaccessible, isolated sandbanks. It is rarely observed on the Maputo city beachfront, despite being present nearby in good numbers.

It is noteworthy that there were no sightings further north in Mozambique, despite considerable observer effort around Tofo and Inhambane, and potentially suitable habitat at Bilene. Rollinson (in press) observed one at sea c.150 km east of Vilankulos, on 8 October 2015, which appears to be the only recent reliable record north of Maputo.

It seems likely that Maputo Bay is a focal destination for a regularly returning subpopulation of Kelp Gulls, and it is remarkable that recently fledged juveniles reach Maputo Bay probably within just a few weeks of fledging. This is probably linked to feeding opportunities around the small fleet of inshore prawn trawlers that operate daily up to 15 km from Maputo, mostly inside the bay. Equally, the apparent absence of the species further north is perhaps related to the relative lack of inshore fishing vessels regularly working specific areas.

### **LESSER BLACK-BACKED GULL** *Larus fuscus*

A rare non-breeding Palearctic migrant to the coast, most frequently reported in the austral summer (Parker 2000). Donnelly (1974) discussed records of the species in southern and central Africa, and assigned a number of sightings of black-backed gulls at Beira to *L. fuscus*. Brooke *et al.* (1981) and Parker (2005) followed Donnelly (1974), reporting at least eight records from Beira prior to 1974, in January, March, May, July, August, November and December. Seventeen birds were subsequently reported there on 7 December 1974 (Sinclair 1979). Without explanation, Clancey (1996) elected not to follow Donnelly (1974), reporting just one record from Beira in April 1971 (by Weikowitz), but mentioned Kelp Gull *L. dominicanus* as occurring in Beira harbour. Parker (2005) reported further singles at Beira in February 1995 and February 2001. There are 35 records in the SABAP database from the

TABLE 1  
Records of Lesser Black-backed Gull *L. fuscus* from southern Mozambique.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Beira <sup>1</sup>	x	2	x		x		x	x			x	x
Beira <sup>2</sup>	2	4	1			2	4	3		1	2	17
Maputo <sup>3</sup>		1								1	1	
Maputo <sup>4</sup>	3	1			1					2 (1)	2	

Sources: <sup>1</sup> Brooke *et al.* (1981) (indicated as 'x' where no counts provided) and Parker (2005); <sup>2</sup> SABAP database; <sup>3</sup> Parker (1999); <sup>4</sup> this study (record in brackets from Bazaruto archipelago).



Figure 4. Three Lesser Black-backed Gulls *Larus fuscus*, Maputo, Mozambique, 16 January 2016, all showing characters of nominate *fuscus* (Baltic Gull), second-calendar year (left back, partially obscured), subadult (middle) and fourth-calendar year (right) (Gary Allport)

Beira region in the 2009–17 period, numbering 1–6 records per annum (Table 1). Further south, Parker (2000) reported two records, at Inhaca in October–November 1976 (Brooke *et al.* 1981) and Maputo Bay in February 1995.

An adult was seen at Ilha de Benguerra, Bazaruto archipelago, on 20 October 2013, with the following observed on beaches at Maputo; one (adult) 9 October 2011, one (2CY) 2 February 2015 (with A. F. A. Hawkins), 6–17 May 2015, 25 November 2015, three (2CY, 4CY, subadult) 16–19 January 2016 (Fig. 4), one (subadult) 23 February 2016 (with C. Cohen) and one (2CY) 7 November 2016.

All birds displayed features consistent with race *L. f. fuscus*, known as Baltic Gull (Jonsson 1998) and there were no sightings of birds that may have been Heuglin's Gulls *L. f. heuglini*. However, as the two races were not always formerly recognised, it is probable that some older records, and even some recent observations, may have involved *L. f. heuglini*, which has been recorded south to Port Elizabeth, South Africa (A. J. Tree pers. comm.).

These records further establish the status of Baltic Gull as a rare but regular visitor to southern Mozambique. The overall pattern is of most records in the austral summer and the majority of reports from Beira in December, but small numbers of birds are present year-round.

All records are from the coast, which is noteworthy as Baltic Gull is known to migrate south inland via the African Rift Valley, regularly occurring at the Great Lakes (Kilpi & Saurola 1984, Bustnes *et al.* 2013) and overwintering more widely in the Congo Basin (Kylin *et al.* 2010), with vagrants regularly reaching the interior of southern Africa (Hockey *et al.* 2005). It is very uncommon on the coasts of East Africa north of Mozambique (Zimmerman *et al.* 1996; N. Baker *in litt.* 2017). The pattern of records suggests that some individuals cross to the coast from the Rift Valley, perhaps at its southern end by following the River Zambezi, and then disperse south along the Mozambican coastline.

Baltic Gull breeds in a restricted area of Scandinavia and has declined during the last 50 years (Bevanger & Thingstad 1990), although numbers have stabilised more recently (Lorentsen 2007); the current population is c.2,000 pairs, making it a globally rare subspecies. Given the length of the southern Mozambique coastline, it is possible that this apparently rare bird nevertheless does occur in numbers significant at a population level.

**GULL-BILLED TERN** *Gelochelidon nilotica*

A resident and Palearctic winter visitor to West Africa, the Rift Valley and coasts of East Africa as far south as Dar es Salaam, Tanzania (Britton 1980, Urban *et al.* 1986). Vagrant to Mozambique. Two records involving four birds were reported by Hockey *et al.* (2005); two each at Gorongosa National Park in December 1972 (Sinclair 1975, Ryan 1997) and at Lake Chuali in June 1995 (Ryan 1997). However, the mapped distribution in Hockey *et al.* (2005) shows five locations in southern Mozambique, of which two of the others accord with Parker (2000)—Maputo / Matola Salt Works and Lago Manjacaze. The final record is mapped in Hockey *et al.* (2005) at an inland locality near the Zimbabwe border, but is not authenticated (and not in the SABAP database). The species is listed as an addendum by Clancey (1996), which Parker (2005) cited as his source for the Gorongosa record. The Lago Chuali record was reported as being from 1995 by Hockey *et al.* (2005) but in 1996 by Ryan (1997); presumably this discrepancy does not imply that there were two different observations. These records are summarised in Table 2. The most recent Mozambican record was in November 2017 on the Matola River, near Maputo (J. R. Nicolau pers. comm.)

One seen feeding along the shore off Matola Salt Works (with R. Hughes) beside Lesser Crested Terns *T. bengalensis* on 11 May 2011 was the fifth record for southern Mozambique. Noted field characters included the short, strong black bill, cleaner paler upperparts and dark tips to the primaries on the underwing. However, photographs taken at the time were incorrectly exposed and do not serve as documentation.

TABLE 2  
The four published records of Gull-billed Tern *Gelochelidon nilotica* in southern Mozambique.

Date	Location	Count	Source	Cited by
December 1972	Gorongosa National Park	2	Sinclair (1975)	Hockey <i>et al.</i> (2005)
March 1995	Salinas da Matola	1	Hockey <i>et al.</i> (1996), Parker (2000)	
June 1995/6?	Lago Chuali	2	Ryan (1997), Parker (2000)	Hockey <i>et al.</i> (2005)
August 1996	Lago Manjacaze	1	Parker (2000)	



**SWIFT TERN** *Thalasseus bergii*

Widespread on coasts in southern Africa. It breeds in the Cape and is a year-round non-breeding visitor to Mozambique (Hockey *et al.* 2005), where regularly recorded as far north as Beira (Clancey 1996), mostly within 18–25 km of the coast but occasionally over the shelf-break (Lambert 2005). Parker (2000) described it as uncommon on coasts in the southern provinces, often seen alone, most frequently in October–April, but with records in all months. Notably, Brooke *et al.* (1981) reported up to 300 during two weeks in October–November 1976 on Inhaca Island, with birds observed displaying and copulating. In central Mozambique, Parker (2005) reported a more seasonal pattern—absent in March–July and a peak in January, but less common than further south, with probably 300 birds in the region. However, Lambert (2005) reported the species as uncommon in the south, where mostly restricted to Maputo Bay and Inhaca Island, but more frequent further north and often the most abundant tern aside of Common Tern, with 30–270 daily in March 1987 and March–April 1988, between Inhambane and the Save River mouth.

Found breeding in the 19th century at the Zambezi River (Kirk 1864, Stark & Sclater 1906, Clancey 1975, J. Kirk *in* Brooke & Cooper 1982) and is assumed to have bred there later than this, but there are no proven records (Parker 2000). There is one report of breeding in northern Mozambique (C. Bento pers. comm. *in* Parker 2005) but no precise locality is given.

Swift Tern has six subspecies distributed coastally from Namibia to East Africa and throughout the Indian Ocean to Australia (Gochfeld *et al.* 2017). The status of those races present in Mozambique is unclear, but three or four subspecies are seemingly involved.

*T. b. bergii* breeds on the coast of Namibia and South Africa, from Swakopmund to Stag Island, Eastern Cape (Cooper *et al.* 1990, Hockey *et al.* 2005), and ringing recoveries show that it disperses along the Atlantic coast as far north as Namibia and east and north to the Indian Ocean coast of KwaZulu-Natal. This race presumably reaches southern Mozambique in the non-breeding season (Clancey 1975, Cooper *et al.* 1990) although definitive evidence is lacking (Cooper *et al.* 1990). It shows a relatively dark upperwing, approximately the tone of Common Gull *Larus canus* (Olsen & Larsson 2010).

*T. b. thalassinus* breeds on coasts of Tanzania and Kenya, and has much paler upperparts than *T. b. bergii*, with the grey tone equivalent to Lesser Crested Tern *T. bengalensis* (see Stevenson & Fanshawe 2002). It is smallest in wing and bill lengths (Table 3) of the first three taxa discussed here. This race has not been confirmed to occur in Mozambique, but it appears probable that *T. b. thalassinus* is present in at least the northern coastal provinces (see below).



Figure 5. Swift Tern *Thalasseus bergii*, off Tofo, Inhambane Province, Mozambique, 29 August 2016, possibly of the race *velox*, showing relatively dark upperwings of a grey tone similar to Lesser Black-backed Gull *L. fuscus* (Gary Allport)

TABLE 3 Wing and bill lengths (in mm), showing mean + (n) of three subspecies of Swift Tern <i>Sterna bergii</i> (Olsen & Larsson 2010)		
Subspecies	Wing	Bill
<i>S. b. bergii</i>	357.5 (18)	62.3 (45)
<i>S. b. thalassinus</i>	337.0 (25)	56.7 (29)
<i>S. b. velox</i>	366.0 (30)	64.6 (37)

Western populations of *T. b. velox* breed in the north-west Indian Ocean and Red Sea. Described as darkest, with upperparts equivalent in tone to Lesser Black-backed Gull *Larus fuscus* (Olsen & Larsson 2010). It has the largest wing and bill lengths of the first three taxa mentioned here (Table 3). Reported in coastal East Africa as a non-breeding migrant (Stevenson & Fanshawe 2002) and Seychelles as a vagrant (Safford & Hawkins 2013).

*T. b. enigma* is based on two specimens collected just north of Beira, which were initially identified by Clancey (1970, 1971) as Royal Terns *T. maxima*, but subsequently described as a new subspecies (Clancey 1975, 1979) thought probably to breed in central Mozambique and possibly Madagascar. Upperparts described as intermediate between *thalassinus* and *bergii*, and the specimen in breeding plumage was reported to have a narrower white forehead separating the black cap from the bill than other races. The taxon has subsequently been synonymised with nominate *bergii* based on small sample size and limited data (Dickinson & Remsen 2013, Gochfeld *et al.* 2017). Hockey *et al.* (2005) also stated that it is 'synonymised with the nominate' but A. J. Tree (*in litt.* 2017) reported that this was an error and the authors intended to lump it with *thalassinus*. Safford & Hawkins (2013) assigned breeders in Madagascar to *thalassinus* and discounted the validity of *enigma*.

In the Maputo Bay area, the species was recorded on 33 days with a mean count of 7.2 birds and daily maxima of 30 on two occasions. Records were in all months except February–March, with no apparent peak. Most birds were scattered feeding across the bay, often following prawn trawlers, picking up offal, and were not seen sufficiently well to assign to race. All observed well enough to enable subspecific identification were assigned to *bergii*, based on their darker upperparts than nearby Lesser Crested Terns. However, two seen on 18 May 2011 showed very dark upperparts, akin to Lesser Black-backed Gull, and are thought to have been race *velox*.

During seven day counts in the Tofo area the mean was 90.1 birds with a max. count of 400 in April. Records were from April–May and August. Larger counts were partly as a result of migratory movements and counts at roost sites. Most were seen distantly through a telescope and very few were assigned to race, but again the majority were assigned to *bergii* except one with the very dark upperparts of race *velox* (Fig. 5).

On 20 October 2013 a group of 80 was found roosting on a sandbank off Benguera Island, Bazaruto. Lighting conditions were harsh, with bright sunlight, and the birds were observed against pale sand background, but all were apparently paler than those seen further south. The group included 2–3 adults in complete breeding plumage—which did not show a notably narrow frons—plus several immatures, and was accompanied by several Lesser Crested Terns *T. bengalensis* with similar upperparts coloration.

My records do not shed much additional light on the status of the different subspecies of Swift Tern in Mozambique, which remains enigmatic. There is reasonable evidence that *T. b. bergii* migrates to southern Mozambique, at least as far north as Maputo Bay, in the non-breeding season (June–December) and presumably some immature non-breeders of this race are resident year-round. Swift Tern does not breed until 3–7 years old, and non-breeders remain away from the colonies, sometimes for many years (A. J. Tree pers. comm.). The total number of breeding pairs per year in southern Africa as a whole is very variable (Cooper *et al.* 1990), suggesting that large numbers skip nesting in certain years. Nevertheless, it appears that significant numbers are present on the Mozambique coast from Inhambane northwards in March–May (Lambert 2005) when adult *T. b. bergii* are breeding in the Cape. Evidence of nesting on Inhaca Island in October (Brooke *et al.* 1981) also suggests the presence of a population of Swift Terns on the southern Mozambique coast that may possess a different annual breeding cycle. Whether these potential breeders represent a different taxon is unproven.

The use of upperparts coloration in subspecies designation clearly merits further attention. Birds seen in August at Tofo and in all months at Maputo were too dark for *thalassinus* but some were considered sufficiently dark to be *velox*. The group seen at Bazaruto in October was also perplexing, showing upperparts that concur with the description of *T. b. enigma* but no other features ascribed to the latter (Clancey 1975, 1979). Swift Terns observed by Brooke *et al.* (1981) in Maputo Bay were also described as showing paler upperparts and presumed to be tropical breeders of the race *enigma*; however, A. J. Tree (*in litt.* 2017) feels that they should be assigned to *thalassinus*. Observers are encouraged to make detailed observations of the species in Mozambique.

### SOOTY TERN *Onychoprion fuscatus*

Widely distributed across open oceans in the tropics (Harrison 1983) and breeds in the Mozambique Channel, in the French Southern Ocean Territories (Le Corre & Safford 2001) and in northern Mozambique. Thousands attempt to breed on the small island of Puga-puga, near Angoche in northern Mozambique, but almost all of their eggs and many adults are taken as food by local people (Kromer 1998). Flocks numbering hundreds occasionally move offshore south-east of southern Mozambique, reaching 28°S (Lambert 2005). Following easterly gales, some reach South African waters in KwaZulu-Natal and the Agulhas Current, even occurring inland occasionally (Brooke & Sinclair 1978, Avery 1982, Maclean 1984).

Several records from coastal southern Mozambique between Beira and Inhaca Island (Brooke *et al.* 1981, Clancey 1996, Harrison *et al.* 1997, Parker 2000). Lambert (2005) found that small to large flocks of Sooty Terns regularly straggle offshore as far south as 26°S, hunting over schools of fish, sometimes accompanied by skuas and other seabirds. They never followed trawlers in the area south of the Save River mouth, but sometimes followed vessels at night, calling loudly. Few were sighted by Lambert in December–January, but flocks of 5–90 birds were seen daily in February–March and November, and hundreds were sometimes found at the shelf-break. In April–October Lambert reported the species more sporadically, but when present was often in flocks of 350–550 birds north of 25°S, usually within 20 nautical miles of the coast. Lambert observed an increase in frequency with decreasing latitude. East of Maputo Bay, around 25°S, 34–35°E, the max. count was 155 on 17 March 1985 (5–140 birds was the norm) but further north, at the Bazaruto archipelago, up to 400 were recorded together. Rollinson (*in press*) recorded Sooty Terns throughout his voyage in southern Mozambique, with flocks as large as 750 noted.

My observations fit the pattern described above. Sooty Terns were seen in small numbers off Tofo in May (2–50 birds), August (75) and October (singles). The pattern of occurrence was similar in waters off Maputo, with 1–10 individuals seen in October–May. However, on 3 October 2016, 800 were seen off Inhaca Island and over the shelf-edge in groups of up to 100 birds. The most notable event was on 18 May 2011 when an estimated 9,000 birds of all ages were seen off Inhaca Island, feeding intensively over bait fishes.

### COMMON TERN *Sterna hirundo*

An abundant Palearctic visitor to the southern African coast in the austral summer, mostly August–April, with some regularly remaining in the austral winter (Brooke & Sinclair 1978, Maclean 1984, Urban *et al.* 1986). Status is similar in Kenya and Tanzania (Zimmerman *et al.* 1996). Thousands have been reported from southern Mozambique (Brooke *et al.* 1981, Kohler & Kohler 1996, Lambert 2005) and Parker (2000) estimated that numbers visiting this region probably exceed 100,000 individuals. Published analysis of ringing records shows that most visitors to western and southern coasts of southern Africa breed in the northern

Western Palearctic (Vandevall 1988, Underhill *et al.* 1999), migrating via the eastern Atlantic to reach Mozambique after rounding the Cape. Evidence suggests that some western / northern birds use the eastern route (A. J. Tree unpubl. data). Recoveries of Common Terns ringed at colonies in south-east Europe (in the Black Sea region) are almost entirely from east of 27°E on Indian Ocean coasts of southern Africa (Vandevall 1988) suggesting they travel south via the Red Sea to East Africa and then along the coast. Their contribution to the population in the region may be under-estimated (Vandevall 1988). In addition to the nominate subspecies, an unknown percentage of *S. h. longipennis* contributes to the total Mozambican population (Brooke & Sinclair 1978, Vandevall 1988, Zimmerman *et al.* 1996, Hockey *et al.* 2005; A. J. Tree *in litt.* 2017).

Common Tern was the most abundant inshore seabird between Ponta d'Ouro and Bazaruto with hundreds seen daily, and up to 5,000 occasionally. Often 1,000 or more birds congregated over schools of small fish brought to the surface by tuna *Thunnus* spp. in shallower waters (<80 m), but with distinctly reduced numbers beyond the shelf-edge. However, it was clear from careful observations based on recent identification data (e.g. Olsen & Larsson 2010), supported by photographs, and with advice from A. J. Tree, that other similar tern species were present in small numbers within these flocks. It was not always possible to undertake systematic searches, but other species were identified in the field among the many Common Terns, often based on structural characters, while some were identified *post hoc* from photographs.

#### ROSEATE TERN *Sterna dougallii*

Breeds on the coasts of Kenya, Tanzania and the western Indian Ocean islands, with a geographically isolated population in Algoa Bay, South Africa (Urban *et al.* 1986, Tree 2005). Movements are poorly understood, but records are rare in south-eastern Africa, with most apparently of birds from Bird Island (ringing recoveries and sightings). One record from Durban is thought to be of the race *S. d. arideensis* from South Asia and the eastern Indian Ocean, and several records from Eastern Cape are also considered to relate to this taxon (Tree 2003, Tree & Klages 2003, *in prep.*). Note that this taxon is now considered synonymous with *S. d. gracilis*, as are all other forms described for the Indo-Pacific region, as part of a revision in the light of genetic and population studies (Lashko 2004, Tree 2005).

Not recorded in northern Mozambique (Urban *et al.* 1986) and an uncommon non-breeding visitor to southern Mozambique, first observed at Bazaruto in June 1950 (M. L. Van Eyssen *in* Clancey 1996), then in January 1997 and January 1998 (U. & P. Kohler *in* Parker 2000). In June 2003, 60 pairs of adults were displaying intensely near Inhassoro, opposite Bazaruto Island (F. Couto pers. comm. *in* Tree & Klages 2003). These were in synchrony with those breeding in South Africa. More recently, a group of displaying birds was seen on the nearby San Sebastian Peninsula in October 2016 (A. Lund *in litt.* 2016).

Away from Bazaruto, at least one was at the mouth of the Rio Savane in September 2001 (A. Hester *in* Parker 2005) and six were on the Pungwe River near Beira in April 1956 (Long 1964), but these were treated as unconfirmed by Parker (2005). Further south one was seen at Inhaca Island in November 1976 (Brooke *et al.* 1981).

Small numbers were seen on pelagic trips from Maputo (seven of 15 trips). All were in non-breeding plumage and appeared to be adults (at least not juvenile) showing an incomplete cap with grizzled forehead, weak carpal bar and outer tail feathers longer than juveniles. All were identified based on a combination of slightly longer shape than Common Tern *S. hirundo* but relatively shorter wings, long bill (*cf.* Arctic Tern *S. paradisaea*), clean white underparts (adult Common Terns breeding in Central Asia are often dark grey on the underparts in summer and transitional plumages), and paler, cleaner greyish-white



upperparts, particularly the secondaries, contrasting with a dark wedge on the outermost 2–4 primaries (Larsson & Olsen 2010). None was visibly moulting. A. J. Tree confirmed my identification of the first birds seen from photographs (although none is of publishable quality). It is possible that juveniles and immatures were overlooked, although structural features were usually key to the initial identification and would apply equally at any age.

There was one sighting from a pelagic off Tofo, on 3 May 2015, and one was seen from shore at Ponta Milibangalala, in Maputo Special Reserve, on 23 May 2015. All other sightings were north of Inhaca Island; 1–2 on 18 May 2011, seven on 9 November 2013 (with F. Koimburi), and singles on 25 November 2013, 23 January and 13 April 2014, 3 October 2015 and 31 January 2016.

A count of 80 at Bazaruto in January 1998 (U. & P. Kohler *in* Parker 2000) suggests that birds in this area originate from East Africa or the Indian Ocean islands, rather than South Africa, because the only known breeding sites in Algoa Bay supported no more than 140 pairs at the time (Parker 2000). However, Hockey *et al.* (2005) was more cautious, treating these birds as of unknown provenance.

Genetic analysis has revealed two distinct lineages in Atlantic *S. d. dougallii* and Indo-Pacific *S. d. gracilis*, and the South African population represents secondary contact and introgression between them (Lashko 2004). Tree (2005) suggested that South African and western Indian Ocean populations be treated as intermediate forms, noting evidence that suggests colonies in the Indian Ocean especially are unstable—supported by Nisbet & Ratcliffe (2008)—and breeding populations may shift annually within the species' range.

My records are the first to suggest infrequent but regular presence of Roseate Tern in southernmost Mozambique and may reflect movement between breeding populations as suspected by Tree (2005).

### **BLACK-NAPED TERN** *Sterna sumatrana*

Breeds in the tropical Indo-Pacific including Seychelles, and is a vagrant to Madagascar and other south-west Indian Ocean Islands (Safford & Hawkins 2013). The first record in the southern African region was reported by Hockey *et al.* (2005) as an adult and immature on Inhaca Island in November 1976, citing Sinclair (1977) and Brooke *et al.* (1981). However, Brooke *et al.* (1981) reported four birds on 10 November and three on 11 November 1976. There are at least nine records from KwaZulu-Natal (Hockey *et al.* 2005), including four immatures at Umvoti River mouth in January–March 1976, pre-dating the Mozambique records (Urban *et al.* 1986). Two records from southern Mozambique were mapped by Hockey *et al.* (2005) but with no further evidence or details.

Two were seen well with the naked eye (whilst surf fishing) at Pomene, on 20 October 2012, chasing each other and calling vociferously. One was seen off Inhaca Island on 22 November 2014, also with the naked eye while I was fishing. All three were adults showing no signs of moult and easily identified by virtue of their pure white underparts, very pale grey upperparts, clear single black-edged outer primary, white rump, long thin black mask extending onto the nape and long black bill. These are the fourth and fifth published records for southern Mozambique.

### **ARCTIC TERN** *Sterna paradisaea*

A common Holarctic passage migrant along South Africa's west coast, but uncommon on the east coast, chiefly in July–November and March–May (Urban *et al.* 1986, Hockey *et al.* 2005). Many immatures winter in the region and most recoveries of ringed birds are in October–January (Brooke & Sinclair 1978, Vandevale 1988). No records in Kenya and





Figure 6. One of a group of Arctic Terns *Sterna paradisaea*, north of Inhaca Island, Mozambique, 23 July 2017; note uniform-aged primaries unlike in the non-breeding (presumed first-year) Common Terns *S. hirundo* seen the same day (Gary Allport)

Tanzania (Zimmerman *et al.* 1996, Stevenson & Fanshawe 2002) or the Malagasy region (Safford & Hawkins 2013).

As mapped by Urban *et al.* (1986) and Hockey *et al.* (2005), Arctic Tern is believed to be regular on the Mozambique coast south of Inhaca Island. However, Clancey (1971) knew of no records—but suspected its occurrence—and the only confirmed record known to Brooke *et al.* (1981) was a ringing recovery further north, at San Martinho (25°S, 34°E), Sul do Save, on 3 July 1967, of a bird ringed in Helsinki, Finland, on 8 July 1966 (Støn 1969). Another record involved a pullus ringed on 24 June 1991 in Denmark that was found moribund aboard a ship 75 km off Chidenguele, Gaza Province, on 27 December 1991 (J. Madsen *in litt.* 2017 *per* A. J. Tree).

Lambert (2005) strongly suspected the presence of Arctic Terns among the large flocks of Common Terns off Maputo, but was unable to confirm this, despite trapping some birds, as all of these proved to be *S. hirundo*.

I found Arctic Tern to occur in small but variable numbers off Maputo. Searching the flocks by eye was the most effective way of finding them, using the smaller, rounder head, less elongated body shape and shorter bill, while the wing feathers of uniform age was often an additional useful character (see Fig. 6). Singles were observed among flocks of Common Terns, but it was difficult to be sure how many were involved. Most were in non-breeding plumage, with the appearance of non-breeding adults or immatures. One or two individuals were seen on eight dates in September–November, January and April. Additionally, 20 were estimated among 700 Common Terns on 10 May 2015, all of which were adults in distinctive full breeding plumage (unfortunately, no publishable photographs were taken). On 12 July 2017 a monospecific group of 12 was found on the sea, in water 400 m deep north of Inhaca Island, all of them in non-breeding plumage, presumably birds in their second- or possibly third-calendar year.

These are the first confirmed sight records of Arctic Tern in Mozambique. The pattern of occurrence, mostly in the austral summer, matches observations in South Africa (Hockey *et al.* 2005) and the pattern of ringing recoveries in the region (Vandevale 1988). No juveniles in their first-calendar year were found, the youngest being in July of its second-calendar

year. It is interesting to note that the two ringing recoveries were of a first-year in December and a second-calendar-year bird in July.

The record of a group of first-summer / second-calendar-year birds on 12 July matches the observations of Rollinson (in press), who observed a total of 29 Arctic Terns on 2–5 August 2015 in three southerly far offshore locations. All were in non-adult plumage and all of those aged were first-summer / second-calendar-year birds. These observations suggest the presence of a small population of non-breeders, which spend their first year in the south-west Indian Ocean.

Adults satellite-tracked from Greenland and Iceland moved east into the southern Indian Ocean, but returned west along the Antarctic pack ice edge to spend most of the austral summer (December–March) in the southern Atlantic (Egevang *et al.* 2010), then returned directly north to breed, crossing the equator around 3 May. Adult Arctic Terns satellite-tracked from the Netherlands, however, were found to stage further east in the central Indian Ocean, between 20–40°N, 65–100°E (Fijn *et al.* 2013).

The record of 20 off Maputo Bay in May accords with the dates when adults head north, after having spent the austral summer feeding along the Antarctic pack ice. It is assumed that these birds were moving south through Mozambican waters to then head north in the Atlantic Ocean. However, Vandevale (1988) noted that an overland nocturnal migration of Arctic Terns near Mogadishu, Somalia, in April (Ash 1983) and a single bird caught at night near Khartoum, Sudan, in May (Nikolaus 1984), along with records from the Ural Mountains (Russia), Black, Mediterranean and Red Seas, and even Kashmir (Vandevale 1988, Urban *et al.* 1986), indicate the possibility of at least some migration via the eastern Indian Ocean. Thus birds off Mozambique may have been heading north. Satellite-tracking juveniles and those breeding further east in the Palearctic should better establish the significance of the Indian Ocean as a migration route and non-breeding area.

### **BLACK TERN** *Chlidonias niger*

An abundant Palearctic visitor to the southern African west coast in the austral summer, mostly in August–April, but some regularly remain in the austral winter (Brooke & Sinclair 1978, Maclean 1984, Sinclair & Ryan 2003). Uncommon on coasts of South Africa but



Figure 7. Black Tern *Chlidonias niger* (centre), Maputo Bay, Mozambique, 31 January 2015 (A. F. A. Hawkins)

recorded in small numbers off KwaZulu-Natal (Hockey *et al.* 2005). One record from the Malagasy region (Turner & Dowsett 1988, Safford & Hawkins 2013) and rare in East Africa with very few records (Britton 1980, Urban *et al.* 1986, Stevenson & Fanshawe 2002). No records in Mozambique.

On 9 November 2013 a juvenile Black Tern was observed on a pelagic trip off Inhaca Island, loosely associated with a group of *c.*50 Common Terns. The bird was in fresh plumage with charcoal-grey upperparts and, after being initially misidentified as a subadult Sooty Tern *Onychoprion fuscatus*, it was re-identified, followed for 20 minutes and some poor-quality photos were taken (see <https://ebird.org/view/checklist/S15630763>). Black upper breast-side patches were noted along with its smaller size compared to adjacent Common Terns and flatter-winged, buoyant flight action. This is the first record for Mozambique.

On 31 January 2015 a short pelagic trip was undertaken off Portuguese Island, Maputo Bay, during which *c.*300 Common Terns were seen and photographs taken. A. F. A. Hawkins subsequently found a Black Tern among one of the groups of terns in one of his photographs (Fig. 7). This bird does not show marked contrast in the age of the primaries and is probably an adult in winter plumage (Olsen & Larsson 2010). This is the second record for Mozambique.

#### SUBANTARCTIC SKUA *Stercorarius antarcticus*

Known off South Africa as a regular non-breeding visitor from its subantarctic breeding islands (Maclean 1984, Sinclair & Ryan 2003). Ryan *et al.* (2006) found the species in the Mozambique Channel near Europa Island, in the French Southern Ocean territories, but outside Mozambican waters, and Safford & Hawkins (2013) reported small numbers off Madagascar.

Hockey *et al.* (2005) mapped this species' range in Mozambique as coastal waters south of Inhaca Island, but there are few previous records to substantiate this. Clancey (1996) and Parker (2000) reported two in Mozambican waters, in August 1959 at Maputo (Brookeworth 1960) and in April 1968 off Inhaca Island (Jensen 1968). However, Lambert (2005) found 20 individuals on 17 dates, most of which were off Inhaca Island, but records were widely scattered with the northernmost off Quelimane.

All of my own records were made in 2015, when one was seen from shore near Tofo on 5 May, another single was north of Inhaca Island on 10 May and four were there on 13 June. In addition a single was seen off Tofo on 20 April 2015 (E. Marais pers. comm.) and another was video-recorded there on 7 April 2012 (H. Darrin pers. comm.). All were identified (relative to South Polar Skua *S. maccormicki*) by heavy build with broad wings, solid dark brown underparts and nape, and relatively narrow white band at bases of the primaries.

The species clearly ranges further north in Mozambique than has previously been documented. Rollinson (in press) observed a total of 32 birds, all in southerly locations east of Maputo. None was further north. It is interesting to note that, despite regular surveys offshore from Maputo, the bulk of the records was in 2015.

#### Acknowledgements

I thank Frank Hawkins for 'finding' the second Black Tern and for use of his photographs. Ross Hughes, Callan Cohen and Felix Koimburi were able field companions and shared in the findings reported herein. Dominic Rollinson reviewed this paper and provided access to his own, as yet unpublished, paper, and Etienne Marais, Angela Lund and Hannah Darrin availed me of details of unpublished sightings. Boat owners Jose Botte and Richard Martins and his family were excellent company on many long days at sea. Trevor Hardaker, Tony Tree, Neil Baker and Pete Morris helped with identification and ageing of birds. Tony Tree and Sam Jones made detailed comments on a draft submission. Arctic Tern ringing data are provided courtesy of the Danish Bird Ringing Centre at the Natural History Museum of Denmark, Univ. of Copenhagen, and thanks go to Tony Fox and J. Madsen for help to access this information.

## References:

- Ash, J. S. 1983. Over fifty additions of birds to the Somalia list including two hybrids, together with notes from Ethiopia and Kenya. *Scopus* 7: 54–79.
- Avery, G. 1982. Results of beach patrols conducted in South Africa in 1981. *Cormorant* 10: 87–96.
- Bevanger, K. & Thingstad, P.-G. 1990. Decrease in some central Norwegian populations of the northern subspecies of the Lesser Black-backed Gull (*Larus fuscus fuscus*) and its possible causes. *Fauna Norv. Ser. C. Cinclus* 13: 19–32.
- Britton, P. 1980. *Birds of East Africa*. East African Natural History Society, Nairobi.
- Brooke, R. K. & Sinclair, J. C. 1978. Preliminary list of southern African seabirds. *Cormorant* 4: 10–17.
- Brooke, R. K. & Cooper, J. 1982. Seabirds of southern Mozambique - corrections. *Cormorant* 10: 58.
- Brooke, R. K., Cooper, J. & Sinclair, J. C. 1981. Additional records of seabirds on the coast of southern Mozambique. *Cormorant* 9: 30–40.
- Brookeworth, C. 1960. Notes on seabirds in harbours in Portuguese East Africa. *Ostrich* 31: 173–174.
- Bustnes, J. O., Moe, B., Helberg, M. & Phillips, R. A. 2013. Rapid long-distance migration in Norwegian Lesser Black-backed Gulls *Larus fuscus fuscus* along their eastern flyway. *Ibis* 155: 402–406.
- Clancey, P. A. 1970. Miscellaneous taxonomic notes on African birds XXIX. *Durban Mus. Novit.* 8: 375–390.
- Clancey, P. A. 1971. A handlist of the birds of southern Moçambique. *Mem. Inst. Invest. Cient. Moçambique Sér. A* 10: 148–309; 11: 1–69.
- Clancey, P. A. 1975. Miscellaneous taxonomic notes on African birds XLI. *Durban Mus. Novit.* 10: 189–210.
- Clancey, P. A. 1979. Miscellaneous taxonomic notes on African birds LIII. *Durban Mus. Novit.* 12: 1–17.
- Clancey, P. A. 1996. *The birds of southern Mozambique*. African Bird Books, Westville.
- Cooper, J., Crawford, R. J. M., Suter, W. & Williams, A. J. 1990. Distribution, population size and conservation of the Swift Tern *Sterna bergii* in southern Africa. *Ostrich* 61: 56–65.
- Crawford, R. J. M., Nel, D. C., Williams, A. J. & Scott, A. 1997. Seasonal pattern of abundance of Kelp Gulls *Larus dominicanus* at breeding and non-breeding localities in southern Africa. *Ostrich* 68: 37–41.
- Dickinson, E. C. & Remsen, J. V. (eds.) 2013. *The Howard and Moore complete checklist of the birds of the world*, vol. 1. Fourth edn. Aves Press, Eastbourne.
- Donnelly, B. G. 1974. The Lesser Black-backed Gull *Larus fuscus* in southern and central Africa. *Bull. Brit. Orn. Cl.* 94: 63–68.
- Egevang, C., Stenhouse, I. J., Phillips, R. A., Petersen, A., Fox, J. W. & Silk, J. R. 2010. Tracking of Arctic terns *Sterna paradisaea* reveals longest animal migration. *Proc. Natl. Acad. Sci. USA* 107: 2078–2081.
- Fijn, R. C., Hiemstra, D., Phillips, R. A. & van der Winden, J. 2013. Arctic Terns *Sterna paradisaea* from the Netherlands migrate record distances across three oceans to Wilkes Land, East Antarctica. *Ardea* 101: 3–12.
- Gochfeld, M., Burger, J., Kirwan, G. M., Christie, D. A. & Garcia, E. F. J. 2017. Greater Crested Tern (*Thalasseus bergii*). In del Hoyo, J., Elliott, A., Sargatal, J., Christie, D. A. & de Juana, E. (eds.) *Handbook of the birds of the world Alive*. Lynx Edicions, Barcelona (retrieved from [www.hbw.com/node/54019](http://www.hbw.com/node/54019) on 8 November 2017).
- Griffiths, A. M. & Sinclair, J. C. 1982. The occurrence of Holarctic seabirds in the African sector of the southern ocean. *Cormorant* 10: 35–44.
- Harrison, J. A., Allan, D. G., Underhill, L. G., Herremans, M., Tree, A. J., Parker, V. & Brown, C. J. (eds.) 1997. *The atlas of southern African birds*, vol. 1. BirdLife South Africa, Johannesburg.
- Harrison, P. 1983. *Seabirds: an identification guide*. Croom Helm, Beckenham.
- Hockey, P. A. R. & the Rarities Committee. 1996. Rare birds in South Africa 1993–1995. *Africa—Birds & Birding* 1(3): 65.
- Hockey, P. A. R., Dean, W. R. J. & Ryan, P. G. 2005. *Roberts—Birds of southern Africa*. Seventh edn. Trustees of the John Voelker Bird Book Fund, Cape Town.
- Jensen, R. A. C. 1968. Observations on migrants at Inhaca Island, Mozambique. *Ostrich* 39: 269–270.
- Jonsson, L. 1998. Baltic Lesser Black-backed Gull *Larus fuscus fuscus* – moult, ageing and identification. *Birding World* 11: 295–317.
- Kilpi, M. & Saurola, P. 1984. Migration and wintering strategies of juvenile and adult *Larus marinus*, *L. argentatus* and *L. fuscus* from Finland. *Orn. Fenn.* 61: 1–8.
- Kirk, J. 1864. On the birds of the Zambesi Region of eastern tropical Africa. *Ibis* 6: 307–339.
- Kohler, P. & Kohler, U. 1996. The Bazaruto archipelago, Mozambique, a site of potential international importance for Palearctic waterbirds. *Ostrich* 67: 165–167.
- Kromer, J.-L. 1998. A Sooty Tern *Sterna fuscata* breeding colony off northern Mozambique. *Bird Numbers* 7(3): 6–7.
- Kylin, H., Louette, M., Herroelen, P. & Bouwman, H. 2010. Nominate Lesser Black-backed Gulls (*Larus fuscus fuscus*) winter in the Congo basin. *Orn. Fenn.* 87: 106–113.
- Lambert, K. 1983. Sturmschwalbe (*Hydrobates pelagicus*) und Schwalbenmöwe (*Xema sabini*) vor der Küste von Moçambique. *Beitr. Vogelk.* 29: 12–16.
- Lambert, K. 2005. The spatial and seasonal occurrence of seabirds (Aves) off southern Mozambique. *Durban Mus. Novit.* 30: 45–60.



- Lashko, A. 2004. Population genetic relationships in the Roseate Tern: globally, regionally and locally. Ph.D. thesis. James Cook Univ., Townsville.
- Le Corre, M. & Safford, R. J. 2001. La Réunion and Îles Eparses. Pp. 693–702 in Fishpool, L. D. C. & Evans, M. I. (eds.) *Important Bird Areas in Africa and associated islands: priority sites for conservation*. Pisces Publications, Newbury & BirdLife International, Cambridge, UK.
- Lorentsen, S. H. 2007. [The national monitoring programme for seabirds. Results up to and including the breeding season 2007]. NINA Report 313. Norwegian Institute for Nature Research, Trondheim. (In Norwegian.)
- Maclean, G. L. 1984. *Roberts' birds of southern Africa*. Fifth edn. John Voelcker Bird Book Fund, Cape Town.
- Nisbet, I. C. T. & Ratcliffe, N. 2008. Comparative demographics of tropical and temperate Roseate Terns. *Waterbirds* 31: 346–356.
- Nikolaus, G. 1984. Further notes on birds new or little known in the Sudan. *Scopus* 8: 38–42.
- Olsen, K. M. & Larsson, H. 2010. *Terns of Europe and North America*. Bloomsbury, London.
- Parker, V. 2000. *The atlas of the birds of Sul do Save, southern Mozambique*. Avian Demography Unit, Cape Town & Endangered Wildlife Trust, Johannesburg.
- Parker, V. 2005. *The atlas of the birds of central Mozambique*. Endangered Wildlife Trust, Johannesburg & Avian Demography Unit, Cape Town.
- Randall, B. M. & Randall, R. M. 1984. Seabirds recorded in Algoa Bay during trips to and from St. Croix Island, South Africa. *Cormorant* 12: 63–70.
- Rollinson, D. P. in press. Seabird sightings off southern and central Mozambique, August–October 2015. *Bull. Afr. Bird Cl.* 25.
- Ryan, P. G. 1997. Gullbilled Tern. P. 773 in Harrison, J. A., Allan, D. G., Underhill, L. G., Herremans, M., Tree, A. J., Parker, V. & Brown, C. J. (eds.) *The atlas of southern African birds*, vol. 1. BirdLife South Africa, Johannesburg.
- Ryan, P. G., Graham, J. & Sutherland, A. C. 2006. Pelagic birding trips in the southern Mozambique Channel. *Bull. Afr. Bird Cl.* 13: 197–204.
- Safford, R. J. & Hawkins, A. F. A. (eds.) 2013. *The birds of Africa*, vol. 8. Christopher Helm, London.
- Sinclair, J. C. 1975. New distributional data 6: Gullbilled Tern *Gelochelidon nilotica*. *Ostrich* 46: 172.
- Sinclair, J. C. 1977. Black-naped Tern in Natal. *Bokmakierie* 29: 18–19.
- Sinclair, J. C. 1979. Birds at sea in the Indian Ocean. *Cormorant* 7: 7–10.
- Sinclair, I. & Ryan, P. G. 2003. *Birds of Africa south of the Sahara*. Struik Publishers, Cape Town.
- Stark, A. & Sclater, W. L. 1906. *The birds of South Africa*, vol. 4. R. H. Porter, London.
- Sten, I. 1969. Die Vogelberingung in Finnland im Jahre 1967. *Mem. Soc. Fauna Flora Fenn.* 45: 63–154.
- Stevenson, T. & Fanshawe, J. H. 2002. *The birds of East Africa: Kenya, Tanzania, Uganda, Rwanda, Burundi*. T. & A. D. Poyser, London.
- Tree, A. J. 2003. An example of the Indian Ocean race of Roseate Tern at Port Alfred. *Bee-eater* 54(1): 12–13.
- Tree, A. J. 2005. The known history and movements of the Roseate Tern *Sterna dougallii* in South Africa and the western Indian Ocean. *Mar. Orn.* 33: 41–47.
- Tree, A. J. 2006. An eastward extension of Kelp Gull breeding activity. *Bee-eater* 57(3): 58.
- Tree, A. J. & Klages, N. T. W. 2003. Status, biometrics, moult and possible relationships of the South African population of Roseate Tern. *Ostrich* 74: 74–80.
- Turner, D. A. & Dowsett, R. J. 1988. Additions and corrections to Afrotropical and Malagasy avifaunas. 1. Western Indian Ocean islands. *Tauraco* 1: 130–138.
- Urban, E. K., Fry, C. H. & Keith, S. (eds.) 1986. *The birds of Africa*, vol. 2. Academic Press, London.
- Underhill, L. G., Tree, A. J., Oschadleus, J. D. & Parker, V. 1999. *Review of ring recoveries of waterbirds in southern Africa*. Avian Demography Unit, Cape Town.
- Vandevale, F. J. 1988. Origins and migration of some Palaearctic terns wintering in Africa south of the Zambezi and Cunene rivers. *Gerfaut* 78: 131–150.
- Zimmerman, D. A., Turner, D. A. & Pearson, D. J. 1996. *Birds of Kenya and northern Tanzania*. Christopher Helm, London.

Address: BirdLife International, The David Attenborough Building, Pembroke Street, Cambridge, CB2 3QZ, UK, e-mail: Gary.Allport@birdlife.org

# A morphological revision of Mascarene Swiftlet *Aerodramus francicus*, with the description of a new subspecies from Reunion

by Guy M. Kirwan, Hadoram Shirihai & Manuel Schweizer

Received 11 February 2018; revised 9 May 2018; published 22 June 2018

<http://zoobank.org/urn:lsid:zoobank.org:pub:D338443D-5D0A-44E0-81DB-E9AC07310403>

**SUMMARY.**—In light of speculation in the recent literature concerning the species' intraspecific taxonomy and personal observations, we examined specimens of the Mascarene Swiftlet *Aerodramus francicus* from both range islands, Mauritius and Reunion, with the aim of documenting any geographical variation in morphology. We found that specimens from Reunion clearly differ from those collected on Mauritius (the type locality) in multiple plumage and biometric characters, and that at least some of these differences are also visible in the field. As a result, we describe the Reunion population as a new subspecies under the Biological Species Concept. Taken together, these insular forms are treated by BirdLife International as Near Threatened, but the declining nominotypical Mauritian population might require a reassessment of its conservation status according to IUCN criteria should future taxonomic research applying an integrative approach indicate that species rank is more appropriate.

Mascarene Swiftlet *Aerodramus francicus* (J. F. Gmelin, 1789) is endemic to the south-west Indian Ocean, where it occurs on two islands, Mauritius and Reunion. Vague historic reports of this swiftlet from far northern Madagascar (Milne-Edwards & Grandidier 1879) are considered to be unfounded and little more than rumours (Safford 2013). The only species of tiny swift in Madagascar is Madagascar Spinetail *Zoonavena grandidieri* (J. Verreaux, 1867). At present, *A. francicus* is considered Near Threatened by BirdLife International (2017) given its restricted range, moderately small population (estimated at 6,000–15,000 mature individuals), comparative paucity of available nesting sites and their vulnerability to human disturbance and vandalism.

One other species of *Aerodramus* Oberholser, 1906, is also endemic to this region of the Indian Ocean, Seychelles Swiftlet *A. elaphrus* (Oberholser, 1906), which is confined to the granitic islands of the Seychelles. It has been speculated to be merely a subspecies of *A. francicus* (Peters 1940: 223, Gaymer *et al.* 1969). All other members of the genus *Aerodramus* as currently constituted (c.20 species) occur in tropical and subtropical Asia, northern Australasia, and on various islands in the western and central Pacific (*cf.* Dickinson & Remsen 2013). Like many other swiftlets, Mascarene and Seychelles Swiftlet were frequently placed in the genus *Collocalia* G. R. Gray, 1840, prior to the realisation that the latter genus could be separated into two clades on the basis of genetic data (Price *et al.* 2005, Thomassen *et al.* 2005). Despite being geographical outliers, both *A. elaphrus* and *A. francicus* are clearly embedded deep within the well-supported *Aerodramus* clade according to multilocus molecular data (Lee *et al.* 1996, Price *et al.* 2004, 2005, Thomassen *et al.* 2005). The two species are, unsurprisingly, closely related to one another, having diverged c.500,000 years ago based on 1% divergence in the mitochondrial marker cytochrome *b* (Johnson & Clayton 1999). In all of these studies, molecular samples for Mascarene Swiftlet are exclusively from

Mauritius (Johnson & Clayton 1999, Lee *et al.* 1996, Price *et al.* 2004, 2005). Other intra-generic relationships are not well known.

Mascarene Swiftlet has always been considered monotypic, although an examination by M. R. Browning (*in litt.* to Chantler & Driessens 2000) of four specimens of this species from the island of Reunion held in the National Museum of Natural History, Washington DC, has led to fairly widespread speculation that more than one subspecies might be involved (Chantler 1999, Safford 2013, del Hoyo & Collar 2014). Browning reported that the specimens are 'duller (brownier, less green) above and darker-rumped than birds of similar museum age from Mauritius. The Reunion series also appears slightly darker on the underparts, especially the undertail-coverts. Browning considered that Reunion birds should be a separate subspecies, but no name was available' (Chantler & Driessens 2000: 129).

During extensive field work throughout the Mascarene Islands in November–December 1999 and March–April 2004, but especially in December 2013–January 2014 and November–December 2014, one of us (HS) observed *A. francicus* on both Mauritius and Reunion, documenting apparent differences between the two insular populations photographically. As a result, we reviewed much of the available specimen material, including the Washington series, and the previous literature, with the aim of determining whether Browning was correct in his belief that more than one subspecies should be recognised.

## Methods and materials

GMK (and in some cases HS) examined and measured 28 study skins of *Aerodramus francicus* as follows: the Natural History Museum, Tring (NHMUK;  $n = 4$ , Mauritius), Cambridge University Museum of Zoology, Cambridge, UK (CUMZ;  $n = 4$ , Mauritius,  $n = 1$ , Reunion), the Muséum national d'Histoire naturelle, Paris (MNHN;  $n = 8$ , Reunion,  $n = 2$ , Mauritius) and Museum für Naturkunde, Berlin (ZMB;  $n = 1$ , Mauritius), as well as those at the Museum d'Histoire naturelle de Genève ( $n = 3$ , Mauritius) and National Museum of Natural History, Smithsonian Institution, Washington DC (USNM;  $n = 4$ , Reunion), which were sent on loan to NHMUK. In addition, HS alone examined material at the American Museum of Natural History (AMNH;  $n = 1$ , Reunion), and specimens at the University of Michigan Museum of Zoology, Ann Arbor (UMMZ;  $n = 4$ , Reunion,  $n = 3$ , Mauritius) were measured and photographed on our behalf by J. Hinshaw. This gave totals of 17 specimens from Mauritius and 19 from Reunion. A juvenile from Reunion held at MNHN (1886.716) was excluded from all analyses. Material of *A. francicus* is comparatively uncommon in museum collections. In addition to the material studied by us, we are aware of the following specimens: Royal Belgian Institute of Natural Sciences, Brussels ( $n = 6$ , Reunion), Kansas State University, Lawrence ( $n = 2$ , Mauritius) and two old specimens, one collected on Mauritius sometime between March 1801 and December 1803, held in Paris (MNHN-ZO-2014-429) and the other, NMW 35205 (Naturhistorisches Museum Wien), labelled Reunion, but of otherwise unknown provenance. Photographs of NMW 35205 were provided by A. Gamauf; the older of the two labels on the specimen has an inscription that cites Bonaparte, suggesting that it was collected sometime later than that held in Paris. The most interesting fact concerning this specimen is that the upperparts gloss suggests that it might actually have been collected on Mauritius (see Results). Photographs of the Brussels specimens were made available by A. Folie.

The type specimen of *A. francicus* does not appear to be extant. The species was described by Gmelin (1789: 1017), who clearly stated its type locality to be 'insula Francia' (= Mauritius). Gmelin cited as authorities for his species the works of Buffon (1779: 345–346)

and Latham (1783: 582). Both of these previous works also mentioned the Île de France as terra typica for this bird, but all three texts (including Gmelin) further cited a depiction of the 'Hirondelle de l'isle de Bourbon' (a reference to Reunion) in Buffon *et al.* (1765–80) as a basis for Gmelin's species. This illustration is clearly attached to a bird that Buffon (1779: 344–345) considered to be a 'variety' of 'la grande hirondelle brune à ventre tacheté' and which Gmelin (1789: 1017) named *Hirundo borbonica* (= Mascarene Martin *Phedina borbonica*), again with type locality 'insula Franciae', although he referred to the same depiction of the 'Hirondelle de l'isle de Bourbon', among other authorities, as the basis for his new name *Hirundo francica*. The plate (544, <https://www.biodiversitylibrary.org/item/109398#page/95/mode/1up>) in Buffon, however, is clearly a closer match for the *Phedina* than a swiftlet, by virtue of its clearly streaked underparts and the pale-tipped tertials (which are characteristic of its plumage when fresh). Nevertheless, to allay any doubt, we searched unsuccessfully for the type of Gmelin's name, by means of both specific queries of certain museums and a general request via the electronic bulletin board for relevant European curators, eBEAC. In particular, J. J. F. J. Jansen (*in litt.* 2018) confirmed that neither Paris nor Leiden, two obvious repositories for material studied by Buffon (and thus subsequently utilised by Gmelin), holds any specimen of *A. francicus* dating from the 18th century. As noted above, the oldest specimens that we have been able to locate clearly date from the 19th century. Thus, without any evidence to the contrary, we must accept Gmelin's type locality designation of Mauritius. It is also worth mentioning that, to date, ourselves and others have been unable to locate a copy of Buffon's *Histoire naturelle des oiseaux* with identical pagination to that cited by Gmelin, although the potential exists that the citation in the latter reflects a typesetting error.

In addition to plumage comparisons conducted under natural light, the following measurements were taken according to standard protocols (Svensson 1999) using dial callipers and a metal wing-rule with a perpendicular stop at zero: wing length (from carpal joint to tip while applying gentle pressure to the primary-coverts), tail length (from the distal end of the pygostyle to the tip), bill length (from the tip of the maxilla to skull, and separately from the tip of the maxilla to the feathers), bill depth (at the distal edge of feathering), tail fork (as the distance between the tips of r1 and r5, i.e. the longest and shortest rectrices, measured along the axis of the tail) and the width of the white rump patch. The latter measurement is difficult to take and we eventually elected to use the mean value of the sum of its max. width (measured as the broadest extent of pale feathering, which we believe would be visible in the field) and its minimum width (the depth of the pure white feathering forming the rump's 'core'). All measurements were taken by GMK, other than the single specimen at AMNH (by HS), the seven specimens at UMMZ (J. Hinshaw) and tail fork alone for the MNHN material (R. Stopiglia). Field work in 2012–14 (see above), by HS alone, which was undertaken on both islands, involved observations of c.200 individuals on Reunion and c.150 individuals in Mauritius, of which small numbers of both were photographed, and the photographs subsequently compared both with each other and other images available online (e.g. at [www.hbw.com/ibc/species/mascarene-swiftlet-aerodramus-francicus](http://www.hbw.com/ibc/species/mascarene-swiftlet-aerodramus-francicus)), and with specimen material.

Statistical analyses of morphometric data were performed in R 3.3.3 (R Core Team 2017). Overall variation was explored with principal component analyses (PCA) applying the function `prcomp` of the package 'stats'. To test whether the swiftlets from Reunion and Mauritius can be separated by the measured traits and to maximise separation between them, flexible discriminant analyses were performed using the package 'mda' (Hastie & Tibshirani 2015). The discriminant power of the seven measured traits was assessed using Wilks' lambda estimated in the package 'DiscriMiner' (Sanchez 2013). Only specimens for



which a complete set of measurements was available were included ( $n = 14$  for Reunion,  $n = 13$  for Mauritius) and all measurements were log-transformed prior to the analyses.

Results

**Plumage.**—Our comparison of the available specimen material confirmed the differences initially suggested by the field observations made by HS and the prior comments by Ralph Browning, but also brought to light additional features, some of which might require confirmation via a longer series of specimens or trapped birds. The three most obvious plumage differences are: (1) the depth of the white rump patch and the number of pure white feathers therein, and thereby its degree of visibility; (2) the browner, less glossed upperparts, especially the wings of Reunion birds, and (3) underparts pattern. We can discount that the differences we highlight are significantly influenced by moult, wear or the age of the specimens concerned (some more than 100 years old), given that we viewed specimen material and live birds from a range of months and years. For example, compare the plumage gloss in the specimens shown in Figs. 4–6, which display consistent differences despite the varying ages of the Mauritian specimens in NHMUK, MNHN and UMMZ, respectively. Nevertheless, all of them are considerably older than those from Reunion, suggesting that fading is not an issue. These and other features are discussed in more detail below (see Diagnosis).

**Biometrics.**—The biometric data we acquired are shown in Table 1 (see also Appendix). In most morphometric characters the populations on the two islands are basically indistinguishable, and it is only in the depth of the white rump patch and the degree of graduation in the rectrices (tail fork) that major differences were found.

There was no consistent separation between the specimens of Reunion from those of Mauritius in the PCA (Fig. 1). Only the length of the tail fork and the width of the white rump patch contributed significantly to the discriminant function according to Wilks’ lambda. All 14 specimens from Reunion and 12 of the 13 specimens from Mauritius were correctly assigned in the flexible discriminant analyses to their respective origin.

The morphological differences between the two populations described above indicate to us that a new taxon is involved that we elect to treat at subspecies level (i.e. under a modern interpretation of the Biological Species Concept, e.g. Helbig *et al.* 2002). We describe herewith the new taxon as follows:

TABLE 1  
Biometric data for 17 specimens of *Aerodramus f. francicus* from Mauritius and 18 specimens from Reunion taken from museum specimens according to standard measuring protocols (see Methods and materials). Mass data from specimen labels. See the Appendix for complete mensural data for all relevant specimens.

Biometric ↓ / Locality →	Mauritius	Reunion
Wing length	103.0–117.0 mm (111.3 mm, $n = 17$ )	107.0–115.0 (110.3 mm, $n = 18$ )
Tail length	46.0–52.0 mm (49.6 mm, $n = 17$ )	45.0–53.0 mm (50.1 mm, $n = 17$ )
Bill to feathers	2.8–4.2 mm (3.5 mm, $n = 17$ )	3.0–4.1 mm (3.6 mm, $n = 16$ )
Bill to skull	4.1–6.3 mm (5.2 mm, $n = 17$ )	4.4–6.1 mm (5.4 mm, $n = 17$ )
Bill depth at feathers	1.4–2.7 mm (1.8 mm, $n = 14$ )	1.5–2.5 mm (1.8 mm, $n = 17$ )
Tail fork	4.1–8.4 mm (6.6 mm, $n = 17$ )	3.5–6.9 mm (5.3 mm, $n = 17$ )
Depth of white rump patch	12.9–17.3 mm (15.0 mm, $n = 14$ )	9.6–15.5 mm (11.8 mm, $n = 17$ )
Mass	9.0–9.3 g (9.17 g, $n = 3$ )	7.9–11.8 g (9.04 g, $n = 8$ )



Figure 1. Dorsal, ventral and lateral views of the (USNM 486962) and three paratypes (USNM 486964–966) of Mascarene Swiftlet *Aerodramus francicus saffordi* (holotype, at left), collected in northern Reunion, in November 1964, compared to four specimens (NHMUK 1844.10.19.3, 1844.10.19.3, 1890.12.16.39, 1890.12.16.40) of *A. f. francicus*, collected on Mauritius on unknown dates in the 19th century (Hadoram Shirihai, © Natural History Museum, London)





Figure 2. Ventral, dorsal and lateral views of the holotype (USNM 486962) of Mascarene Swiftlet *Aerodramus francicus saffordi*, collected 8 km south-southwest of Saint-Denis (20°52'44"S, 55°26'53"E), northern Reunion, on 17 November 1964, compared to a specimen (NHMUK 1844.10.19.5) of *A. f. francicus*, collected on Mauritius on an unknown date in the 19th century; USNM 486962 is on the left in the first two images and above in the lateral view (Hadoram Shirihai, © Natural History Museum, London)



### *Aerodramus francicus saffordi* subsp. nov.

**Holotype.**—National Museum of Natural History, Washington DC (USNM 486962), male collected by F. B. Gill, at 1,100 m elevation, 8 km south-southwest of Saint-Denis (20°52'44"S, 55°26'53"E), northern Reunion, in the south-west Indian Ocean, on 17 November 1964 (Figs. 1–2).

**Paratypes.**—USNM 486964, female collected by F. B. Gill, at Nez de Bœuf (21°12'20"S, 55°37'14"E), Reunion, on 22 November 1964; USNM 486965, male collected by F. B. Gill, at Nez de Bœuf, Reunion, on 22 November 1964; and USNM 486966, male collected by F. B. Gill, 6 km north-northwest of Le Vingt-Septième (c.21°11'38"S, 55°29'47"E), on 23 November 1964 (Fig. 1).

**Diagnosis.**—Based on the rather small sample sizes available, *saffordi* is separable from nominate *francicus* using plumage characters and biometrics (see Table 1, Fig. 3). For biometrics, *saffordi* has an on average smaller / narrower pale rump patch than nominate

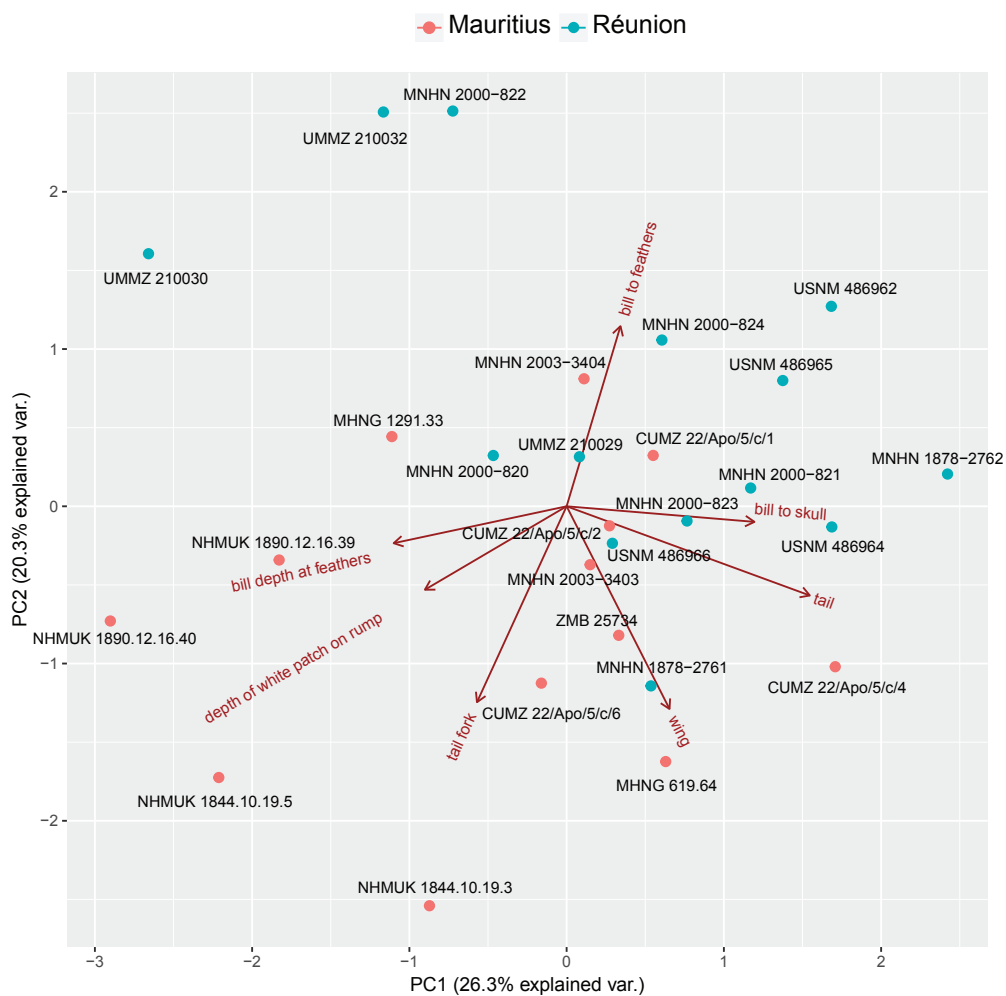


Figure 3. Plot of first two axes of a principal components analysis (PCA) showing the morphospace of *Aerodramus francicus* from Mauritius ( $n = 13$ ) and Reunion ( $n = 14$ ) based on seven measurements. Museum numbers are given for each specimen and the vectors indicate the direction and strength of the contributions of the different morphological variables to the overall distribution.

*francicus*. Additionally, tail fork is potentially a useful separating character, with that of *saffordi* being on average considerably (*c.*20%) shallower, although judging specimens in comparable states of feather wear unquestionably can limit the reliability of this feature in the museum. Nevertheless, it can be obvious when comparing images of live birds on the wing (Fig. 4). In plumage, the rump patch of *saffordi* is far less contrasting by virtue of the often many fewer pure or almost pure white feathers therein, in addition to its being narrower. As noted by M. R. Browning (*in* Chantler & Driessens 2000), the wings, especially the flight-feathers, of nominate *francicus* appear substantially more glossed (greenish in some lights, but bluer in others) than those of *saffordi*, and this remains obvious even in much older specimen material from Mauritius (see Fig. 1). The head-sides and ear-coverts of nominate *francicus* typically appear much more solidly dark than those of *saffordi*, with the result that its cap seems much larger, whereas *saffordi* appears to display much more of a paler and contrasting neck-collar. Finally, specimens of *saffordi* appear considerably more





Figure 4. Comparative field photographs of the Réunion and Mauritius populations of Mascarene Swiftlet *Aerodramus francicus* in both fresh (lower line) and very worn plumages (middle line); the bird top left is at the extreme end of variation in the white rump patch of this island's population (Hadoram Shirihai)

patterned below than those of nominate *francicus*, displaying much more obvious shaft-streaks on the lower breast and belly, and a sharper division between the darker throat and breast vs. paler (and greyer) remainder of the underparts; in nominate *francicus* this pectoral band effect is much reduced, as well as being much higher on the breast. *A. f. saffordi* is separated from the similar but larger and darker *Aerodramus elaphrus* of the Seychelles by most of the same characters as can be used to distinguish the latter from nominate *francicus*, namely the shorter wings and bill of *saffordi* (*A. elaphrus* has wing 115–119 mm and bill to feathers 7.5–8.0 mm; Rocamora 2013), its narrower wing base and smaller eye. In contrast to nominate *francicus*, the rump patch of *saffordi* being rather less obvious within the otherwise dark upperparts, is more similar to *A. elaphrus*.

**Description of holotype.**—See also Figs. 1–2. Colours correspond to those in Smithe (1976). Very dusky above, and paler, slightly greyer below. Head basically shows four tones: the cap which is blacker (between Color 119 Sepia and 119A Hair Brown) and quite well demarcated reaching level with lowest part of eye; the lores which are even blacker (closest to Color 89 Jet Black); the paler greyish-brown ear-coverts (close to Color 119B Dark Drab) and chin (slightly paler than the ear-coverts); with the throat being the palest part of the head (closest to 119C Light Drab). Upperparts: largely dusky brown (Color 221 Vandyke Brown), contrasting with ill-defined paler grey rump (between Color 119C Light Drab and 119D Drab-Grey), with very few whitish bases and edges exposed; rectrices, remiges and some of the coverts and tertials are darkest part of wing, almost blackish brown (Color 119), with very slight greenish gloss/iridescence. Underparts: lower throat to breast 119C Light



Figure 5. Two specimens of *Aerodramus f. francicus* (MNHN 2003-3403 and 2003-3404; top two) collected on Mauritius on unknown dates, previously in the Boucard collection, compared to a specimen of *A. f. saffordi* (MNHN 2000-823) collected on Reunion in July 1966 (Guy M. Kirwan, Muséum national d'Histoire naturelle, Paris)

Drab, or slightly darker (119B Dark Drab) forming a very broad and somewhat diffuse breast-band, below which the remainder of the underparts (belly to undertail-coverts) become paler (between 119C and 119D); especially from the mid-breast across the belly, shaft-streaks are very well pronounced and there are dark feather centres exposed between the lower throat and upper breast forming a broken mesial stripe. Underwing-coverts as top of head (nearest to Color 119), but underside of remiges marginally paler (between Color 119 Sepia and 119A Hair Brown). Bare parts all dark post-mortem (original colours unknown).

**Measurements of holotype.**—Wing 107.0 mm, tail 51.0 mm, bill (to skull) 5.8 mm, bill (to feathers) 3.3 mm, bill depth (at feathers) 1.5 mm, tail fork 4.9 mm, and depth of white rump patch 9.9 mm; mass 8.6 g.

**Variation in the type series.**—The three paratypes (Fig. 1) are very similar both to one another and to the holotype, but USNM 486965 has the most visible white on the rump, whereas the holotype and USNM 486966 show least.

**Measurements of paratypes.**—USNM 486964 (female): wing 109.5 mm, tail 52.0 mm, bill (to skull) 5.9 mm, bill (to feathers) 3.3 mm, bill depth (at feathers) 1.6 mm, tail fork 6.5 mm, and depth of white rump patch 10.3 mm; mass 8.9 g. USNM 486965 (male): wing 111.5 mm, tail 49.0 mm, bill (to skull) 6.1 mm, bill (to feathers) 3.7 mm, bill depth (at feathers) 1.5 mm, tail fork 5.2 mm, and depth of white rump patch 12.1 mm; mass 11.8 g. USNM 486966 (female): wing 110.0 mm, tail 50.0 mm, bill (to skull) 5.7 mm, bill (to feathers) 3.0 mm, bill depth (at feathers) 1.8 mm, tail fork 5.0 mm, and depth of white rump patch 12.6 mm; mass 8.5 g.

**Geographic distribution.**—Endemic to the island of Reunion (2,152 km<sup>2</sup>), a French overseas territory, where it is widespread from sea level to the island's highest point (3,069 m, Piton des Neiges), although known breeding sites are comparatively few, and most support rather small numbers of birds. The largest are in the Ravine de la Grande Chaloupe, an Important Bird Area in the north-west of the island (Le Corre & Safford 2001) and at La



Figure 6. Specimen of *Aerodramus f. francicus* (UMMZ 210026), collected on Mauritius, in September 1964, showing glossy wings and upperparts (Janet Hinshaw, © University of Michigan Museum of Zoology, Ann Arbor)

Chapelle, Cirque de Cilaos, in the centre of Reunion (Cheke & Hume 2008). However, at least some caves (potential breeding sites) are almost certainly inaccessible and detailed surveys do not appear to have been attempted, in contrast to the situation on Mauritius (Safford 2013).

**Etymology.**—In naming this new swiftlet subspecies, it is gratifying to be able to pay tribute to the many contributions of Roger Safford to our avifaunal knowledge of the south-west Indian Ocean islands, especially the Mascarenes. His work there began in the late 1980s and culminated recently in the co-authorship of a superb new field guide to the region (Hawkins *et al.* 2015) and, even more importantly, the eighth adjunctive volume in *The birds of Africa* series, of which he was both an editor and a primary author (Safford & Hawkins 2013). Safford is currently a Senior Programme Manager at BirdLife International with a special responsibility for threatened species conservation. The name *saffordi* is a noun declined in its genitive singular form.

**Taxonomic rank.**—Employing a modern interpretation of the Biological Species Concept, we elect to describe *saffordi* at subspecies level based on the multiple but relatively modest morphological characters that distinguish the Reunion population of this swiftlet from that on Mauritius. This fulfils the notion expressed by Remsen (2010), in a defence of their usefulness in avian taxonomy, that subspecies should represent “geographic populations diagnosable by one or more phenotypic traits.” Given that the discriminant analyses correctly assigned all but one of 27 specimens from the two islands to population, including all of the Reunion material (see Results, Biometrics), it appears that Patten & Unitt’s (2002) advocacy of a 95% rule for assessing diagnosability of subspecies can be met in the case of *saffordi*. Despite that the sum of these differences might be considered comparatively significant within a morphologically extremely conservative group such as swiftlets, given our current lack of vocal, behavioural or genetic evidence of additional differentiation, we contend that subspecies rank is most appropriate for the Reunion population. For the present we have no basis to believe that, other than as a function of geography, the two populations would function as reproductively isolated units, and we have no evidence of potential pre-mating isolation mechanisms. Morphological characters demonstrate that there are qualitative and, to a lesser degree, quantitative differences between the two populations. Traditional genetic data would merely give an indication of a lack of gene flow over a certain time period.

**Biogeographical considerations.**—The landbird faunas of Mauritius and Reunion are strongly characterised by: (a) being highly depauperate (at least following several centuries of human impact); (b) extremely high rates of endemism among their native birds; and (c)

the majority of species on both islands being introduced. None of these characters can be considered surprising given their comparative isolation, lying c.2,000 km from the African mainland and 175 km from each other; their volcanic and independent origins (Mauritius is c.8–9 million years old, Reunion c.2–5 million years old: see Safford & Hawkins 2013: 15); as well as their comparatively long periods of continuous human colonisation and importance to traders.

Discounting the introduced taxa, under most previous taxonomic arrangements Reunion boasted six extant endemic landbird species (a harrier *Circus maillardi*, a cuckooshrike *Coracina newtoni*, a bulbul *Hypsipetes borbonicus*, a stonechat *Saxicola tectes*, and two white-eyes, *Zosterops borbonicus* and *Z. olivaceus*), one endemic subspecies (*Terpsiphone b. bourbonnensis*, a monarch flycatcher) and two other native landbird species—*Aerodramus francicus* and *Phedina borbonica*. The latter is distinguished by being subdivided into separate races on Madagascar (*P. b. madagascariensis*) and in the Mascarenes (Mauritius and Reunion; nominate). The *Saxicola* is sometimes treated as a subspecies of a much wider Old World species-complex, or as a race of a purely Afrotropical species, but under either arrangement, the taxon concerned, *tectes*, is endemic to Reunion.

Extant Mauritian landbird endemism was previously measured by eight species (a kestrel *Falco punctatus*, a pigeon *Nesoenas mayeri*, a parakeet *Psittacula eques*, a cuckooshrike *Coracina typica*, a bulbul *Hypsipetes olivaceus*, two white-eyes *Zosterops chloronothos* and *Z. mauritanus*, and a fody *Foudia rubra*) and one subspecies (*Terpsiphone bourbonnensis desolata*). The only other native landbirds were the two species shared with Reunion (i.e. *Phedina borbonica* and *Aerodramus francicus*).

It is worth remarking, however, that when considering overall known diversity, taking into account extinctions, the basic biogeographical differences between the two islands shrink, and it becomes obvious that their avifaunas are much more similar than might be apparent from the above (Cheke & Hume 2008, Safford & Hawkins 2013). Nevertheless, most populations are congeneric and clearly differentiated to some extent. Consequently, it is unsurprising that Mascarene Swiftlet should in fact conform to the same pattern of unique taxa on the different islands. This leaves the *Phedina* as the only landbird native to both Mauritius and Reunion that displays no named morphological differentiation between the two islands.

**Conservation.**—The following is largely based on Safford (2013). In the mid 1990s the Reunion population of *Aerodramus francicus* was estimated to be in excess of 10,000 individuals (whereas Barré *et al.* 1996 thought numbers to be approximately 5,000 birds); indeed, the colony at La Chappelle (see Geographic distribution) was estimated to comprise more than 10,000 nests alone. This was believed to reflect a genuine increase in numbers since the 1970s (when the species was thought to be much less numerous on Reunion compared to Mauritius), rather than merely improved coverage. Several colonies on Reunion were considered to be threatened by the caving activities of speleologists, while the species' nests have recently acquired a reputation for enhancing effects of cannabis (M. Le Corre in Chantler & Driessens 2000, Cheke & Hume 2008). On Mauritius, *A. francicus* declined between the early 20th century and the 1970s, but by the time of the first detailed survey, in 1998, it was believed to be increasing. At this time, numbers were estimated at just 2,244–2,610 individuals, with no cave holding more than 600–700 and 19 of 34 caves known to harbour the species held fewer than 30 swiftlets (Middleton 1999). Varied forms of human persecution and exploitation, which certainly was ongoing in the 1990s, as well as the deliberate blocking of cave entrances, suggest that the Mauritian population is not only considerably rarer but also at greater risk than that on Reunion. Consequently, should any future taxonomic work determine that *saffordi* and *francicus* merit species rather than



subspecies rank, then it appears certain that *francicus sensu stricto* would automatically be listed as globally threatened.

### Acknowledgements

We are grateful to the following museum curators and others for their assistance with specimen material: Robert Prŷs-Jones, Mark Adams and Hein van Grouw (Natural History Museum, Tring); Renata Stopiglia, Patrick Boussès and Jérôme Fuchs (Muséum national d'Histoire naturelle, Paris), Paul Sweet (American Museum of Natural History, New York), Michael Brooke (Cambridge University Museum of Zoology, Cambridge, UK), Alice Cibois (Muséum d'Histoire naturelle de Genève), Pascal Eckhoff (Museum für Naturkunde, Berlin), Chris Milensky (National Museum of Natural History, Smithsonian Institution, Washington DC) and Janet Hinshaw (University of Michigan Museum of Zoology, Ann Arbor). Further thanks are due to Annelise Folie at the Royal Belgian Institute of Natural Sciences, Brussels, for supplying comparative photographs of the specimens in her care. Justin Jansen kindly provided information concerning old specimens of *A. francicus* and Anita Gamauf sent photographs of the Vienna specimen. Roger Safford provided some advice and ideas concerning the manuscript. We are grateful to Mike Tarboton, Frank Steinheimer and Robert Prŷs-Jones for their comments on the submitted text. Andrew Elliott further discussed the type description of *Hirundo francica* with us. Nomenclature in this paper was reviewed by the Working Group on Avian Nomenclature of the International Ornithologists' Union.

### References:

- Barré, N., Barau, A. & Jouanin, C. 1996. *Oiseaux de la Réunion*. Second edn. Éditions du Pacifique, Paris.
- BirdLife International. 2017. Species factsheet: *Aerodramus francicus*. [www.birdlife.org/datazone](http://www.birdlife.org/datazone) (accessed 19 July 2017).
- Buffon, G. L. L. 1783. *Histoire naturelle des oiseaux*, vol. 7. L'Imprimerie Royale, Paris.
- Buffon, G. L. L., Daubenton, E.-L. & Daubenton, M. 1765–80. *Planches enluminées d'histoire naturelle*, vol. 6. L'Imprimerie Royale, Paris.
- Chantler, P. 1999. Mascarene Swiftlet *Aerodramus francicus*. Pp. 426–427 in del Hoyo, J., Elliott, A. & Sargatal, J. (eds.) *Handbook of the birds of the world*, vol. 5. Lynx Edicions, Barcelona.
- Chantler, P. & Driessens, G. 2000. *Swifts: a guide to the swifts and treeswifts of the world*. Second edn. Pica Press, Robertsbridge.
- Cheke, A. S. & Hume, J. P. 2008. *The lost land of the Dodo. An ecological history of Mauritius, Reunion and Rodrigues*. T. & A. D. Poyser, London.
- Dickinson, E. C. & Remsen, J. V. (eds.) 2013. *The Howard and Moore complete checklist of the birds of the world*, vol. 2. Fourth edn. Aves Press, Eastbourne.
- Gaymer, R., Blackman, R. A., Dawson, P. G., Penny, M. & Penny, C. M. 1969. Endemic birds of Seychelles. *Ibis* 111: 157–175.
- Gmelin, J. F. 1789. *Systema naturae, per regna tria naturae: secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*, vol. 1(2). Leipzig & Lyon.
- Hastie, T. & Tibshirani, R. 2015. 2015mda: mixture and flexible discriminant analysis. R package version 0.4–8. In Leisch, F., Hornik, K. & Ripley, B. D. (eds.) *Original R port*. <https://cran.rproject.org/web/packages/mda/index.html>.
- Hawkins, F., Safford, R. & Skerrett, A. 2015. *Birds of Madagascar and the Indian Ocean islands*. Christopher Helm, London.
- Helbig, A. J., Knox, A. G., Parkin, D. T., Sangster, G. & Collinson, M. 2002. Guidelines for assigning species rank. *Ibis* 144: 518–525.
- del Hoyo, J. & Collar, N. J. 2014. *HBW and BirdLife International illustrated checklist of the birds of the world*, vol. 1. Lynx Edicions, Barcelona.
- Johnson, K. P. & Clayton, D. H. 1999. Swiftlets on islands: genetics and phylogeny of the Seychelles and Mascarene swiftlets. *Phelsuma* 7: 9–13.
- Latham, J. 1783. *A general synopsis of birds*, vol. 2(2). Leigh & Sotheby, London.
- Le Corre, M. & Safford, R. J. 2001. La Réunion and Iles Eparses. Pp. 693–702 in Fishpool, L. D. C. & Evans, M. I. (eds.) *Important Bird Areas in Africa and associated islands: priority sites for conservation*. Pisces Publications, Newbury & BirdLife International, Cambridge, UK.
- Lee, P. L. M., Clayton, D. H., Griffiths, R. & Price, R. D. 1996. Does behaviour reflect phylogeny in swiftlets (Aves: Apodidae)? A test using cytochrome *b* mitochondrial DNA sequences. *Proc. Natl. Acad. Sci. USA* 93: 7091–7096.
- Middleton, G. J. 1999. The Caves of Mauritius project 1998. *J. Sydney Speleological Soc.* 43: 81–108.
- Milne-Edwards, A. & Grandidier, A. 1879. *Histoire naturelle des oiseaux*. In Grandidier, A., Mabilie, P., Saussure, H. & Zehntner, L. (eds.) *Histoire physique, naturelle, et politique de Madagascar*, vol. 12. Imprimerie Nationale, Paris.
- Patten, M. A. & Unitt, P. 2002. Diagnosability versus mean differences of Sage Sparrow subspecies. *Auk* 119: 26–35.

- Peters, J. L. 1940. *Check-list of birds of the world*, vol. 4. Harvard Univ. Press, Cambridge, MA.
- Price, J. J., Johnson, K. P. & Clayton, D. H. 2004. The evolution of echolocation in swiftlets. *J. Avian Biol.* 35: 135–143.
- Price, J. J., Johnson, K. P., Bush, S. E. & Clayton, D. H. 2005. Phylogenetic relationships of the Papuan Swiftlet *Aerodramus papuensis* and implications for the evolution of avian echolocation. *Ibis* 147: 790–796.
- R Core Team. 2017. A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna. <http://www.R-project.org/> (accessed January 2018).
- Remsen, J. V. 2010. Subspecies as a meaningful taxonomic rank in avian classification. *Orn. Monogr.* 67: 62–78.
- Rocamora, G. 2013. Seychelles Swiftlet *Aerodramus elaphrus*. Pp. 590–592 in Safford, R. J. & Hawkins, A. F. A. (eds.) *The birds of Africa*, vol. 8. Christopher Helm, London.
- Safford, R. J. 2013. Mascarene Swiftlet *Aerodramus francicus*. Pp. 593–595 in Safford, R. J. & Hawkins, A. F. A. (eds.) *The birds of Africa*, vol. 8. Christopher Helm, London.
- Safford, R. J. & Hawkins, A. F. A. (eds.) 2013. *The birds of Africa*, vol. 8. Christopher Helm, London.
- Sanchez, G. 2013. Discriminer: tools of the trade for discriminant analysis. R package version 0.1–29.
- Smithe, F. B. 1976. *Naturalist's color guide*. Amer. Mus. Nat. Hist., New York.
- Svensson, L. 1999. *Identification guide to European passerines*. Fourth edn. Privately published, Stockholm.
- Thomassen, H. A., den Tex, R. J., de Bakker, M. A. G. & Povel, G. D. E. 2005. Phylogenetic relationships amongst swifts and swiftlets: a multi locus approach. *Mol. Phyl. & Evol.* 37: 264–277.

**Addresses:** Guy M. Kirwan, Research Associate, Field Museum of Natural History, 1400 South Lakeshore Drive, Chicago, IL 60605, USA, e-mail: GMKirwan@aol.com. Hadoram Shirihi, Emek Ayalon 39, Shoham 60850, Israel, e-mail: albatross\_shirihi@hotmail.com. Manuel Schweizer, Naturhistorisches Museum der Burgergemeinde Bern, Bern, Switzerland, e-mail: manuel.schweizer@nmbe.ch

**Appendix:** mensural data for adult specimens of Mascarene Swiftlet *Aerodramus francicus* measured by the authors and others; the AMNH specimen was handled by HS, the UMMZ material was measured by J. Hinshaw, and all other specimens were measured by GMK. Measuring techniques are described under Methods and materials. Blank fields represent missing data that were impossible to take for various reasons.

	wing	tail	bill to skull	bill to feathers	bill depth at feathers	tail fork	depth of white patch on rump
<b>Mauritius</b>							
NHMK 1890.12.16.39	106.0	48.0	5.7	3.3	1.9	8.1	17.05
NHMK 1890.12.16.40	111.0	46.0	4.1	3.1	1.7	7.1	15.8
NHMK 1844.10.19.3	114.5	49.0	5.4	2.8	2.0	7.8	13.35
NHMK 1844.10.19.5	113.0	49.0	4.4	3.3	2.1	8.4	15.35
MNHN 2003-3404	108.5	50.0	5.1	3.8	1.4	5.8	16.5
MNHN 2003-3403	110.5	52.0	5.5	3.7	1.9	6.3	15.8
MHNG 1291.33	110.0	49.0	4.6	3.1	1.9	4.1	13.9
MHNG 619.64	116.0	50.0	5.5	3.0	1.7	5.6	13.1
MHNG 1291.32	115.5	52.0	5.5	3.2		4.8	14.1
CUMZ 22/Apo/5/c/6	113.0	51.0	5.4	3.6	1.9	7.0	15.9
CUMZ 22/Apo/5/c/4	117.0	51.5	5.5	3.7	1.5	6.1	13.5
CUMZ 22/Apo/5/c/2	111.0	50.0	6.3	3.9	1.9	6.7	15.5
CUMZ 22/Apo/5/c/1	107.0	51.5	5.3	3.7	1.5	7.9	12.9
ZMB 25734	114.0	50.0	5.8	3.5	1.7	5.5	17.3
UMMZ 210028	103.0	46.5	5.1	3.6	2.7	5.7	
UMMZ 210027	109.5	48.5	5.0	4.2		8.1	
UMMZ 210026	112.5	50.0	4.6	3.6		6.7	
<b>Reunion</b>							
MNHN 1878-2761	113.0	53.0	5.6	3.5	2.3	6.6	12.1
MNHN 2000-821	112.0	52.0	5.1	3.5	1.6	5.0	12.5
MNHN 2000-823	113.0	50.0	5.5	3.6	1.9	6.4	9.8
MNHN 2000-820	108.0	50.0	4.8	3.4	1.8	6.9	10.9
MNHN 2000-824	112.0	51.0	5.1	4.1	1.9	4.8	12.3
MNHN 2000-822	107.5	47.0	5.7	3.8	2.0	3.5	13.9

	wing	tail	bill to skull	bill to feathers	bill depth at feathers	tail fork	depth of white patch on rump
MNHN 1878-2762	115.0	53.0	5.2	3.5	1.5	3.9	11.5
MNHN 1878-2765	110.5	50.5			2.0	3.5	9.6
AMNH 815847	109.0	51.0	6.0		2.5		15.5
USNM 486964	109.5	52.0	5.9	3.3	1.6	6.5	10.3
USNM 486966	110.0	50.0	5.7	3.0	1.8	5.0	12.6
USNM 486965	111.5	49.0	6.1	3.7	1.5	5.2	12.1
USNM 486962	107.0	51.0	5.8	3.3	1.5	4.9	9.9
CUMZ 22/Apo/5/c/3	110.0		6.0	3.1	1.55		
UMMZ 210031	111.0	47.5	4.4	3.6		6.1	11.0
UMMZ 210032	107.0	47.5	4.8	4.0	1.9	4.4	12.75
UMMZ 210030	108.0	45.0	4.6	3.7	2.1	5.7	12.2
UMMZ 210029	111.5	51.5	4.7	3.8	1.9	5.7	12.25

## Third record of the Critically Endangered Brazilian Merganser *Mergus octosetaceus* in São Paulo state, south-east Brazil, after almost two centuries

by Miguel Nema Neto, Fabiana D. Pereira, Ana L. M. Wuo & Carlos Zacchi Neto

Received 11 February 2018; revised 24 April 2018; published 22 June 2018

<http://zoobank.org/urn:lsid:zoobank.org:pub:9163F1AD-EC6C-495F-A068-59C2067983CD>

**SUMMARY.**—Brazilian Merganser *Mergus octosetaceus* is one of the most endangered bird species in the Americas and one of the rarest ducks in the world. We photographed the species in August 2017, at Serra do Mar State Park, Salesópolis, in eastern São Paulo state. This is the third documented record in São Paulo, but the first for approximately 200 years.

Brazilian Merganser *Mergus octosetaceus* is considered one of the rarest bird species in the Americas and among the most threatened waterfowl in the world, being currently considered Critically Endangered (Collar *et al.* 1992, BirdLife International 2018). It is adapted to watercourses in montane regions, inhabiting clear-water rivers especially those with rapids, and the species feeds on fish, aquatic insects and molluscs (Sick 1997, Carboneras *et al.* 2018).

Originally found across south-central Brazil and adjacent Argentina and Paraguay, the species' range is now drastically reduced (Collar *et al.* 1992), despite its more recent discovery further north than previously known (Braz *et al.* 2003). Intolerant of impacts



Figure 1. Male Brazilian Merganser *Mergus octosetaceus*, rio Claro, Salesópolis, São Paulo, Brazil, 25 August 2017 (Fabiana Dias Pereira)





Figure 2. Locality where observations were made in August and November 2017, rio Claro, Salesópolis, São Paulo, Brazil (Miguel Nema Neto)

to its environment and sensitive to human disturbance, activities such as agricultural expansion, pollution, dams and loss of riverine vegetation can all negatively impact the species (Hughes *et al.* 2006). Recent sightings evidence its survival in Argentina (Misiones) and perhaps even in Paraguay, but in Brazil it is considered extinct in the states of Mato Grosso do Sul, São Paulo, Rio de Janeiro and Santa Catarina (Collar *et al.* 1992, Lamas & Lins 2009, Carboneras *et al.* 2018). In Paraná, recent field work has failed to confirm the species' presence and the last record was now more than 20 years ago, in 1995 (Lamas & Lins 2009, Carboneras *et al.* 2018). Indeed, in recent decades *M. octosetaceus* has been recorded at just a few locations in Brazil, mainly within protected areas, especially Serra da Canastra National Park (Minas Gerais), Chapada dos Veadeiros National Park (Goiás) and Jalapão State Park (Tocantins) (Braz *et al.* 2003, Bianchi *et al.* 2005, Lamas 2006). It has also been reported in western Bahia state, although subsequent searches of this area were unsuccessful (Lamas & Lins 2009). Occasional records elsewhere in Minas Gerais perhaps involve wandering or dispersing birds (Lamas & Lins 2009), although to date there is no definitive evidence that the species moves far from its natal areas (Ribeiro *et al.* 2011).

In the state of São Paulo, the only well-documented record of the species involves a female (from a pair) collected by J. Natterer in August 1820, at Itararé (24°07'S, 49°20'W), on the border with Paraná, and now in the Natural History Museum, Tring, UK (Collar *et al.* 1992). In addition Stresemann (1954), repeated by Collar *et al.* (1992), mentioned that in the previous year, 1819, Frederick Sellow took specimens (now in Berlin) during his travels through Rio de Janeiro, Minas Gerais and São Paulo, including in the last-named state, although Partridge (1956) insisted that these were likely to have all emanated from Minas Gerais. Another specimen (in the Museu de Zoologia de São Paulo), until recently often reported in the literature as originating from São Paulo state (e.g. Pinto 1938), collected at either Salto Grande or Fazenda Caiuá, on the rio Paranapanema, on 30 May 1903, is in fact from Paraná (Straube *et al.* 2002).

We made the third record of *M. octosetaceus* in São Paulo, almost two centuries after the specimens mentioned above. On 25 August 2017, a male was photographed (Fig. 1)

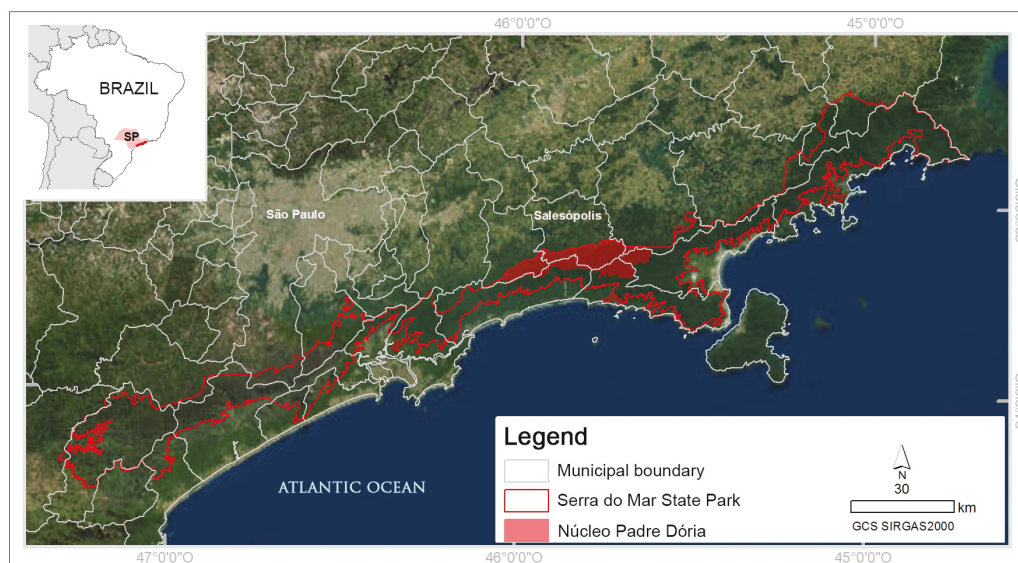


Figure 3. Study area of Padre Dória, Serra do Mar State Park, Salesópolis, São Paulo, Brazil.

on the rio Claro, in the Alto Tietê basin, Salesópolis. This river lies within a system of dams established in 1973 that provides water to 1.1 million people in the metropolitan region of São Paulo (SABESP 2017). The location is included within Important Bird Area SP04 (Bencke *et al.* 2006), forms part of Serra do Mar State Park (Fig. 3) and is very close to Boracéia Biological Station, whose avifauna has been studied for >60 years, and in this respect is one of the best-known locations in south-east Brazil (Cavarzere *et al.* 2010). It is also c.110 km from São Paulo city, the most populous urban area in Latin America, while the town of Salesópolis is well known among ornithologists for the recently described São Paulo Antwren *Formicivora paludicola* (Buzzetti *et al.* 2013).

The bird was seen swimming and diving next to the riverbank, in a 10-m stretch of slow-moving river, with clear, cold, very shallow (c.1 m deep) water, and a sandy bottom (Fig. 2). The bird was seen again, but not photographed, in the same place on 23 November 2017, perhaps indicating that it was territorial, although there have been no subsequent records despite regular visits to the area.

As previously mentioned, changes in hydrology caused by damming of rivers represents a significant threat to this globally endangered species. The rio Claro is a tributary of the rio Tietê, and the nearest dam is the Ribeirão do Campo, on the rio do Campo, which flows into the rio Claro. Nevertheless, upstream of the dam, the rio Claro extends for many kilometres through the Serra do Mar State Park, making it easier for the bird to move locally. Further work is needed to determine whether there is a population in this area, or this individual was a wanderer. But, for now it appears that Brazilian Merganser is not regionally extinct.

#### Acknowledgements

We especially thank the management and staff of Serra do Mar State Park, Núcleo Padre Dória, for logistical support, Jamile El Kassis Marangoni and Marcos Salvador Mathias Júnior for translating the text, researchers at the “Instituto Florestal”, Marina Mitsue Kanashiro for the map, and Alessander Z. Antunes for suggestions concerning the manuscript. The manager of the North Shore Forestall Foundation, Leandro de Oliveira Caetano, and Larissa Araújo Nema encouraged us to publish this observation.

## References:

- Bencke, G. A., Maurício, G. N., Develey, P. F. & Goerck, J. M. (eds.) 2006. *Áreas importantes para a conservação de aves no Brasil*, vol. 1. SAVE Brasil, São Paulo.
- Bianchi, C. A., Brant, S., Brandão, R. A. & Brito, B. F. 2005. New records of Brazilian Merganser *Mergus octosetaceus* in the rio das Pedras, Chapada dos Veadeiros, Brazil. *Cotinga* 24: 72–74.
- BirdLife International. 2018. Species factsheet: Brazilian Merganser *Mergus octosetaceus*. <http://datazone.birdlife.org/species/factsheet/brazilian-merganser-mergus-octosetaceus> (accessed 14 January 2018).
- Braz, V. S., Abreu, T. L. S., Lopes, L. E., Leite, L. O., França, F. G. R., Vasconcellos, M. M. & Balbino, S. F. 2003. Brazilian Merganser *Mergus octosetaceus* discovered in Jalapão State Park, Tocantins, Brazil. *Cotinga* 20: 68–71.
- Buzzetti, D. R. C., Belmonte-Lopes, R., Reinert, B. L., Silveira, L. F. & Bornschein, M. R. 2013. A new species of *Formicivora* Swainson, 1824 (Thamnophilidae) from the state of São Paulo, Brazil. *Rev. Bras. Orn.* 21: 269–291.
- Carboneras, C., Kirwan, G. M. & Sharpe, C. J. 2018. Brazilian Merganser (*Mergus octosetaceus*). In del Hoyo, J., Elliott, A., Sargatal, J., Christie, D. A. & de Juana, E. (eds.) *Handbook of the birds of the world Alive*. Lynx Edicions, Barcelona (retrieved from <https://www.hbw.com/node/52928> on 25 April 2018).
- Cavazere, V., Moraes, G. P. & Silveira, L. F. 2010. Boracéia Biological Station: an ornithological review. *Pap. Avuls. Zool., São Paulo*. 50: 189–201.
- Hughes, B., Dugger, B., Cunha, H. J., Lamas, I., Goerck, J., Lins, L., Silveira, L. F., Andrade, R., Bruno, S. F., Rigueira, S. & Barros, Y. M. 2006. *Action plan for the conservation of the Brazilian Merganser Mergus octosetaceus*. ICMBio, Brasília.
- Lamas, I. R. 2006. Census of Brazilian Merganser *Mergus octosetaceus* in the region of Serra da Canastra National Park, Brazil, with discussion of its threats and conservation. *Bird Conserv. Intern.* 16: 145–154.
- Lamas, I. R. & Lins, L. V. 2009. Brazilian Merganser (*Mergus octosetaceus*). In Schulenberg, T. S. (ed.) *Neotropical birds online*. Cornell Lab of Ornithology, Ithaca, NY. <https://doi.org/10.2173/nb.bramer1.01> (accessed 13 January 2018).
- Partridge, W. H. 1956. Notes on the Brazilian Merganser in Argentina. *Auk* 73: 473–488.
- Pinto, O. M. O. 1938. Catálogo das aves do Brasil e lista dos exemplares que as representam no Museu Paulista, 1a. parte. *Rev. Mus. Paulista* 22: 1–556.
- Ribeiro, F., Lins, L. V., Gomes, V. M., Nery, F. H. & Reis, E. S. 2011. Dispersão e maturidade sexual de *Mergus octosetaceus* Vieillot, 1817 na região da Serra da Canastra, Minas Gerais, Brasil. *Rev. Bras. Orn.* 19: 391–397.
- SABESP (Companhia de Saneamento Básico do Estado de São Paulo). 2017. Acesso em 13 de Janeiro de 2018, disponível em SABESP: <http://site.sabesp.com.br/site/imprensa/noticias-detalle.aspx?secaoId=66&id=7437>.
- Sick, H. 1997. *Ornitologia brasileira*. Ed. Nova Fronteira, Rio de Janeiro.
- Straube, F. C., Willis, E. O. & Oniki, Y. 2002. Aves colecionadas na localidade de Fazenda Caiuá (Paraná, Brasil) por Adolph Hempel, com discussão sobre sua localização exata. *Ararajuba* 10: 167–172.
- Stresemann, E. 1954. Ausgestorbene trod Aussterbende Vogelarten, vertreten im Zoologischen Museum zu Berlin. *Mitt. Zool. Mus. Berlin* 30: 38–53.
- Addresses:* Miguel Nema Neto, Rua Horto Florestal 1200, Rio do Ouro, Caraguatatuba, São Paulo, Brazil, CEP 11675-730, e-mail: miguelpsm@gmail.com. Fabiana Dias Pereira, Rodovia Alfredo Rolim de Moura 882, Vila Bueno, Salesópolis, São Paulo, Brazil, CEP 08970-000, e-mail: tiafabi84@hotmail.com. Ana Lúcia Moraes Wuol, Rua 15 de Novembro 569, Centro, Salesópolis, São Paulo, Brazil, CEP 08970-000, e-mail: analuciaawuo@gmail.com. Carlos Zacchi Neto, Rua Horto Florestal 1200, Rio do Ouro, Caraguatatuba, São Paulo, Brazil, CEP 11675-730, e-mail: carlospsm@gmail.com



# *Hemixus sumatranus* Wardlaw Ramsay, 1882, and *Hemixus sumatranus* Salvadori, 1888

by Giorgio Aimassi & Edward C. Dickinson

Received 3 March 2018; revised 17 May 2018; published 22 June 2018

<http://zoobank.org/urn:lsid:zoobank.org:pub:5394C58B-0B55-4966-A3AF-3C02F52BD96A>

**SUMMARY.**—Eight specimens collected in 1878 by the Italian explorer Odoardo Beccari have provided one or more type specimens for two seemingly identical names given to the Sunda Bulbul of Sumatra, now treated as a subspecies of *Ixos virescens* or perhaps a full species. These names are *Hemixus sumatranus* Wardlaw Ramsay, 1882, and *Hemixus sumatranus* Salvadori, 1888. The *International code of zoological nomenclature* is not clearly explicit on the treatment of a name that when introduced was simultaneously a junior homonym and an objective junior synonym. While both names are available, the junior one is invalid because of its homonymy. Because both names are available, both have type material and this is not identical. Here we clarify the situation and the type material applicable.

This case came to light during research relating to the type specimens of the ornithological collection of the Univ. of Turin (MZUT), Italy, held in the Museo Regionale di Scienze Naturali (MRSN). It had already been noted by Dickinson *et al.* (2002) and in a footnote on p. 132 these authors wrote that ‘Salvadori was apparently unaware of the name proposed by Wardlaw Ramsay’. They listed Salvadori’s name as a junior synonym, believing it to be based on separate type material. More likely he became aware of it only four or five years later. It seems probable that Wardlaw Ramsay never sent Salvadori an offprint, and we suggest that this was because Wardlaw Ramsay’s uncle, the Marquis of Tweeddale, died in 1878 and Wardlaw Ramsay was commissioned to prepare the collected papers of his uncle for publication, a task he completed in 1881.

## The specimens involved

**Wardlaw Ramsay’s name.**—Warren & Harrison (1971: 544) listed BMNH (now NHMUK) 1888.4.1.305 as the holotype of *Hemixus sumatranus* Wardlaw Ramsay, 1882. The original description dealt with a specimen that had come from Count Salvadori ‘in a small lot of duplicates of M. Beccari’s collection’. Wardlaw Ramsay appears to have assumed that he had discovered the one specimen that existed of his new species, probably aided in this idea by the fact that Salvadori’s notes would appear to have classified it as *Hypsipetes malaccensis*. Reference to the new taxon appeared in *Ibis* in the following year, in a paper concerning the birds of Sumatra (Nicholson 1883: 246) which one might have supposed that Salvadori would see. Indeed, it is possible that Count Salvadori was sent an offprint but it did not reach him, although Wardlaw Ramsay’s preoccupation, mentioned above, may suggest one was not sent.

**Salvadori’s name.**—Salvadori (1879: 221), in the catalogue of Sumatran birds collected by Odoardo Beccari, listed eight specimens obtained on Mount Singalan in 1878, between 28 June and 18 July (or perhaps 9 August), identifying them as *Hypsipetes malaccensis* Blyth, 1845. As discussed above, one of these specimens, no. 62 of the Beccari collection, was sent in a lot of duplicates to R. G. Wardlaw Ramsay, whose description of this is mentioned



above. A few years later Salvadori (1888)<sup>1</sup>, seemingly unaware of the name proposed by Wardlaw Ramsay, realised that the specimens collected by Beccari did not belong to *Hypsipetes malaccensis* and described his 'new species' *Hemixus sumatranus*.

Salvadori, recalling the 1879 paper, reiterated that there were five males, two females and one unsexed bird, but he did not remark on the fact that one or more of the eight specimens was no longer in the collection. It is probable that Salvadori did not revisit the eight specimens collected by Beccari. However, the reference in the 1888 paper is completely explicit and there is no doubt that all of the specimens listed in 1879 as *Hypsipetes malaccensis* become syntypes of *Hemixus sumatranus* Salvadori, 1888 (but not of Wardlaw Ramsay's name), and that the specimen sent to Wardlaw Ramsay, his holotype, must be counted as one of them.

As reported by Salvadori (1916: 29) and by Elter (1986: 240), in the MZUT collection there is a type specimen of *Hemixus sumatranus* Salvadori (Fig. 1), which was donated by Marquis Giacomo Doria in 1878, along with another 19 specimens collected by O. Beccari on Sumatra, probably to reward Salvadori for having studied the entire collection. Arbocco *et al.* (1979: 212) reported the presence of three syntypes of *H. sumatranus* Salvadori in the Museo Civico di Storia Naturale "Giacomo Doria", Genova (MSNG), the basis for listing the Genoa Museum by Dickinson *et al.* (2002). The sixth specimen collected on Sumatra by Dr Beccari for which we have information is no. 129, collected 11 July 1878. According to the SysTax database (<http://www.systax.org>, accessed 9 November 2017) it is located at the Senckenberg Naturmuseum, Frankfurt-am-Main, and referred to as a 'typus' of *Hemixus sumatranus* Ramsay.

## The subsequent literature

Salvadori's *Hemixus sumatranus* was mentioned in *Ibis* under 'Recently published ornithological works' (Anon. 1888: 368). A few years later, Oberholser (1899: 212–213), listing all the species of the genus *Ixos*, which in his opinion 'must supplant *Hemixus* Hodgson', quoted '*Ixos sumatranus* (Salvadori)' and made no reference to the binomen introduced six years earlier by Wardlaw Ramsay.

Büttikofer (1900: 226–228) appears to have been the first author to mention both Wardlaw Ramsay and Salvadori's names. He was obviously aware that the specimens described came from the same locality, but he considered both names to be junior synonyms of *Hemixus malaccensis* Blyth and did not refer either to their types or to their homonymy. Chasen (1935: 192) considered *Ixos sumatranus* (Wardlow [sic] Ramsay) to be a valid subspecies of *Ixos virescens* Temminck, 1825, but did not refer to Salvadori's description.

H. G. Deignan (*in* Mayr & Greenway 1960: 291–292) continued to consider *H. sumatranus* Wardlaw Ramsay as a valid subspecies of *Ixos virescens*, as did Dickinson *et al.* (2002: 132) noting synonymy with *H. sumatranus* Salvadori.

No author has previously clarified that Wardlaw Ramsay's holotype must be a syntype of Salvadori's name. The issue we address here is whether the two names (one being both a junior homonym and a junior synonym) are both validly introduced. That the earlier name is validly introduced has not been challenged, nor do we see any basis for challenging it. So, we focus here on the status of Salvadori's name.

The term 'homonym', whether primary or secondary, is defined explicitly to apply to names with the same spelling established for different nominal taxa (ICZN 1999, Art. 57.2 and 57.3). The *Code* makes clear that a junior primary homonym is—except in exceptional

<sup>1</sup> The work of Salvadori is usually dated to 1887, but it was actually published on 2 January 1888 (Poggi 2010: 345).



Figure 1. Syntype of *Hemixus sumatranus* Salvadori and two old labels, showing original identification as *Hypsipetes malaccensis* Blyth (above) and subsequent designation as 'type' of *Hemixus sumatranus* Salvadori (below), Museo Regionale di Scienze Naturali di Torino (MZUT Av9563) (L. Ghiraldi, © MRSN)

circumstances—permanently invalid (Art. 57.2). Note that the Glossary of the *Code* defines 'invalid' as meaning 'Of an available name or nomenclatural act...' (ICZN 1999: 107). So, published in accord with the rules in the *Code*, a name can be available—as Salvadori's name is—but invalid.

A few other examples of homonyms that are also junior synonyms come to mind: see for example (1) *Pitta ussheri* Gould, 1877, and of Sharpe, 1877 (Dickinson *et al.* 2000: 104); (2) *Melanocorypha maxima* Blyth, 1867, and of Gould, 1867 (Dickinson *et al.* 2001: 89, 100); (3) *Alauda tenuirostris* C. L. Brehm, 1841, and of d'Orbigny & Lafresnaye, 1836 (Dickinson & Lebossé 2018: 164). In addition, during GA's examination of type specimens in the ornithological collection of the MRSN, Turin, the case of *Sylvia cetti* Temminck, 1820, and *Sylvia cetti* Marmora, 1820, was noticed and the issue of precedence in that case needs to be addressed.

## The status of the type specimens linked to Salvadori's name

We consider that *Hemixus sumatranus* Salvadori was published and is available, but it is invalid because it is a junior homonym. However, as an available name it is entitled to types. Based on that availability, the syntypes of *Hemixus sumatranus* Salvadori, 1888, all collected in 1878 on or near Mount Singalan, West Sumatra, are listed below:

Beccari no. 62, captured 28 June, is in Tring museum with the reg. no. NHMUK 1888.4.1.305, and is referred to as the holotype of *Hemixus sumatranus* Wardlaw Ramsay (Warren & Harrison 1971: 544). The museum's type catalogue may need editing to record this as a syntype of Salvadori's name.

No. 106 of the Beccari collection, captured 9 July (but the original label shows the date 9 August), corresponds to specimen MZUT Av9563 of the Museo Regionale di Scienze Naturali, Torino.

Beccari no. 146, ♂ captured 15 July, no. 116, ♂ captured 10 July, no. 147, ♀ captured 15 July, correspond to specimens C.E. 9349, 9350 and 9351, respectively, of the Museo Civico di Storia Naturale "Giacomo Doria", Genova (Arbocco *et al.* 1979).

Beccari no. 129, ♂ captured 11 July, is in the Senckenberg Naturmuseum, Frankfurt-am-Main, with the no. SMF-50783 and (erroneously) referred to as a 'typus' of *Hemixus sumatranus* Wardlaw Ramsay (SysTax database; G. Mayr pers. comm.). Actually, this specimen is a syntype of *H. sumatranus* Salvadori.

The location of Beccari specimens no. 123, ♂ collected 11 July, and no. 164, ♀ collected 18 July, is not known.

### Acknowledgements

For their collaboration in the preparation of this note, we are very grateful to Elena Gavetti, Luca Ghiraldi, Claudio Pulcher, Marina Spini (Museo Regionale di Scienze Naturali, Torino, Italy), Mark Adams (Natural History Museum, Tring, UK), Gerald Mayr (Senckenberg Naturmuseum, Frankfurt-am-Main, Germany), and Frank Rheindt (National University of Singapore, Singapore). We also thank the referees, Andrew Elliott and Frank Steinheimer, for their helpful comments.

### References:

- Anon. 1888. Recently published ornithological works. 76. Salvadori on a new *Hemixus*. *Ibis* 30: 368.
- Arbocco, G., Capocaccia, L. & Violani, C. 1979. Catalogo dei tipi di uccelli del Museo Civico di Storia Naturale di Genova. *Ann. Mus. Civico Storia Nat. Genova* 82: 184–265.
- Büttikofer, J. 1900. Zoological results of the Dutch scientific expedition to central Borneo. The birds. *Notes Leyden Mus.* 21: 145–276.
- Chasen, F. N. 1935. A handlist of Malaysian birds. *Bull. Raffles Mus., Singapore, Straits Settlements* 11: 1–389.
- Dickinson, E. C. & Lebossé, A. 2018. A study of d'Orbigny's "Voyage dans l'Amérique Méridionale". IV. New avian names deriving from d'Orbigny's expedition with evidence for their first introduction and necessary corrections to authorship, dates and citations. *Zool. Biblio.* 5(4): 49–274.
- Dickinson, E. C., Dekker, R. W. R. J., Eck, S. & Somadikarta, S. 2000. Systematic notes on Asian birds. 5. Types of the Pittidae. *Zool. Verhand. Leiden* 331: 101–119.
- Dickinson, E. C., Dekker, R. W. R. J., Eck, S. & Somadikarta, S. 2001. Systematic notes on Asian birds. 12. Types of the Alaudidae. *Zool. Verhand. Leiden* 335: 85–126.
- Dickinson, E. C., Dekker, R. W. R. J., Eck, S. & Somadikarta, S. 2002. Systematic notes on Asian birds. 26. Types of the Pycnonotidae. *Zool. Verhand. Leiden* 340: 115–160.
- Elter, O. 1986. *La collezione ornitologica del Museo di Zoologia dell'Università di Torino*. Cataloghi 8. Museo Regionale di Scienze Naturali, Torino.
- International Commission on Zoological Nomenclature (ICZN). 1999. *International code of zoological nomenclature*. Fourth edn. The International Trust for Zoological Nomenclature, London.
- Mayr, E. & Greenway, J. C. (eds.) 1960. *Check-list of birds of the world*, vol. 9. Mus. Comp. Zool., Cambridge, MA.
- Nicholson, F. 1883. On a second collection of birds made in the island of Sumatra by Mr. H. O. Forbes. *Ibis* 25: 235–257.
- Oberholser, H. C. 1899. Some untenable names in ornithology. *Proc. Acad. Nat. Sci. Philadelphia* 51: 201–216.

- Poggi, R. 2010. Gli "Annali" pubblicati dal Museo civico di Storia naturale "Giacomo Doria" di Genova: storia del periodico ed indici generali dei primi cento volumi (1870-2009). *Ann. Mus. Civico Storia Nat. "Giacomo Doria"* 101: 1–529.
- Salvadori, T. 1879. Catalogo di una collezione di uccelli fatta nella parte occidentale di Sumatra dal Prof. Odoardo Beccari. *Ann. Mus. Civico Storia Nat. Genova* 14: 169–253.
- Salvadori, T. 1888. Descrizione di una nuova specie del genere *Hemixus* raccolta in Sumatra dal Dott. O. Beccari. *Ann. Mus. Civico Storia Nat. Genova* 25: 525–527.
- Salvadori, T. 1916. Notizie storiche intorno alla collezione ornitologica del Museo di Torino. *Mem. R. Accad. Sci. Torino* (2)65: 1–49.
- Wardlaw Ramsay, R. G. 1882. Descriptions of two new species of birds from Sumatra. *Ann. Mag. Nat. Hist.* (5)10: 431.
- Warren, R. L. M. & Harrison, C. J. O. 1971. *Type-specimens of birds in the British Museum (Natural History)*, vol. 2. Trustees of the Brit. Mus., London.

*Addresses:* Giorgio Aimassi, c/o Museo Regionale di Scienze Naturali, Turin, Italy, e-mail: gaimass@tin.it.  
Edward C. Dickinson, 19 Marlborough Court, Southfields Road, Eastbourne BN21 1BT, UK, e-mail: edward@asiaorn.org



# Slate-crowned Antpitta *Grallaricula nana* in the western Andes of Ecuador

by Juan F. Freile, José M. Loaiza & Pablo Molina

Received 6 March 2018; revised 26 April 2018; published 22 June 2018

<http://zoobank.org/urn:lsid:zoobank.org:pub:6B045FD6-E8C7-4366-8815-940EA6802478>

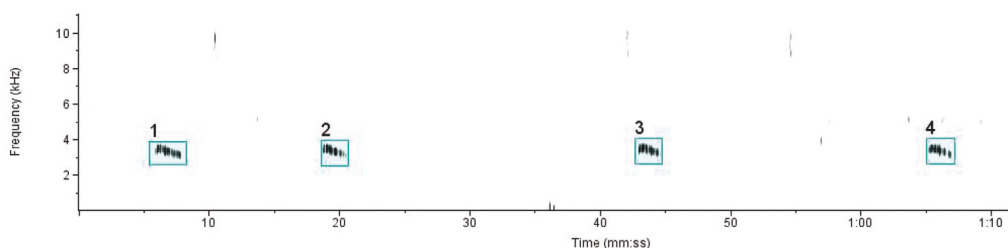
Slate-crowned Antpitta *Grallaricula nana* has a widespread Andean distribution, with up to eight subspecies recognised (Krabbe & Schulenberg 2003, Donegan 2008). It ranges from the coastal mountains of Venezuela, west and south along the three Andean ranges in Colombia, and in the eastern Andes of Ecuador to northernmost Peru, with an isolated population in the tepuis of south-east Venezuela and adjacent Guyana (Greeney 2018). The taxonomy of *G. nana* is not fully resolved, as indicated by ongoing discussion as to the validity of *G. nana cumanensis* (with *G. n. pariae*) and *G. n. kukenamensis* as separate species (Donegan 2008, Remsen *et al.* 2017, Greeney 2018).

Between southern Colombia and northern Peru, *G. nana* has been recorded to date only on the Amazonian slopes of the eastern Andes (Krabbe *et al.* 2017). These populations have been assigned to *G. n. occidentalis* by some authorities (Donegan 2008, Krabbe *et al.* 2017, Greeney 2018) but to the nominate subspecies by Krabbe & Schulenberg (2003) who synonymised *G. n. occidentalis* with it (see also Ridgely & Greenfield 2001).

During field work on 3–7 February 2017 at El Corte (00°49'13.28"N, 78°05'40.63"W; 2,500–2,620 m elevation), Carchi province, north-west Ecuador, we discovered *G. nana* in natural secondary forests on very steep slopes adjacent to small streams. We located five territories in very dense and tangled understorey, with patchy bamboo and a broken canopy. Despite intensive efforts, we were unable to mist-net or photograph adults, but we recorded the vocalisations of two different individuals (Fig. 1; archived on xeno-canto.org; XC404700, 404702, 404706, 404707).

The geographically closest population to north-west Carchi is in the eastern Andes of Ecuador, which corresponds to *G. n. occidentalis* (*fide* Donegan 2008, Krabbe *et al.* 2017, Greeney 2018). The *nudo de Pasto* of southern Colombia—where the three Andean ranges of Colombia merge into a single plateau—reaches c.4,000 m at high passes, and isolates the eastern and western slopes of the Andes. However, several taxa (i.e. Golden-faced Tyrannulet *Zimmerius chrysops*, Sulphur-bellied Tyrannulet *Mecocerculus minor*, Rufous-tailed Tyrant *Knipolegus poecilurus*, Bicoloured Antvireo *Dysithamnus occidentalis*) that occur on the eastern Andean slopes of southern Colombia and northern Ecuador 'spill over' the Andes into north-west Ecuador, north of the dry Mira Valley (Krabbe *et al.* 1998, Krabbe 2008), in some cases ranging into south-west Colombia as well. This pattern is probably shared by *G. nana* given the lack of records from the western Andes of Imbabura and ornithologically well-known Pichincha province, south of the Mira Valley. To date, there is a single, undocumented record of *G. nana* from the West Andes of southern Colombia, at Laguna de Cumbal (00°57'02.5"N, 77°49'05.7"W), dpto. Nariño, just 30 km north of the El Corte region, in 2015 (J. Zuleta; <https://ebird.org/view/checklist/S25166185>). This record, however, requires confirmation as the locality appears unsuitable by elevation and habitat for *G. nana*. Other localities on the Pacific slope of the West Andes of Colombia are further north—beyond the Patía Valley, from dpto. Cauca northwards (Donegan 2008, Greeney 2018).

A



B

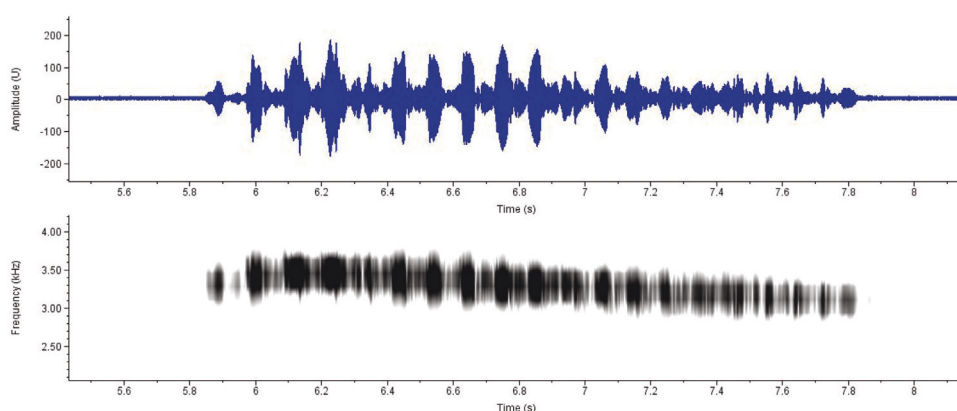


Figure 1. Sonogram of four phrases of song (A); sonogram and oscillogram of a single phrase (B) of Slate-crowned Antpitta *Grallaricula nana*, El Corte, Carchi province, north-west Ecuador, February 2017. Recorded by JFF using a Zoom H4N Pro (Zoom North America, NY) with built-in microphone; sonogram and oscillograms prepared by PM using Raven Pro (Cornell Lab of Ornithology, Ithaca, NY).

Donegan (2010) suggested that the population in the West Andes of north-central Colombia and the headwaters of the Magdalena Valley, where the West and Central Andes meet, might represent an unnamed subspecies, due to its vocal characters. Curiously, Donegan (2008) included two localities from eastern dpto. Nariño, close to the Ecuadorian border on the east-facing slope of the Andes (Llorente and La Victoria; Paynter 1997), as being occupied by this putative subspecies. Our recordings suggest that the vocalisations of *G. nana* in north-west Carchi are similar to those of widespread *G. n. occidentalis*. Number of notes, song duration and pace are within or close to the range of variation in this subspecies (Donegan 2008), suggesting a closer relationship with cis-Andean populations of *G. n. occidentalis* and not to the West Andes population in northern and central Colombia (Donegan 2008). It remains to be determined if *G. n. occidentalis* ranges north to the Patía Valley onto the Pacific slopes of dpto. Cauca and northwards, and whether it meets the population in West Andes of Colombia (*vide* Donegan 2008).

We tentatively assign the population in north-west Carchi to *G. n. occidentalis*, but suggest the need for additional exploration of the area—including adjacent dpto. Nariño of southern Colombia—to obtain further audio-recordings and to collect specimens, considering the apparent geographic isolation from both *G. n. occidentalis* and the West Andes ‘vocal type’ of Donegan (2008, 2010). A better understanding of the distribution of *G. nana* subspecies in south-west Colombia will also aid in understanding the geographic variation in song postulated by Donegan (2008).

### Acknowledgements

Field work formed part of a project searching for Turquoise-throated Puffleg *Eriocnemis godini*, funded by the American Bird Conservancy. Thanks to Wendy Willis and Daniel Lebbin for their assistance; to Jordan Karubian for his permanent support and advice; and to Lenin Quintanchala and Rubén Quintanchala for hospitality and company in the field. Harold Greeney provided an insightful revision of the submitted manuscript.

### References:

- Donegan, T. M. 2008. Geographical variation in Slate-crowned Antpitta *Grallaricula nana*, with two new subspecies from Colombia and Venezuela. *Bull. Brit. Orn. Cl.* 128: 150–178.
- Donegan, T. M. 2010. *Grallaricula nana*: subspecies and species limits. [www.xeno-canto.org/article/34](http://www.xeno-canto.org/article/34) (accessed 10 January 2018).
- Greeney, H. F. 2018. *Antpittas and gnateaters*. Christopher Helm, London.
- Krabbe, N. 2008. Arid valleys as dispersal barriers to high-Andean forest birds in Ecuador. *Cotinga* 29: 28–30.
- Krabbe, N. & Schulenberg, T. S. 2003. Family Formicariidae (ground antbirds). Pp. 682–731 in del Hoyo, J., Elliott, A. & Christie, D. A. (eds.) *Handbook of the birds of the world*, vol. 8. Lynx Edicions, Barcelona.
- Krabbe, N., Skov, F., Fjeldså, J. & Petersen, I. K. 1998. *Avian diversity in the Ecuadorian Andes. An atlas of distribution of Andean forest birds and conservation priorities*. DIVA Tech. Rep. 4. Centre for Research on the Cultural and Biological Diversity of Andean Rainforests (DIVA), Rønde.
- Krabbe, N. K., Schulenberg, T. S., de Juana, E. & Kirwan, G. M. 2017. Slate-crowned Antpitta (*Grallaricula nana*). In del Hoyo, J., Elliott, A., Sargatal, J., Christie, D. A. & de Juana, E. (eds.) *Handbook of the birds of the world Alive*. Lynx Edicions, Barcelona (retrieved from [www.hbw.com/node/56919](http://www.hbw.com/node/56919) on 22 December 2017).
- Paynter, R. A. 1997. *Ornithological gazetteer of Colombia*. Second edn. Mus. Comp. Zool., Cambridge, MA.
- Remsen, J. V., Areta, J. I., Cadena, C. D., Jaramillo, A., Nores, M., Pacheco, J. F., Pérez-Emán, J., Robbins, M. B., Stiles, F. G., Stotz, D. F. & Zimmer, K. J. 2017. A classification of the bird species of South America. [www.museum.lsu.edu/~Remsen/SACCBaseline.html](http://www.museum.lsu.edu/~Remsen/SACCBaseline.html) (accessed 22 December 2017).
- Ridgely, R. S. & Greenfield, P. J. 2001. *The birds of Ecuador*, vol. 1. Cornell Univ. Press, Ithaca, NY.
- Addresses:* Juan F. Freile, Comité Ecuatoriano de Registros Ornitológicos, Pasaje El Moro E4-216 y Norberto Salazar, Quito, Ecuador, e-mail: [jfreileo@yahoo.com](mailto:jfreileo@yahoo.com). José M. Loaiza, Fundación ECOMINGA Red de Bosques Protectores Amenazados, 12 de Noviembre 270 y Luis A. Martínez, Baños, Ecuador. Pablo Molina, San Antonio de Ibarra, Calle Ramón Teanga, Ecuador.





## CONTENTS

Club Announcements .....	66
BOESMAN, P., CLAESSENS, O., COSTA, T. V. V., PELLETIER, V., INGELS, J. & RENAUDIER <sup>†</sup> , A. Songs of Rusty Tinamou <i>Crypturellus brevirostris</i> and duetting in <i>Crypturellus</i> species .....	69
HALLEY, M. R. The ambiguous identity of <i>Turdus mustelinus</i> Wilson, and a neotype designation for the Veery <i>Catharus fuscescens</i> (Stephens) .....	79
SÁNCHEZ <sup>†</sup> , J. E., CONEJO-BARBOZA, K., SÁNCHEZ, C., ARCE, A. A. F., TENORIO, J. & SANDOVAL, L. Nest architecture and parental care in Ruddy Treerunner <i>Margarornis rubiginosus</i> .....	93
ALLPORT, G. Notable recent records of terns, gulls and skuas in southern Mozambique including the first country records of Black Tern <i>Chlidonias niger</i> .....	101
KIRWAN, G. M., SHIRIHAI, H. & SCHWEIZER, M. A morphological revision of Mascarene Swiftlet <i>Aerodramus francicus</i> , with the description of a new subspecies from Reunion.....	117
NETO, M. N., PEREIRA, F. D., WUO, A. L. M. & NETO, C. Z. Third record of the Critically Endangered Brazilian Merganser <i>Mergus octosetaceus</i> in São Paulo state, south-east Brazil, after almost two centuries .....	131
AIMASSI, G. & DICKINSON, E. C. <i>Hemixus sumatranus</i> Wardlaw Ramsay, 1882, and <i>Hemixus sumatranus</i> Salvadori, 1888 .....	135
FREILE, J. F., LOAIZA, J. M. & MOLINA, P. Slate-crowned Antpitta <i>Grallaricula nana</i> in the western Andes of Ecuador .....	140

## EDITORIAL BOARD

Bruce M. Beehler, Murray Bruce, R. T. Chesser, Edward C. Dickinson, Françoise Dowsett-Lemaire, Steven M. S. Gregory, José Fernando Pacheco, Robert B. Payne, Pamela C. Rasmussen, Cees Roselaar, Thomas S. Schulenberg, Lars Svensson

**BOC Office**  
 c/o Natural History Museum at Tring,  
 Akeman Street, Tring, Herts. HP23 6AP, UK  
 E-mail: [info@boc-online.org](mailto:info@boc-online.org)  
 Tel. +44 (0)208 8764728 / 07919174898

Registered Charity No. 1169733

**[www.boc-online.org](http://www.boc-online.org)**