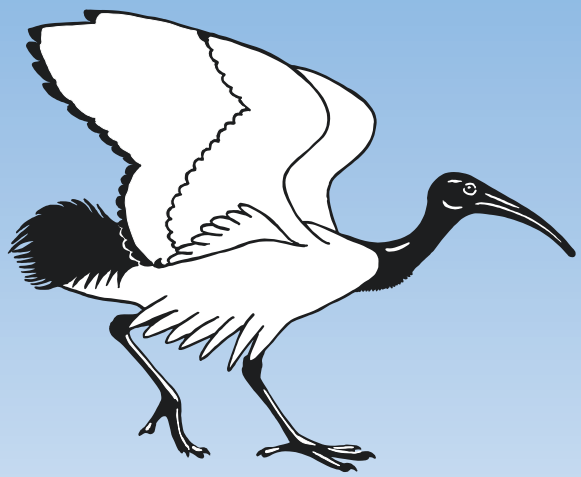
Bulletin of the British Ornithologists' Club



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Bulletin of the
BRITISH ORNITHOLOGISTS' CLUB

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CLUB ANNOUNCEMENTS

The 992nd meeting of the Club was held on Monday 12 November 2018 in the upstairs room at the Barley Mow, 104 Horseferry Road, London SW1P 2EE. Twenty-five people were present: Miss H. Baker, Mr P. J. Belman, Mr R. Bray, Mr S. Chapman, Ms J. Childers, Ms J. Day, Mr R. Dickey, Mr R. Gonzalez, Mr K. Heron, Ms J. Jones, Mr R. Langley, Dr C. F. Mann, Mr F. Martin, Mr D. J. Montier, Mr T. J. Pittman, Mr R. Price, Dr O. Prŷs-Jones, Dr R. Prŷs-Jones, Dr D. G. D. Russell, Mr P. Sandema, Mr S. A. H. Statham, Mr C. W. R. Storey (*Chairman*), Dr J. Tobias (*Speaker*), Mr J. Verhelst and Mr P. Wilkinson.

Joe Tobias gave a talk entitled *The shape of birds, and why it matters*. 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 eco-morphology 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. Joe's talk explored recent research based on detailed measurements of almost all of the world's bird species, and described 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?

REVIEWS

McGhie, H. A. 2017. *Henry Dresser and Victorian ornithology – birds, books and business.* Manchester Univ. Press. 368 pp, 62 colour plates and 78 other illustrations. ISBN: 978-1-7849-9413-6. Hardback, £25.

A good museum curator is a combination of organiser, manager, historian and detective, and Henry McGhie has expertly used all four skills in this extremely useful book, which is so much more than just a biography of a man obsessed by birds. McGhie explores the very unusual life of Henry Eeles Dresser (1838–1915), who clearly displayed these same four skills, plus those of businessman, publisher and bird collector. Dresser came from a wealthy Yorkshire family, who had made a fortune in the timber trade. His parents made sure their son had the right education to succeed in this by sending him to school in countries heavily involved in timber—Dresser thereby became fluent in German, French and the Scandinavian languages, which stood him in good stead as an avid collector of birds and their eggs. He travelled all over the Old World for business, but had special connections with Canada and the Baltic.

On his very first day at Manchester Museum, McGhie came across a box of archival material belonging to Henry Dresser and was hooked from that moment. Dresser's bird collections (skins and eggs) are found in museums all over the world, but the Manchester collection is particularly rich. McGhie has the added bonus of having being able to purchase, for the museum, an important album of portrait photographs and letters from Dresser's correspondents. This is a gold mine of portraits, with autographs, of the most important and influential ornithologists of the times. McGhie's book is liberally scattered with these gems: John Harvie-Brown leans nonchalantly on his gun, whereas Ernest Shelley seems about to fire his. Both are dressed in immaculate three-piece suits, whereas 'The Old Bushman' Horatio Wheelwright is more suitably dressed for the field, posed with both his gun and working dog.

Dresser is described as a man with 'demoniacal energy', with a striking and intense appearance set off rather strangely by an ill-fitting wig. He always talked at great speed and rarely about anything other than birds. He was a leading light in British natural history societies—most notably the British Ornithologists' Union (BOU) and the Zoological Society of London—and a prolific speaker and correspondent. Undoubtedly Dresser's most important publication is the monumental *A history of the birds of Europe*, published in 84 parts between 1871 and 1882, but he wrote more than 100 books and articles on birds and their eggs.

Henry McGhie's stated purpose for writing this book was to explore the world of Victorian ornithology, and how the world of birds and the attitudes to ornithological collections in museums have changed over time. How can the modern museum perform better to support nature conservation? What values should curators have today and what choices should they be making? How should these attitudes be explained to the general public?

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Whatever ornithological fact you might be looking for from Henry Dresser's period, it will be in this book, carefully referenced. It is a mine of information and the result of much meticulous research.

Clemency Fisher

Nowak, E. 2018. *Biologists in the age of totalitarianism: personal reminiscences of ornithologists and other naturalists*. Cambridge Scholars Publishing, Newcastle upon Tyne. 358 pp, many black-and-white photographs. ISBN (10): 1-5275-1099-9 / ISBN (13): 978-1-5275-1099-9. Hardback, £65.99.

For many British and American ornithologists, this book will provide novel, fascinating, and frequently terrifying insight into the lives of continental European, and some Asian, ornithologists during the 20th century. Their names will often be known, indeed familiar, from the ornithological literature, but the conditions under which many had to struggle just to survive, let alone undertake research, under brutal, competing, totalitarian dictatorships will be almost incomprehensible. Dr Eugeniusz Nowak, an ornithologist and conservationist who was born in 1933 in Poland and now lives in Germany, himself lived through these events and, as the title suggests, writes from personal knowledge of nearly all of the 40 or more individuals included.

The focus of the book, based on earlier editions in German, Russian and Polish, is very much on the personal lives and challenges faced by the individuals discussed, rather than on the details of their scientific output. Binding the whole volume together is the towering figure of Erwin Stresemann (1889–1972), probably best known to English-speaking ornithologists from the 1970s translation of his seminal early 1950s survey of the history of ornithology, written in the ruins of post-WWII Berlin. His account, at 35 pages, opens the book and is much the longest in it, but his name recurs repeatedly thereafter as he had contacts with, taught or otherwise influenced numerous of the other individuals. It seems extraordinary that there has been as yet no English-language version of his biography produced. I was amused to read of his nickname as the 'Pope' of ornithology, as I had always understood that it was Allan Octavian Hume who had held this title (Collar & Prŷs-Jones 2012)—maybe a little further digging will reveal a hitherto unexamined chronological succession of ornithological pontiffs!

Fascinating background details of individuals previously known to me only from papers they had written or species named after them leap out from these pages. Back in the 1970s, when writing a thesis on buntings *Emberiza*, a paper that excited me sufficiently to get translated from the Russian was by Stegman (1948), recounting his studies in the delta region of the River Ili in Kazakhstan into the counter-intuitive differences in winter feeding ecology between thick- and thin-billed Reed Buntings *E. schoeniclus*. Since then I have always had a vague aspiration to visit this exotic-sounding area, but Nowak's account of the circumstances of Boris Karlovich Stegman's self-imposed five-year exile to this remote environment places my naïve thoughts in a harshly factual framework, as well as informing me that Stegman actually wrote a book about his experiences, unfortunately only available in Russian! On a less personal note, the amazing history of the Jankowski family, notably Michal Jankowski (1842–1912) of Jankowski's Bunting *E. jankowski* fame, was totally unknown to me, including their links to the Brynner family, with their son Julka, the future American film star Yul Brynner.

A frequent reaction I experienced to reading the accounts here was the desire for further information; often this is actually available, as the excellent reference list points out, though not normally in the couple of languages that are all I can even attempt to read. One notable exception is someone who here receives merely a passing mention, namely Gerd Heinrich (1896–1984), who collected birds for Stresemann in then exotic places such as Sulawesi, but was by inclination an expert on the Ichneumonidae. The truly mind-expanding travels and travails of this man, born in the much fought-over region that has at different times been part of Poland and Germany, encompass most of the 20th century and have been recounted in a compelling biography and family history, *The snoring bird*, by his son Bernd Heinrich (2007), himself an outstanding American academic biologist and writer on avian natural history.

A sideline that emerges from Nowak's account touches on contacts during WWII between German ornithologists, such as Stresemann and Günther Niethammer, with captive British servicemen who had ornithological interests, such as John Buxton and George Waterston. The experiences of the latter men have of course previously been written about, an insightful summary being by Niemann (2012), but it is intriguing to acquire brief glimpses of these interactions from a central European perspective. Throughout his book, Nowak presents a remarkably balanced account not only of the struggles of the individuals he covers both to survive and to undertake ornithological research, but also of the moral failings that he and others have perceived in some of them, highlighting the extraordinary conditions under which they lived, allowing readers to draw their own conclusions as to how they might themselves have behaved in similar circumstances.

The book is nicely produced and generally very well translated, although unfortunately sufficiently expensive to potentially deter many who might otherwise consider reading it. I would strongly urge them to make the investment, and thereby begin to flesh out their knowledge of the lives behind the names of some leading ornithologists of the past 100 or more years.

Robert Prŷs-Jones

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OBITUARY

James (Jim) W. Wiley, 20 January 1943–19 September 2018

Jim Wiley commenced his professional life as a physician in the Vietnam War, and it was only on his return to the US that he realised that he wanted to be a biologist. Firstly he worked as an ichthyologist and later as a herpetologist, but birds eventually captured him for the rest of his life. Few colleagues are perhaps aware that Jim's first visit to the West Indies was to Cuba, not as a biologist, but as a student with two friends, after his history professor had suggested that they might witness the arrival of the Castro rebel caravan into Havana on 1 January 1959. As an ornithologist, his first visit to the Caribbean was in the early 1970s, when he went to Puerto Rico to study columbids. Jim's main focus became the study of threatened species in the Greater Antilles such as *Amazona* parrots, Plain *Patagioenas inornata* and White-crowned Pigeons *P. leucocephala*, raptors, and many others, but it was a study of the invasive Shiny Cowbird *Molothrus bonariensis* which enabled his Ph.D. in 1982 from Miami University. His second visit to Cuba was not until the late 1980s but the country soon became a major attraction to Jim, with many interesting, poorly known and threatened species.

My first contact with Jim was at the Museo Nacional de Historia Natural de Cuba, Havana, where he was collating information concerning the museum's material as part of a project to database all Cuban specimens around the world (Wiley *et al*. 2008). Afterwards, I offered him a lift on my bike (this was during the Special Period when public transport was terrible), never suspecting that I was taking an Olympic cyclist (he competed in the 1968 Mexico City games), but I soon realised that he was the best field ornithologist I had ever met. We soon became good friends and excellent colleagues.

His support of my studies and those of many other Cuban ornithologists was infinite and his company unforgettable, always lots of work but many laughs along the way. I never understood how he could conduct so many projects so well, and make the impossible possible. He responded to every e-mail immediately and reviewed every paper in detail, yet still produced his own work. He was a person who never said no to anybody, and was always ready to help, especially those lacking basic materials or references, but also by supporting expeditions and research with his own money. Such support was spread far and wide across Cuba, even to people that he hardly knew, as just the recommendation of a colleague was more than enough to enlist his help. It was not always an easy task for Jim to obtain a work visa for Cuba, but despite these and many other adversities his love for Cuba's nature and its people kept him going. That and his indomitable will to continue and improve his detailed studies, even in the worst field and health conditions, many times

Left: Jim Wiley, Ciénaga de Zapata, Cuba (Arturo Kirkconnell)

Right: Arturo Kirkconnell (left) and Jim Wiley researching hole-nesting birds, Ciénaga de Zapata, Cuba (Arturo Kirkconnell Posada)

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totally covered by mosquitoes in the Zapata Peninsula, or riding his bike for many kilometres carrying his huge backpack full of equipment.

It was a Cuban doctor who recommended that he leave the country right away, to try to tackle the cancer that would ultimately take his life (albeit not until several years later). I tried to change his mind, but nothing could prevent him from continuing, thus he remained another three months in Zapata on this visit. Even to convince him to take a lift from somebody, instead of cycling everywhere along rough trails, proved futile. Some of the local people in Zapata referred to him as the biggest protector of the forest and its birds.

It is Jim's spirit, camaraderie and desire to share and help others that will live with me longest, and impressed me most, but he also possessed a quite amazing curriculum vitae that included more than 300 scientific publications. He also participated in several books, among them *A guide to the birds of the West Indies* (Raffaele *et al*. 1998)—the successor to Bond's field guide—and *The birds from Hispaniola: an annotated checklist* (Keith *et al*. 2003), but perhaps most importantly his sole effort, *A bibliography of West Indies ornithology* (Wiley 2000), a compendium project that perhaps only Jim, or someone of similarly unshakeable resolve, could have completed successfully. In addition, he was a founding member of the Society of Caribbean Ornithology and the first editor of its publication *El Pitirre* (now the *Journal of Caribbean Ornithology*) overseeing, during his nine years at the helm, its transition from newsletter to fully fledged journal and helping countless young and inexperienced authors along the way.

Wiley's legacy was extraordinary, and his data and knowledge of Cuban endemic birds staggering, some of which will form part of a BOC checklist to the country's birds that is currently being edited for publication (Kirkconnell *et al*. in press). Jim's final research was focused on the largest of the West Indies, on the breeding and foraging ecology of Gundlach's Hawk *Accipiter gundlachi*, a study of cavity nesters such as Cuban Parrot *Amazona leucocephala*, Cuban Pygmy Owl *Glaucidium siju*, Bare-legged Owl *Margarobyas lawrencii* and the country's woodpeckers (Picidae), as well as Bee Hummingbird *Mellisuga helenae*. Jim's desire to know the intimate details of the natural history of Cuba's threatened and endemic birds was unsurpassed, because his commitment was to their conservation, the ultimate goal that drove every piece of research he conducted.

Jim was the recipient of several awards (including the Alexander F. Skutch and Gundlach medals) for his contribution to bird conservation. It is some measure of the respect in which he was held that he was the first foreigner to be recognised with the latter by the Cuban Zoological Society. I am deeply honoured to have counted as a friend such an outstanding ornithologist. A mutual friend wrote after he passed on 'It is a terrible loss to Caribbean ornithology, and we know that he achieved more than most people do in about three lifetimes.' Rest in peace dear friend, we all miss you!

Arturo Kirkconnell

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Corrigendum. The melanistic variety of Red-legged Partridge *Alectoris rufa* continued

by Hein van Grouw, Ludovic Besson & Benoît Mellier

Received 12 February 2019

Following the publication of our paper regarding extant specimens of melanistic Red-legged Partridges (van Grouw *et al*. 2018), another such specimen, apparently not yet adult, came to our attention (Figs. 1–2). It was received by the Muséum des sciences naturelles d'Angers (MHNAn) from the Catholic University of the West in Angers (Université Catholique de l'Ouest = UCO). Freedom of teaching was granted in France on 1 July 1875 after many universities had been temporarily disbanded during the French Revolution. The French bishops decided then to found five Catholic universities and Angers, thanks to Bishop Charles Émile Freppel (1827–91), was chosen to serve western France. The university was founded in November 1875, and possesses some natural history collections from the 19th century. In late 2014, due to lack of space, the UCO asked MHNAn if the museum was interested in parts of the university's collections. Among the specimens was an '*atro-rufa*'; a melanistic Red-legged Partridge. Unfortunately, no labels or any associated data came with this specimen, so its origin appears unknown. However, we can speculate that it may be connected with Michel Honoré Vincelot (1815–77) and perhaps also Eugène Lemetteil (1822–90).

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Figures 1–2. Mounted specimen of a melanistic Red-legged Partridge *Alectoris rufa*, originally part of the collection of the Université Catholique de l'Ouest, now in the Muséum des sciences naturelles d'Angers, France (Michel Beucher, © Musées d'Angers)

Lemetteil was a keen amateur ornithologist from Bolbec in Normandy, northern France. He had a melanistic partridge that was sent to him by Abbot Vincelot (Lemetteil 1869), but it seemed to be lost (van Grouw *et al*. 2018). Michel Honoré Vincelot (1815–77) was an abbot at Angers (Crépon 1877), an amateur ornithologist and a member of the Linnaean Society of Maine-et-Loire. He also was honorary canon at the Saint Maurice Cathedral of Angers and a member of the Departmental Council of Public Education (Port 1878), later the Catholic University of the West in Angers. Vincelot had an egg collection, including some eggs of *atro-rufa* (Vincelot 1867). Although he did not mention specimens, he must have had at least one melanistic Red-legged Partridge as he sent that to Lemetteil. Most of Vincelot's egg collection is at UCO (BM pers. obs. 2018), and was probably donated by Vincelot himself or a next of kin. One can assume that, if Vincelot also had skins / mounts, these were donated to UCO too, meaning that the mounted specimen now at MHNAn can be assumed to have originated from Vincelot's collection. Whether it was the specimen he had send to Lemetteil initially, and perhaps was returned to him, or that Vincelot had a second specimen is a mystery.

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FORTHCOMING MEETINGS

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

BOC MEETINGS are open to **all**, not just BOC Friends, **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 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 20 May 2019—6.30 pm—Julian Hume—*Birds of Lord Howe Island: past, present and future*

Abstract.—Lord Howe Island, situated 790 km north-east of Sydney in the Tasman Sea, was first observed on 17 February 1788, making it one of the last islands to be discovered by Europeans. An endemic gallinule, pigeon and parakeet were quickly hunted to extinction, but habitat alterations were minimal; therefore a diverse forest bird fauna remained intact. The accidental introduction of Black Rats *Rattus rattus* in 1918 and barn owls (*Tyto*) in the 1920s resulted in another wave of bird extinctions, but several endemics survive including a flightless rail. Seabird diversity is also high and they still breed in large numbers, although rat predation is an ongoing problem. I present the results of a recent palaeontological and ornithological survey of Lord Howe Island, highlighting fossil discoveries and conservation successes, and also discuss the pros and cons of plans to eradicate rats entirely from the island in 2019.

Biography.—Julian Hume has travelled widely in search of avian palaeontological deposits, especially in the Mascarene Islands of Mauritius, Réunion and Rodrigues, on Madagascar and in Hawaii. More recently, he has turned his attention to islands off the Australian coast and he spoke to the Club in early 2017 on his research into the dwarf emus *Dromaius* spp. of the South Australian islands. By profession he is an artist specialising in extinct birds, but also has a Ph.D. in avian palaeontology and is a Scientific Associate of the Natural History Museum, Tring. He has written a number of books and published many papers on birds and their fossil history, his most recent book being the second edition of the widely acclaimed *Extinct birds*.

Monday 16 September 2019—6.30 pm—Pat Morris—*The Hastings Rarities: taking the long view*. **Note change in date compared to previous announcement.**

Abstract.—It is now more than 50 years since hundreds of bird records were dismissed as potentially fraudulent on the grounds that it was unlikely that so many rare species would turn up within a short period of time and a limited area around Hastings. Statistical analysis confirmed a significant difference between the numbers of records in that area and time compared to other areas of Kent / Sussex and with later periods. In ornithological terms it makes limited difference, as most of the suspect species have been found subsequently in that area. It has long been widely accepted that fraud occurred and that a local taxidermist, George Bristow, was responsible for perpetrating this. Bristow was unable to defend himself, having died, and the taxidermy profession was besmirched. Although protests were made at the time the issue appears closed. However, worrying doubts remain when the evidence is examined closely. Equally, in retrospect there may be further evidence to confirm Bristow's guilt. A colleague, Philip Redman, has also been studying details of the Hastings affair, and may hopefully be able to join us from Paris.

Biography.—Dr Pat Morris was Senior Lecturer in Zoology at Royal Holloway, Univ. of London, and well known for his studies of mammal ecology. He is a past Chairman of the Mammal Society, a former Council Member of the National Trust, and has published >70 scientific papers and *c*.20 books. A consultant to several major publishers and the BBC Natural History Unit, in his spare time he has pursued a long-standing interest in the history of taxidermy and was appointed the first Hon. Life Member of the Guild of Taxidermists. He was awarded the Founder's Medal by the Society for the History of Natural History and made MBE in the 2015 Honours List 'for services to the natural and historic environment'.

In addition the Club will be holding a one-day joint conference with the Neotropical Bird Club on **26 October 2019** in the Flett Theatre of the Natural History Museum in South Kensington, London. Attendance is open to all and entrance is free. The conference will include a range of talks on Neotropical ornithology and full details of the programme will appear on the Club's website and here in due course.

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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), 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), to discuss future 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; 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. 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).

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Notes on nesting, territoriality and behaviour of broadbills (Eurylaimidae, Calyptomenidae) and pittas (Pittidae) in Tawau Hills Park, Sabah, Malaysian Borneo

by Eric R. Gulson-Castillo, Teresa M. Pegan, Emma I. Greig, Justin M. Hite, Jack P. Hruska, Julian A. Kapoor, Sophia C. Orzechowski, J. Ryan Shipley & David W. Winkler

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http://zoobank.org/urn:lsid:zoobank.org:pub:510F5743-6D99-4097-AD89-8922B0030011

Summary.—Basic natural history and behavioural data are lacking for the majority of broadbills and pittas (Eurylaimidae, Calyptomenidae and Pittidae). We present a series of observations on these birds made during two visits to Tawau Hills Park, Sabah, Malaysia. During this period, we detected changes in temporal presence, detectability or vocal behaviour in various species. We also found habitat overlap on one ridgeline among four species of pitta. We observed a Green Broadbill *Calyptomena viridis* respond to our imitation of a call with a wing display. We discuss the social behaviour of Black-and-yellow *Eurylaimus ochromalus* and Banded Broadbills *E. javanicus*, including wing displays, territoriality, and in the first-named species, social groups comprising multiple adults. We also describe various nesting behaviours in these two species, including nest-construction techniques, incubation behaviour, nest defence, and the first described Banded Broadbill nest on Borneo. We found Dusky Broadbills *Corydon sumatranus* to frequently be the most conspicuous members of mixed-species flocks otherwise dominated by Cuculidae and Picidae. We analysed Black-crowned Pitta *Erythropitta ussheri* home range size and density in a colour-banded population, and found a potential hybrid or backcross with Garnet Pitta *E. granatina*. We observed that Blue-banded Pitta *E. arquata* make non-vocal sonations by striking their closed wings on their flanks, and discuss the immature male plumage of Blue-headed Pitta *Hydrornis baudii*.

The Old World suboscines, or Eurylaimides, are a passerine radiation that reach their highest diversity in South-East Asia. Within this region, the island of Borneo is home to three species of Calyptomenidae, five Eurylaimidae and nine Pittidae; six of these are endemic to the island (Phillipps & Phillipps 2014). Most knowledge of these birds comes from sporadic field observations, descriptions of specimens and phylogenetic analyses (e.g. Phillipps 1970, Raikow 1987, Prum 1993, Myers 1999, Prum *et al*. 2014, Zubkova & Korzun 2014). Prior to our work, there were no dedicated studies of these birds in the field on Borneo, although some Old World suboscines have been the subject of dedicated studies elsewhere (e.g., Zimmermann & Noske 2003, Zubkova 2017).

Here, we report our observations on natural history of the eurylaimid broadbills, pittas, and green broadbills made at Tawau Hills Park in Sabah, Malaysia (during six weeks in summer 2012 and three months in early 2013).

Methods

Tawau Hills Park is a national park managed by Sabah Parks, a state agency, in Tawau District in southern Sabah, near the border with Indonesia. The park was established in

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1979 to protect the water basins of seven major rivers, and spans nearly 280 km^2 (Omar & Nais 1995). It supports primary lowland and hill dipterocarp forest, *kerangas*, and lower montane forest spread across three low mountains (Gunung Magdalena—1,312 m, Gunung Lucia—1,202 m and Gunung Maria—1,083 m; Omar & Nais 1995, Sabah Parks 2018). It is the only park in Sabah to protect lowland primary forest on volcanic soils (Tjia *et al*. 1992, Lakim 2008), and thus hosts some of the tallest tropical trees in the world, including a *Shorea faguetiana* that is 88.3 m tall (Dial *et al*. 2005, Seino *et al*. 2007). The park is surrounded by plantations.

Our visits to Tawau Hills were made on 20 June–1 August 2012 and 26 February–20 May 2013. The philosophy guiding these undergraduate-led expeditions is detailed in Winkler *et al*. (2017), but our goal was to document the natural history of Old World suboscines. Our research was concentrated within the 2 km^2 of old-growth forest around the park entrance (04°39.95′N, 117°88.92′E) and included patches of primary and secondary lowland and hill forest, freshwater swamps, riparian forest, and forest edge. We also briefly visited montane forest on Gunung Lucia.

Observations.—We took notes on the life history of all suboscines encountered. We spent most time off main trails, using paths in the study area and moving between them, particularly near Black-crowned Pitta *Erythropitta ussheri* territories (see Figs. 1, 9 and 11 for

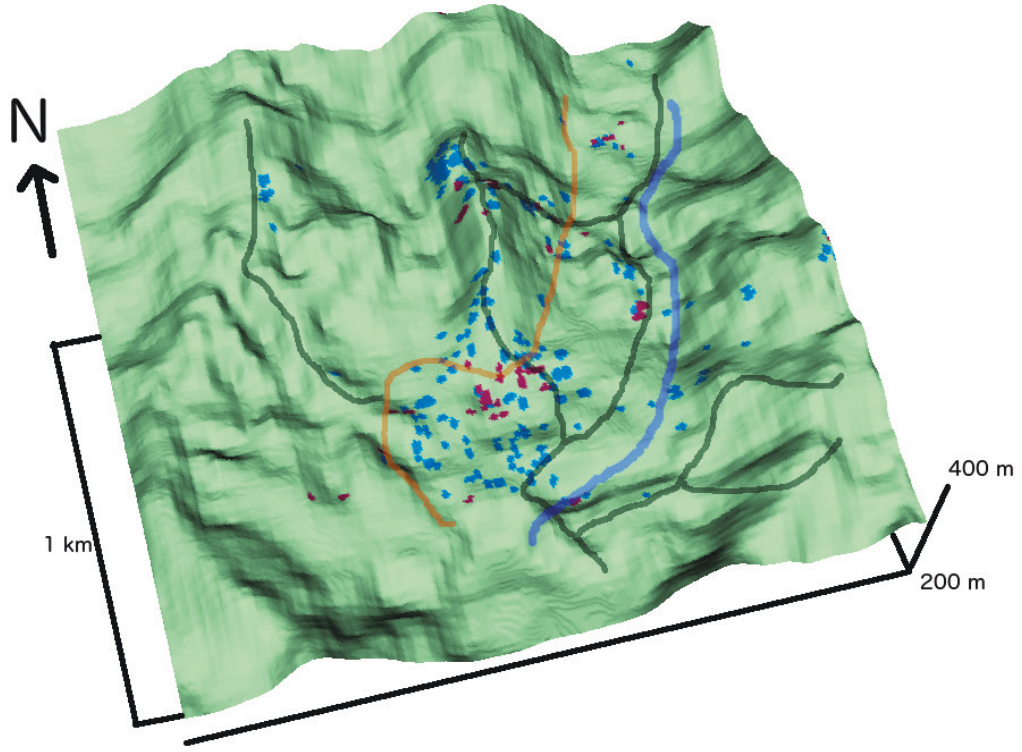

Figure 1. Map of the topography of our study area showing sightings of Black-and-yellow *Eurylaimus ochromalus* (blue) and Banded Broadbills *E. javanicus* (maroon) from both visits. Each point represents a sighting. Variation in point size and shape is an artefact of 3D plotting. This map demonstrates that Banded Broadbills occurred at a much-reduced density in the study area compared to Black-and-yellow Broadbills. Grey lines represent trails, the brown line represents a water pipeline, and the blue line represents the Tawau River. 3D map courtesy of JAXA (2015).

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maps of the main study area). During both visits, a crew of 6–8 people spent 10–12 hours per day in the field (generally 06.00–18.00 h). We follow Clements *et al*. (2018) for species limits and names.

Spot mapping.—For some focal species, we recorded the locations of sightings and plotted these on a 3D topographic map of our main study area using data from the ALOS (Advanced Land Observing Satellite) Global Digital Surface Model, released by the Japan Aerospace Exploration Agency (© JAXA 2015). See Figs. 1, 9 and 11.

Home range estimates.—We used sightings and captures of individual Black-crowned Pittas, which were colour-banded, to plot each bird's home range (i.e. the area used by the individual on a daily basis) using a kernel density estimator (Powell 2000). Analyses were performed in R 3.2.1 (R Core Team 2015) using the function *kde2d* in the package *MASS* (Venables & Ripley 2002). Bandwidth was determined using a rule-of-thumb procedure of Scott (1992), employing a standard factor of 1.06. From our observations, we used a min. 7 and max. 119 points to calculate home range estimates.

Capture.—All captured birds were caught in 30-mm mesh, 3–12 m mist-nets. To target broadbills, we suspended two 12-m, four-trammel mist-nets, one above the other, 10–30 m above ground using a pulley system fastened to a scaffolding of para-chord that we placed in the trees. We had few passive captures in these mist-nets and used playback to target individuals. All of our playback tracks were .mp3 files downloaded from Xeno-canto (www.xeno-canto.org). All birds were handled under the approved Cornell IACUC protocol # 2001-0051 to DWW, and under an access license from Sabah Biodiversity Council and research permit issued by Sabah Parks.

Media collecting.—We collected high-quality audio and video recordings of vocalisations and behaviours. All of these are archived at the Macaulay Library of Natural Sounds (macaulaylibrary.org) and are publicly available online. We include Macaulay Library video catalogue numbers to cite videos of the behaviours we describe. To easily view the linked video, use the following URL with the catalogue number in question; e.g. http://macaulaylibrary.org/asset/479590 links to the video catalogue number ML 479590.

Results

GREEN BROADBILL *Calyptomena viridis*

Encountered infrequently in the lowlands of Tawau Hills in 2012 and 2013 (despite regular visits to fruiting trees), but it was more common in the highlands in 2013. We observed the species ten times between 24 June and 26 July 2012, and twice in 2013, the latter during four visits to a strangler fig tree from 27 February to 4 March, and on a single visit to a fig tree 350 m away on the other side of a ridge on 7 April. Green Broadbills responded once to playback in 2012 (see below), but never in 2013. They were usually solitary, but we saw them in pairs several times, including on 27 February 2013, when a pair visited the understorey and made complex soft vocalisations while just out of sight. During a three-day excursion to Gunung Lucia in 2013, we heard *c*.6 individuals at 850–940 m.

The species' scarcity in the primary forest lowlands of Tawau Hills during our visits (including July 2012) contrasts with the abundant breeding activity (and responsiveness to playback) in a degraded lowland forest in July 2014 (Pegan *et al*. 2018). Others have suggested that Green Broadbills are nomadic, as evidenced by broad and sporadic elevational records, and apparent rarity when fruit is scarce (Medway & Wells 1970, Fogden 1972; but see Lambert 1989). That the species tended to appear suddenly at Tawau Hills in places that they had not been before, and then disappear again, is consistent with this hypothesis.

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On 24 June 2012, JAK observed a Green Broadbill respond to an imitation of its calls with a wing-raising display. JAK imitated the soft vocalisations of a lone male calling in the midstorey, whereupon the bird immediately flew directly and repeatedly overhead (*c*.5 m above ground). Each time the bird perched, it raised both wings so that their dorsal surfaces either touched or almost did so. Other displays in which Green Broadbills use their wings in various ways were summarised by Lambert & Woodcock (1996) and Wells (2007), although none was in response to vocal imitations or playback.

BLACK-AND-YELLOW BROADBILL *Eurylaimus ochromalus*

By far the commonest broadbills at our study site. We made spot maps of sightings (compiled in Fig. 1) which demonstrate that Black-and-yellow Broadbill occurs at a fairly high density throughout the areas we surveyed, relative to Banded Broadbill *E. javanicus* with which its home ranges overlapped.

Individuals (in pairs or small groups) often counter-sang in close proximity to other individuals or groups. They interspersed their frequent songs with throaty *keowrr* calls, which were used during sometimes aggressive confrontational interactions (as in a video JMH made at Sepilok Rainforest Discovery Centre, near Sandakan in north-east Sabah, ML 480277). Attempts to understand territoriality by colour-marking three individuals were largely unsuccessful because we only re-sighted birds twice: one on the day following its capture in the same general area; and the other at its nest, 137 m from the mist-nets, several days post-capture.

Despite frequent apparently confrontational behaviour, such as counter-singing, we rarely witnessed aggressive interactions such as chasing. Individuals we observed had a high level of tolerance for others in their territories or in close proximity. Even in areas where birds frequently counter-sang, individuals were often accompanied by several others silently perched nearby and only calling occasionally. In one territory, three adults—a female and two males—often approached together in response to playback and showed no signs of aggression to each other. Once, when only the two males appeared, they duetted after flying back and forth together, searching for the source of the vocalisations. Wells (2007) reported gatherings of up to five birds, but no 'regular associations larger than pairs or pairs with offspring'.

Although other broadbills sometimes breed cooperatively (Phillipps 1970, Lambert & Woodcock 1996, Zubkova 2017), we never saw more than two Black-and-yellow Broadbills at or in the general vicinity of nests, except once when two females and an unmarked male briefly perched near an almost constructed nest belonging to a different (colour-marked) male. One of the females entered the nest for a few seconds, but all three birds departed shortly afterwards. Unseen birds sang and called throughout the event, but the colour-marked male did not arrive until 30 minutes later. The unmarked male never came near the nest again, and it is unlikely that he was engaged in cooperation.

Wing displays have been described for this species. These involve stereotypical raising of the wings, usually slightly above the back, accompanied by a slow opening and closing of the flight feathers (Lambert & Woodcock 1996). We observed such displays in a variety of contexts. Individuals frequently displayed after singing and after arriving in an area in response to playback. However, there were many situations in which a lone bird that had apparently been foraging would open its wings. On several occasions, we observed them spread just one wing at a time, and other times a spread wing was accompanied by a tail wag. When we approached birds along the canopy walkways at the Sepilok Rainforest Discovery Centre, we could hear soft vocalisations associated with these displays (Fig. 2, ML 480226), which were higher pitched and squeakier than similar calls of Banded

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Broadbills (see below). We also sometimes witnessed gaping displays along with wing displays, during which an individual would open and close its bill in a deliberate fashion without making any sound (ML 479588, 480299). These displays may be enhanced by the striped pattern of the gape. However, it is sometimes difficult to distinguish these from non-display yawning or stretching (e.g. ML 480305). More information on the contexts of these displays would aid our understanding of the species' social behaviour.

Like Prentice (1988 *in* Lambert & Woodcock 1996), we observed a copulation following a wing-spreading display, and videoed the entire process (ML 471162). On 24 July 2012 at 07.58 h, an adult male and female perched on a horizontal branch *c*.6 m above ground. As the male flew in, the female spread her wings and opened her bill. The male then performed

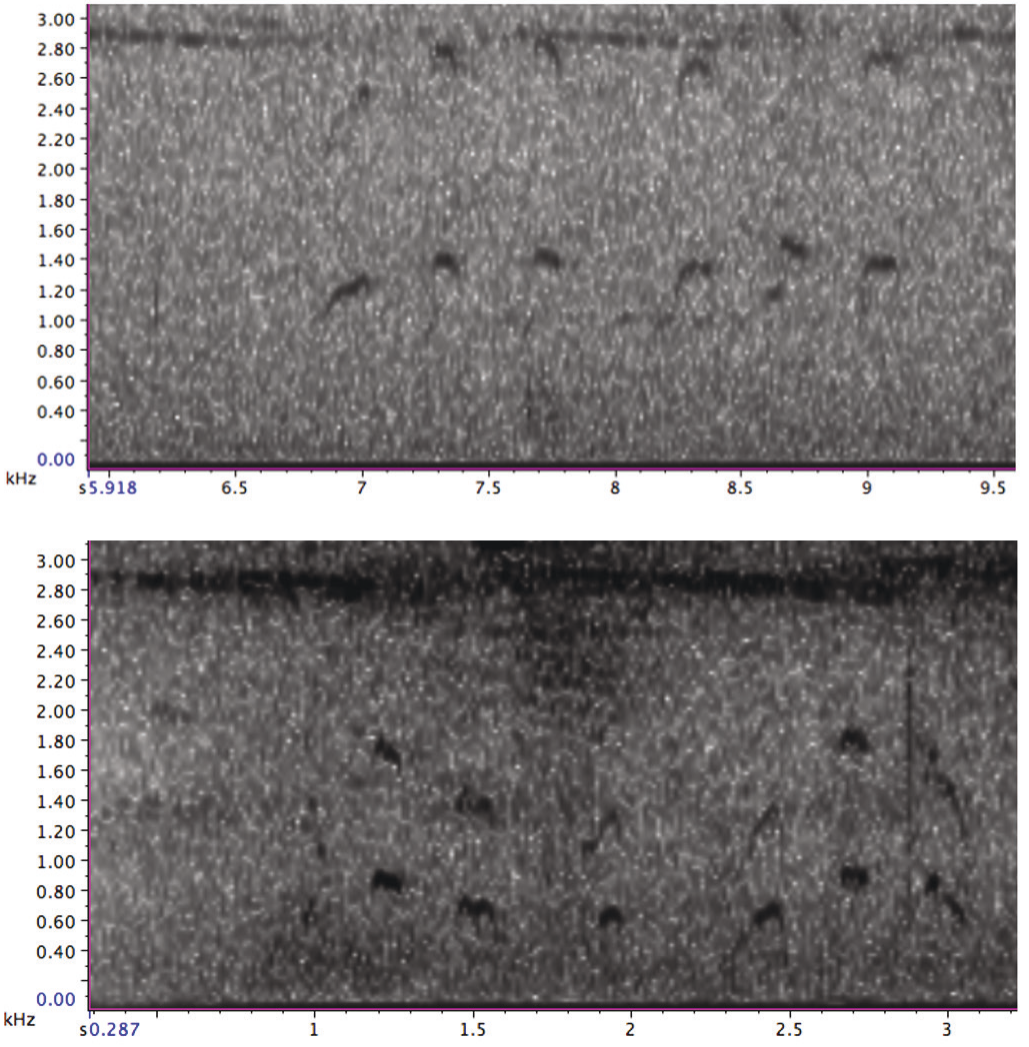

Figure 2. Spectrograms of the soft vocalisations made by *Eurylaimus* broadbills while performing spread-wing displays. In both species the duration of each note was *c*.0.12–0.2 seconds, given at a rate of 2–3 notes / second. Black-and-yellow Broadbill *E. ochromalus* calls (top, *n* = 10 in two bouts) ranged from 1.14 to 1.75 kHz (mean 1.45) and Banded Broadbill *E. javanicus* calls (above, *n* = 6 in one bout) from 0.61 to 0.88 kHz (mean 0.73). A set of harmonic notes is visible above the fundamental frequency in both spectrograms.

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Figure 3. Black-and-yellow Broadbill *Eurylaimus ochromalus* nest, 2013 (Eric R. Gulson-Castillo). Inset: Black-and-yellow Broadbill holding a green object just before bringing it to its nest, from video ML 471552 (© Brian Magnier)

the same displays. They did not wag their tails, as they did in the display described by Prentice (1988). Following several repetitions by both individuals, they copulated. The male then perched to the left of the female and continued to perform wing displays but the female did not (similar to Prentice 1988). Four seconds later the female briefly pecked the male's bill while he continued displaying. The male continued displaying his wings until after the female departed a few seconds later.

We observed one active nest (see Fig. 3) in late July 2012, and four between 9 March and 22 April 2013. An additional new nest construction attempt was observed briefly on 9 May 2013. The five nests were high in trees (*c*.20–35 m above ground). Most were at least partially shaded by a leafed branch or vine, but that in July 2012 was suspended from a brushy vine tangle dangling in the open away from the tree's trunk, exposing the nest to full sunlight. All of the nests swayed freely in wind. Some nests were concealed, but others were conspicuous. We never noticed bee or wasp hives in the vicinity of nests (Lambert & Woodcock 1996, Smythies 1999), despite searching for them. The appearance of the nests was consistent with previous descriptions (summarised in Lambert & Woodcock 1996, Bruce 2003, Wells 2007). When incubating, the bird's blue bill was often visible in the nest entrance (as in Norman 1964), but birds also frequently hunkered down and were invisible inside the chamber.

We inferred that the nest discovered on 12 July 2012 contained eggs because adults spent long periods of time inside it, probably incubating. Two nests in 2013 were discovered during nest construction between 29 March and 2 April. One nest in 2013, discovered on 13 March (when inferred to be in the incubation stage, due to long visits by adults), was predated between 19 and 21 March. Another of the 2013 nests was found completed on 27 February, but no birds were in attendance. Ten days later, we observed visiting adults

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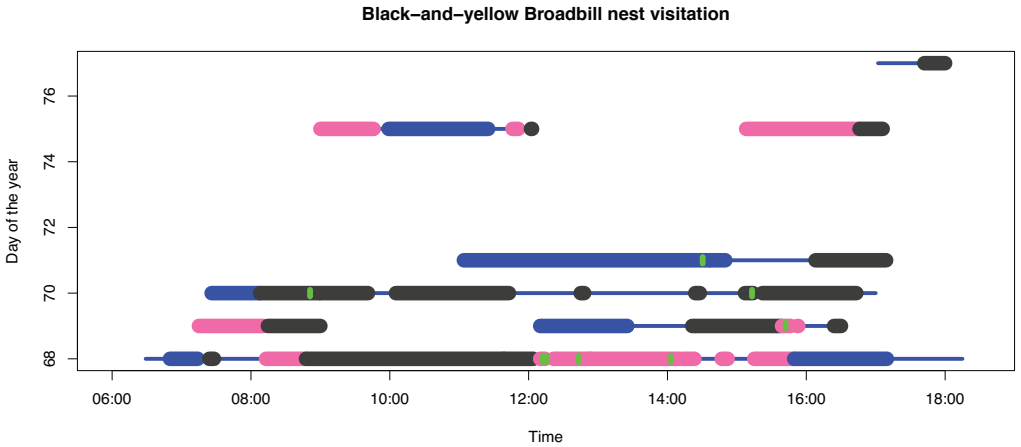

Figure 4. Graphical summary of nest visitation by Black-and-yellow Broadbills *Eurylaimus ochromalus* during incubation at one nest in 2013. Y axis = day (where day 68 = 9 March) and x axis = time of day. Thin blue lines represent time periods during which nest watches occurred, thicker lines represent visits by broadbills. Colour of thicker lines represents sex: pink = female, blue = male, dark grey = unsexed. Individuals could not always be sexed due to the angle that they approached the nest; these three colours probably represent just two individuals. When visit breaks are too short to be visible, they are marked with a small green line.

and discovered that incubation had commenced. The broadbills never laid eggs in the two nests that were discovered under construction, instead abandoning them as soon as they were complete. Some birds construct nests without using them (e.g. Verner & Engelsen 1970, Berg *et al*. 2006), but it is possible that our presence (which did not deter the birds from continuing construction efforts) might have prompted them to delay incubation. One of these nests belonged to a colour-marked individual, and we continued to see this male nearby after the birds stopped visiting it.

Both members of a pair participated in nestbuilding. Addition of material appeared to occur in three distinct parts of the nest: the roof, near the nest's attachment to the branch; the sides; and the internal chamber, where most attention was focused late in the process. Birds added material with vigorous head-shaking like Banded Broadbills, but they did not appear to pull loose material from the sides inwards to the chamber (see Banded Broadbill account). The chamber was formed from within, often by the birds pressing their head or breast against the walls. Visits with material tended to last 15–100 seconds, with visits by the female generally longer than those by the male. Sex ratio associated with the number of visits made to the nest seemed equal, with both adults working on the sides and chamber, but the roof was predominantly built by the male. Visit length increased as building progressed.

Both adults participated in incubation (Fig. 4). Entries and exits were swift and easily missed, making birds difficult to sex unless the visit was recorded on video and analysed later. Of a sample of 32 videoed visits at one nest during incubation, the female was identified visiting twice as frequently as the male (14 female, seven male, 11 unidentified due to the angle of entrance / exit). Within this small sample of visits, the mean incubation bout also differed between the sexes, with males remaining on average 75 minutes (n = 7) and females 38 minutes (n = 14; the mean duration for birds of unknown sex was 36 minutes, n = 11). When an adult departed, the nest was often unattended for several minutes before the presumed mate arrived; these off-periods were substantially shorter than on-periods, usually less than 15 minutes in duration, although they occasionally lasted >30 minutes to nearly an hour.

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Both sexes defended the nest. In 2012, we observed a Prevost's Squirrel *Callosciurus prevostii* foraging in a nest tree for 30 minutes, during which period the broadbills were apparently absent. The squirrel eventually came to a vine near the nest whereupon both pair members suddenly appeared and made very fast vertical dives near the squirrel. Although the birds did not appear to make physical contact, the squirrel jumped from the vine and landed in a tree below. We never witnessed nest parasitism, although known broadbill nest parasites (e.g. Indian Cuckoo *Cuculus micropterus*) were abundant at the study site.

We occasionally saw broadbills carry triangular green objects (probably leaves) into the nest chamber during incubation. Other broadbills often line their nests with green leaves (Wells 2007, Zubkova 2017), although Wells (2007) noted that a Black-and-yellow Broadbill nest he inspected lacked them. Once we caught an image on video that could be sexed, and it was the male holding the leaf (ML 471552; Fig. 3).

We did not observe nestlings (or feeding behaviour indicating their presence) at any of the five nests we found. One nest in 2012 was abandoned during incubation; one in 2013 was predated (and visibly torn) during incubation; two in 2013 were abandoned prior to incubation; and one in 2013 was in a tree that came into leaf subsequently, blocking the nest from view (whether it later produced nestlings is unknown). Around six weeks after the nest in 2013 was predated, we observed a pair in the early nestbuilding stages *c*.20 m away.

We saw fledglings twice, once each on 16 July 2012 and 20 March 2013. In the latter case, the bird was accompanied by three other birds—one adult of each sex and one of unknown age and sex. Both fledglings matched descriptions in Lambert & Woodcock (1996) and Myers (2009).

BANDED BROADBILL *Eurylaimus javanicus*

Encountered daily, but at lower density than Black-and-yellow Broadbill (Fig. 1). These species have been reported at similar densities in Sarawak (Fogden 1976), but our observation that Banded Broadbill is less common agrees with observations from Brunei (C. F. Mann pers. comm.).

This species shared the Black-and-yellow Broadbill's repertoire of wing and bill displays (see above). Such displays have not been previously reported for Banded Broadbill (Lambert & Woodcock 1996, Wells 2007). The context and patterns of these were similar to Black-and-yellow Broadbill displays. We also saw displays performed near a nest (ML 479554). Birds displayed both when accompanied by conspecifics, and apparently when alone. Soft calls accompanying displays were lower pitched and less squeaky than those made by Black-and-yellow Broadbills when wing-displaying (ML 480261; Fig. 2).

We found what appears to be the first nest of the species to be described on Borneo (Smythies 1999). It was under construction and suspended from the thick, serrated, drooping leaves of a large epiphytic *Pandanus* sp. (Fig. 5) growing *c*.15–20 m above ground in the lowest crotch of a *Koompassia excelsa* tree at the edge of a clearing with a densely vegetated swamp, at *c*.290 m elevation. The completed nest, which we subsequently collected and is now in the Sabah Parks Vertebrates Collection, was 25 cm tall, 22.5 cm wide and 15 cm deep. Its outward appearance was of a rounded, oblong tangle of vines (*c*.1 mm thick, some with leaves), narrow black fibres, twigs (*c*.2–3 mm thick) and scattered leaves. The entrance to the inner chamber was near the top of the tangle, directly below the *Pandanus* leaves from which the nest was suspended. It faced away from the tree trunk and the epiphyte, and was 54 mm tall by 58 mm wide. Mean thickness of the walls around the entrance was 35 mm. Diameter of the inner cavity at the nest entrance was 11.6 cm; the inner cavity was lined with thick, flat grass stems and leaves.

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Figure 5. Banded Broadbill *Eurylaimus javanicus* nest during late construction, with an adult exiting at the lower left (© Kayleigh Chalkowski). Inset: close-up of the nest chamber after the nest was abandoned and collected, showing lining material (Eric R. Gulson-Castillo).

The nest leant against the tree trunk. It was almost entirely supported by a 44 mm-thick bundle of fibres slung around one of the *Pandanus* leaves, but some stray vines were connected to other leaves nearby. The location was relatively unobscured by branches and received ample sunlight: this *Koompassia excelsa* was an emergent and the nest was sited well above the tangles and saplings of the adjacent swamp. Similar to a nest described in Peninsular Malaysia (Myers 1999), our nest was close to a bees' nest sited within the tree trunk, which had an entrance tunnel two-thirds of the way up. However, the bees were not aggressive and ignored observers, including on the three occasions when we climbed the tree after the nest had been abandoned, suggesting these were sweat bees (F. Lambert pers. comm.), which do not sting.

Upon discovery on 11 March 2013, both adults visited the site silently with nesting material, hovering beside the tree. The nestbuilding process was then observed in a series of two-hour watches between 11 and 29 March (Fig. 6). Long, tangled fibres (including vines) were draped over the base of some of the *Pandanus* leaves, near its centre. The birds generally visited the nest singly, bringing one piece of material to the top or side of the tangle. On visits to the roof of the nest, the bird generally wedged its bill into the top of the tangle, rapidly shaking its head to affix the fibre, which was left to hang freely over either side. The chamber was formed once a large number of fibres had been draped over the *Pandanus* leaves. When visiting the side of the nest, the bird would integrate some material and then grab a previously placed piece emanating from the tangle and push this material inwards, shaking its head to affix the piece to the back wall of the nest, while flaring its tail. As the nest formed, the main nestbuilding activity shifted from the exterior to the chamber. Material was added to the roof during nine of 24 observed visits between 07.00 and 09.00 h

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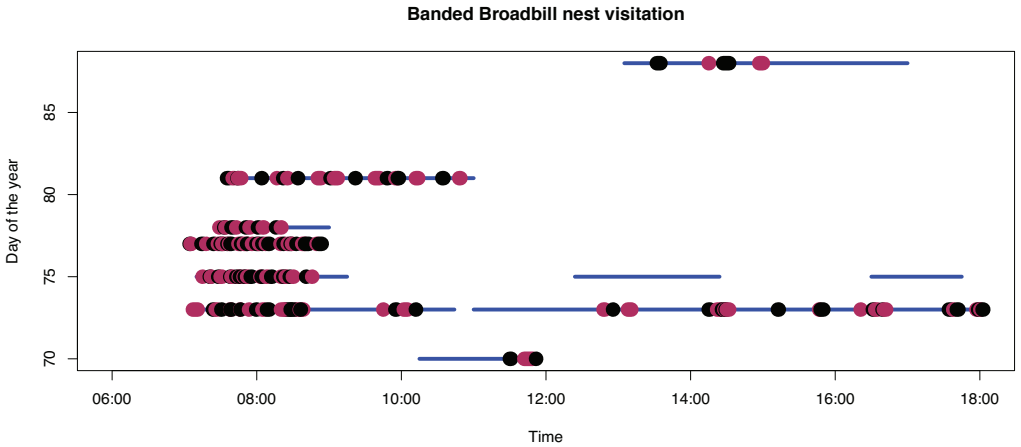

Figure 6. Graphical summary of nest visitation by Banded Broadbills *Eurylaimus javanicus* during nest construction. Y axis = day (day 70 = 11 March) and x axis = time of day. Thin blue lines represent time periods during which nest watches occurred, thicker lines visits by broadbills. The colour of each visit alternates to highlight visits with short intervening breaks, which would otherwise appear to blend into a single line; colour does not represent sex or individual.

on 14 March, five of 28 visits between 07.00 h and 09.00 h on 16 March, and one of 66 visits between 07.00 and 09.00 h on 18 March; all other visits brought material to the sides of the nest or the chamber, which was not well formed on 14 March, but neat and recognisable by 16 March. To work on the chamber, a bird would enter, turn around so that it was facing outwards, then reach down or sideways to grab the end of a free fibre, and pull it inwards. This was often repeated several times during each visit. By the time the chamber was well formed, the base of the nest consisted of a large wad of fibres curling from the sides of the nest inwards. The nestbuilding techniques described here are generally consistent with those reported for Black-and-red *Cymbirhynchus macrorhynchos* and Dusky Broadbills (Zubkova 2017).

Division of labour between the sexes was not closely observed because sexing this species at a distance is difficult. Occasionally, while a bird was working on the nest the other member of the pair would join it. Once, on 18 March, one bird sang as it clung to the outside of the nest near the chamber.

On 29 March, one bird stayed in the nest for 1.8 hours during the watch and was still present when we departed at the end of the day. We observed relatively little activity in the two hours beforehand—all visits involved the adult visiting the chamber for a brief period. We interpreted this to signify the presence of eggs and that incubation had begun. It is possible that incubation started before this: Banded Broadbill sometimes continues nest construction after incubation has begun (Wells 2007). As with incubating Black-and-yellow Broadbills, we could sometimes observe the adult's blue bill in the nest entrance (Myers 1999 specifically did not see this). We observed several incubation bouts on 30 March, but during our watches over the next few days, all activity ceased. There was no sign of activity when we collected the nest on 9 April, 2.5 weeks after the earliest possible start of incubation and well before any nestlings would have fledged.

Videos of this nest being constructed can be seen at ML catalogue numbers 479337, 479428–438, 479527–544, 479590, 479998, 480004 and 480006. ML 479590 shows nestbuilding behaviour by both pair members, including an instance in which the male became tangled on a vine and had to struggle for 50 seconds to get free.

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DUSKY BROADBILL *Corydon sumatranus*

Observed in groups of 8–12 individuals in the lowlands on eight occasions in 2012 (most in early July) and four times in 2013; also once on Gunung Lucia in 2013. We generally located them by their far-carrying calls, given consistently. Birds were observed both sides of the Tawau River in 2012, but in 2013 we generally saw them on the ridge west of the river. We usually saw flocks during the morning but also observed loud activity, including nestbuilding, well into the midday hours (although the species is reportedly crepuscular: Lambert & Woodcock 1996). One of the few times we saw the species in late afternoon was also the only time it was silent. On this occasion, on 2 March 2013, ERGC observed a small flock in a tall *Macaranga hypoleuca* tree with clusters of very small flowers. They sallied after insects while foraging and occasionally hovered immediately below a flower, but it was unclear if they were eating flowers or small insects.

Groups of Dusky Broadbills mostly appeared to be accompanied by mixed-species flocks. The broadbills' vocalisations were very audible over several hundred metres, making them the most obvious members of these flocks. The other birds consistently included species of Cuculidae and Picidae, including Raffles's *Rhinortha chlorophaea*, Red-billed *Zanclostomus javanicus* and Chestnut-breasted Malkohas *Phaenicophaeus curvirostris*; an unidentified small coucal *Centropus* sp.; and Maroon *Blythipicus rubiginosus*, Orange-backed *Reinwardtipicus validus*, Checker-throated *Chrysophlegma mentale*, Crimson-winged *Picus puniceus*, Grey-and-buff *Hemicircus concretus*, Buff-necked *Meiglyptes tukki* and Buff-rumped Woodpeckers *M. tristis*. Other species recorded sporadically near these flocks were Slender-billed Crow *Corvus enca*, Black Magpie *Platysmurus leucopterus*, Greater Racket-tailed Drongo *Dicrurus paradiseus*, Red-naped Trogon *Harpactes kasumba* and Maroon-breasted Philentoma *Philentoma velata*. We have found no mention of Dusky Broadbills associating with mixed-species flocks in the literature, but Norman (1964) reported a noisy flock at Kalabakan (near Tawau) in the company of Red-bearded Bee-eaters *Nyctyornis amictus*, unspecified hornbills (Bucerotidae) and Bat Hawks *Macheiramphus alcinus*. SCO also observed multiple Dusky Broadbills and Banded Broadbills in a clearing on the ridge west of the Tawau River on 7 March 2013. Both species vocalised frequently as they repeatedly flew back and forth across the clearing, but no interactions were observed. It was unclear whether Dusky Broadbill acted as a nuclear species in the flocks we observed, but it was certainly the loudest species and generally the only species that vocalised regularly.

We twice encountered groups constructing nests (Fig. 7). Reports of Dusky Broadbill breeding behaviour are relatively common (Lambert & Woodcock 1996), probably because the species is very vocal around nests, which they visit in large

Figure 7. Dusky Broadbill *Corydon sumatranus* nest during early construction with an adult perched on top (© Brian Magnier)

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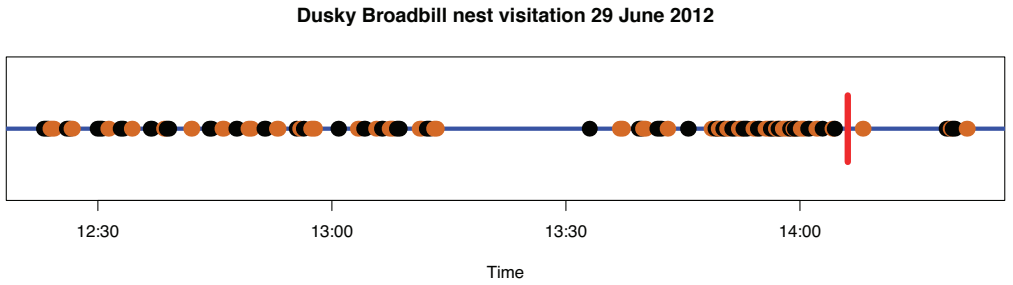

Figure 8. Graphical summary of nest visitation by Dusky Broadbills *Corydon sumatranus* during the early nestbuilding period. X axis = time of day. The thin blue line represents a continuous nest watch, the thicker lines visits by broadbills. The colour of each visit alternates to illustrate visits with short intervening breaks, which would otherwise appear to blend into a single line; colour does not represent sex or individual. Red line represents disturbance. We watched the nest until 18:00 h, but no birds visited after 14:21 h.

groups. We found the first group building on 29 June 2012 and another on 15 July 2012. Both dates are typical for the species, yet late compared to other nests reported on Borneo (Lambert & Woodcock 1996, Myers 2009). The first nest was suspended from a long rattan whip directly above the park's main trail (*c*.700 m from the headquarters), very close to the river. The second was in a low, swampy area off the trail, further to the east, near a Black-crowned Pitta territory.

Only the first nest was observed in detail (Fig. 8). At this nest, a flock of *c*.8 birds worked amid a cacophony of constant calling. The birds generally took turns, bringing material one at a time, and added each piece of stick, vine, leaf or moss atop the growing pile, sometimes with a head-shaking motion similar to that used by *Eurylaimus* broadbills (see above). We observed the 'winding' behaviour described by Zubkova (2017), in which a flying bird latches the loose end of a fibre to the top of the nest, then spirals downwards while balanced on the side of the nest, to place the other end of the fibre near the base. However, we also frequently saw birds simply place a new piece of material atop the tangle of fibres (both behaviours visible in ML 471148). Young individuals, identified by their paler, smaller throat patches and paler bills, were present and called loudly with the others (ML 471545–546). Although immatures did not actively participate in nest construction while we watched, their presence is consistent with suggestions that the species breeds cooperatively (Lambert & Woodcock 1996, Zubkova 2017).

This nestbuilding attempt was abandoned the same day we discovered the nest, at *c*.14.20 h, after we began setting up a rope system for a hide in the trees nearby. Although they appeared unperturbed by our presence, the ropes we launched into the trees may have disturbed them sufficiently to abandon. The nest was still quite small and far from complete. However, the second nest, which was only observed by JPH, was also abandoned after just one day of building, and JPH did not disturb the birds in any way that would have obviously caused the birds to abandon.

BLACK-CROWNED PITTA *Erythropitta ussheri*

The most common representative of the Pittidae in our study area. Unlike other pittas, their singing behaviour did not change noticeably between the two visits, except when pairs were tending a nest, when they became silent (see Gulson-Castillo *et al*. 2017 for a detailed description of parental care at a nest in 2013). Our observations were biased towards times when birds were singing—a simple, prolonged, whistle. We heard the subtle 'wing-clap' sonation (Pegan *et al*. 2013) often during both periods, although only ever from a recently singing bird departing a perch (ML 181755, 4:03). After bouts of singing, pittas often moved

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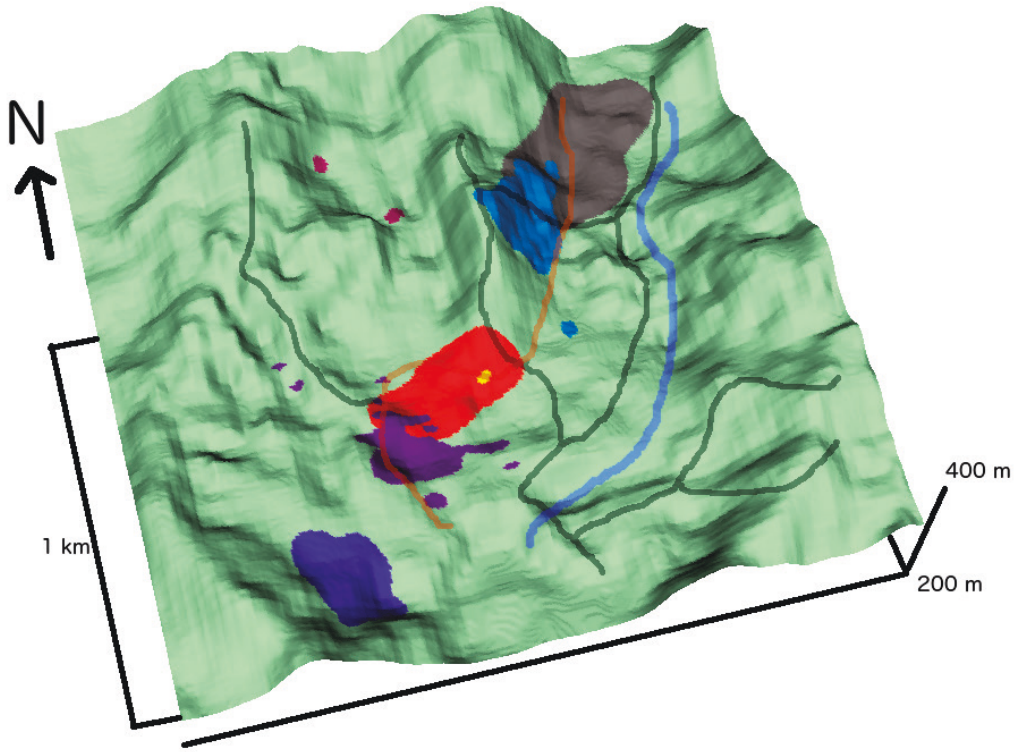

Figure 9. Map of the topography of our study area showing home ranges of five pairs of colour-banded Black-crowned Pittas *Erythropitta ussheri* observed in 2013. Coloured shapes represent the 95th percentile of a kernel density of sightings of each pair. Colours represent different pairs' territories. The location of a nest is marked by a yellow point. The map demonstrates the approximate number and size of Black-crowned Pitta home ranges, including apparent overlap between two pairs' home ranges. Kernel densities were calculated in R using the function *kde2d* with default bandwidth. We had only four sightings at one territory (maroon points near the upper left corner) and display points rather than kernel density. Grey lines represent trails, the brown line a pipeline, and the blue line the Tawau River. 3D map courtesy of JAXA (2015).

through the understorey and across the forest floor, perching on logs and roots to sing occasionally as they flipped over leaves, foraging. Once, JMH observed a pitta climb 2 m up a buttress to inspect a clump of leaf litter against the trunk.

Because we followed individuals in our study area closely and colour-banded most of them in 2013, we were able to use our sightings to calculate 95th percentile kernel densities of home ranges for each pair. One bird was colour-banded in 2012 and occupied the same area in both 2012 and 2013. Fig. 9 shows the estimated home ranges for five pairs, as well as a few sightings for a sixth pair in an area that we visited infrequently. Two pairs' home ranges either overlapped slightly or had abutting boundaries (red with purple, and grey with pale blue in Fig. 9). Neighbouring birds sang in response to each other's presence or to playback in the boundary area, and birds in the northern two territories frequently counter-sang at opposite sides of a gully. The active nest we found belonged to birds in the southern set of adjoining home ranges, and is shown on the map as a yellow point. All territories were associated with a tangled swamp or stream, usually the former, and some also included a segment of drier slope on the neighbouring ridge.

The plotted density kernels are probably fairly representative of the home range occupied by each pair, although without radio-tracking data we cannot eliminate the

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possibility that these areas were merely those parts of their territories in which the birds were most detectable (i.e. where they sing most frequently, or where the topography was most accessible). Indeed, small points outside the main territories, displayed as part of the pale blue and purple home ranges on Fig. 9, demonstrate that birds sometimes visited areas where we usually did not detect them. The calculated areas of the home ranges are as follows: 6.5 ha; 5.3 ha; 14.4 ha; 4.4 ha; and 4.3 ha. However, these areas are affected by the number of points used to calculate them, and should be taken as very approximate estimates—larger sample sizes led to smaller estimates of range size. Phillipps & Phillipps (2014) interpreted Fogden (1976) finding two individuals within 20 ha to signify that the species' home range size is *c*.10 ha, which is consistent with our findings. Using radio telemetry, Lambert & Howes (in prep. *in* Lambert &Woodcock 1996; F. Lambert pers. comm.) estimated, based on the small area used by individuals in their study, as many as 21–22 pairs per km^2 in Danum Valley, which is much greater than the density we observed at Tawau Hills; within the 3 km^2 area of Fig. 9 we found six pairs. Danum Valley may possess more suitable habitat than the area we surveyed in Tawau Hills, which contains numerous steep, drier ridges.

Figure 10. A presumed hybrid or backcrossed female Black-crowned *Erythropitta ussheri* × Garnet Pitta *E. granatina* (right), showing brighter coloration than other female Black-crowned Pittas and a streak of red on the head and nape; at left is her presumed mate (© Katherine Lauck)

All home ranges except one appeared to harbour a pair (the other held a single individual). One member of each pair (probably the male) sang more frequently and tended to be more brightly coloured (similar to Rainbow Pittas *Pitta iris*; Zimmermann & Noske 2003). The putative females sang much less often—we would generally hear them once or twice during a prolonged visit to a territory. They occupied the same area as putative males and their songs did not elicit an aggressive response from the latter. Their songs were distinctly higher pitched than putative male songs. We subsequently used blood samples to determine the sex of captured individuals, which confirmed this (Gulson-Castillo *et al*. 2017).

We trapped a bird that appeared to be a hybrid or backcross with Garnet Pitta *Erythropitta granatina*. We took photographs, blood, audio and feather samples from this individual. This bird shared a territory with a male Black-crowned Pitta and sang less often than the latter, but more frequently than a typical female. We used the blood sample to confirm that the bird was female; it was the only female we caught that appeared to be just as brightly coloured as its mate (Fig. 10). The dark purplish feathers in the upper mantle of all Black-crowned Pittas (including the unusual bird's mate) have a slight reddish tint at the fringes. In the presumed hybrid, a bright red streak emanated from these red-tinted feathers in the upper mantle and ended on the central crown (Fig. 10). This streak was not as broad or long as the red crown of a Garnet Pitta and although each so-marked feather was

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mostly red, their tips were still black (Fig. 10). This is probably the second or third report of a possible hybrid Black-crowned × Garnet Pitta (Erritzøe & Erritzøe 1998), matching the description of one collected in 1935 by V. von Plessen at Peleben on the Kayan River, North Kalimantan (Erritzøe & Erritzøe 1998). Another potential hybrid was collected by Lumholtz at Kaburau, also on the Kayan River—it has much more extensive red than the other birds, resembling Garnet Pitta with limited black tips to some crown feathers, and not all authors accept this as a record of hybridisation (Voous 1961, Lambert & Woodcock 1996). These other hybrids were collected *c*.150–250 km from Tawau Hills Park. We found no other evidence of Garnet Pitta at Tawau Hills and observed no evidence of hybridisation in the other individuals we trapped.

Nine individuals were trapped, of which two were subsequently recaptured. The only bird caught in 2012 was radio-tagged with a *c*.0.4 g beeper radio-tag. The night after its capture, we tracked the bird to its roost site, *c*.2 m above ground on a branch with its plumage fluffed extensively, as in previous reports (L. Emmons *in* Lambert & Woodcock 1996). The following night, the tag was found in low shrubbery, evidently removed by the pitta.

BLUE-BANDED PITTA *Erythropitta arquata*

Uncommon, but regularly distributed in appropriate habitat and reliably encountered in their territories. We found two territories in the lowlands, at *c*.345 and 290 m (the former shown in Fig. 11, red points) and two in the highlands at 850 and 1082 m. All birds appeared to favour the steep slopes of ridges, in accord with previous habitat assessments (Lambert & Woodcock 1996).

We observed the use of sonations, or non-vocal sounds, similar to those in Black-crowned Pitta (Pegan *et al.* 2013). These sonations sound like a soft knock on wood and appear to be produced using the wings. In one video (ML 479573), after the bird had been singing from a perch for a couple of minutes, it lifted its wings without extending them and puffed its belly feathers. It then brought its wings down quickly as its belly is deflated, with a soft *tok* recorded just as its wings hit its sides, before they bounced back up. The quality of the sound was similar in both species. Further studies are required to determine whether they use the sonation in the same context as Black-crowned Pitta (Pegan *et al*. 2013, see above). Although other pittas make sonations, their context appears somewhat different. Those of African *Pitta angolensis* and Green-breasted Pittas *P. reichenowi* sound different and are associated with displays (summarised in Erritzøe & Erritzøe 1998). Eared Pitta *Hydrornis phayrei* makes sonations by flicking their wings toward each other, instead of their flanks (Round 2002); these are made repeatedly prior to calling. Gurney's Pitta *H. gurneyi* makes wing-claps against its flanks together with territorial calls (Well 2007). Giant Pitta *H. caerulea* also makes wing-claps; it is unclear if they use their flanks, but they produce the sounds in flight when alarmed (Lambert & Woodcock 1996).

BORNEAN BANDED PITTA *Hydrornis schwaneri*

Common on steep slopes and ridges leading to Gunung Lucia. Between the hostel and the summit, we observed at least four pairs along the trail at *c*.950 m on 12 July 2012. On 22 July 2012, we found at least one individual in the lowlands near the park headquarters at *c*.300 m. It was observed five more times in this area on 24–30 July 2012 (when our visit ended), and was generally easy to find, calling frequently. The bird stayed in a relatively small area (Fig. 11, yellow points). Because this area was within our main study area and well-surveyed throughout the period, we are confident that it was not present and calling before late July.

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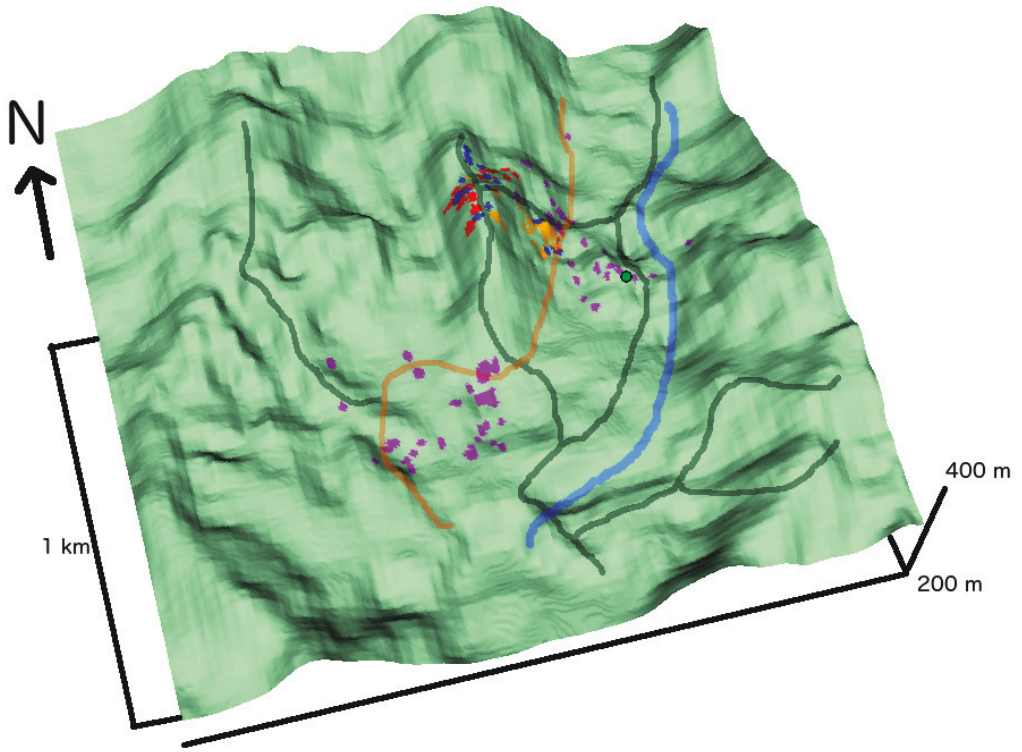

Figure 11. Map of the topography of our study area showing sightings of four species of pittas during the 2012 field work: Black-crowned Pitta *Erythropitta ussheri* (purple), Blue-headed Pitta *Hydrornis baudii* (blue), Bornean Banded Pitta *H. schwaneri* (yellow) and Blue-banded Pitta *Erythropitta arquata* (red). Each point represents a sighting. Variation in point size and shape is an artefact of 3D plotting. The map demonstrates that the areas occupied by each species overlapped considerably, especially on the ridge in the centre, where all four species occurred in close proximity. Black-crowned Pitta was seen more commonly in low swampy areas, whereas the other three species occurred mainly on this ridge and its slopes. A fifth species, Hooded Pitta *Pitta sordida*, was heard infrequently and seen just once, a juvenile, at the green point. Grey lines represent trails, the brown line a water pipeline, and the blue line the Tawau River. 3D map courtesy of JAXA (2015).

Although Lambert & Woodcock (1996) observed that Bornean Banded and Blue-headed Pittas *Hydrornis baudii* are never found in the same area of forest at Danum Valley, at Tawau Hills that which the *H. schwaneri* occupied in 2012 overlapped with a Blue-headed Pitta territory (Fig. 11). In fact, the former was first observed within the lowland study area on 24 July 2012 in precisely the same location as a pair Blue-headed Pittas had been present *c*.1 hour prior. On 30 July, JMH spent several hours observing a female Blue-headed Pitta with a juvenile (see below). Once the female hopped out of view behind a tangle and JMH heard and saw a 'scuffle', with branches in the tangle moving. After this, a Bornean Banded Pitta emerged from the same area the female had disappeared, suggesting that an interaction between the two species had occurred (although contact between them could not be confirmed). Lambert & Woodcock (1996) suggest that habitat preferences are responsible for the apparent segregation of Bornean Banded and Blue-headed Pittas in Danum, but the potential interspecific interaction we observed suggests that competition could play a role as well.

Bornean Banded Pittas were present on the slopes of Gunung Lucia again in 2013, but none was observed in the lowlands near the park headquarters. It is possible that

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their occurrence in this area is seasonal, or that the sightings in 2012 in the lowlands were unusual—perhaps a dispersing individual that eventually moved elsewhere permanently.

BLUE-HEADED PITTA *Hydrornis baudii*

Shy, quiet and difficult to observe during both visits; however, they were more reliably found and regularly heard during 2012. One pair was observed regularly that year (Fig. 11, blue points). The birds seemed to favour a particular rattan *Calamus* sp. clump and were often seen together. They were seen nearly every evening on 19–28 July, at 16.30–17.30 h, atop a west to east-running ridge, but also frequented in a swampy area at its base. When moving together, they sometimes called every 15–30 seconds. More frequently, one of the pair would call once or twice, then disappear. This pair vocalised after playback only if they had been calling previously. On 28 July 2012, just before 17.00 h, one gave several of the 'alarm note[s] of the female' (Lambert & Woodcock 1996), then an upslurred *porrrwuh?*, perhaps similar to what has been described as a possible alarm call (B. Gee *in litt*. *in* Erritzøe & Erritzøe 1998). Lambert & Woodcock (1996) and Bruce (2003) suggested that the first-mentioned call, the loud and nasal *kwee-ouu*, is a 'female alarm call' but we observed both sexes give a call matching this onomatopoeic description (ML 479549).

Although we never found a nest, JMH discovered a young bird on 30 July 2012, within the same territory (Fig. 12). It followed its female parent closely, generally standing silently next to her as she foraged, but occasionally begging emphatically as she ate or moved onward (ML 479513); we never saw it being fed. The young was a male, identified by its bright white throat (similar to that of an adult male). Given that no pitta is known to be dependent for more than two months (Erritzøe & Erritzøe 1998), and that the bird showed remnants of gape flanges and of the orange bill tip shown by many nestling pittas, we consider that this was a juvenile (younger than two months) in pre-formative moult to immature plumage. This plumage does not precisely match the description for juvenile or immature plumage given by Lambert & Woodcock (1996) and Erritzøe & Erritzøe (1998), as neither source mentions a bright white throat. However, it is difficult to believe this bird

Figure 12. Two frames from a video of an immature male Blue-headed Pitta *Hydrornis baudii* (top) showing a white throat, patches of blue in the underparts, and reddish wing-coverts, with an adult female Blue-headed Pitta (bottom). Frames from video ML 479513 (Justin Hite)

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was old enough to be moulting to adult plumage (given its gape and begging behaviour), and we suggest that previous descriptions of immature male plumage, based on two specimens (Erritzøe & Erritzøe 1998), may not represent the complete range of pre-adult variation.

See Bornean Banded Pitta account for description of a possible interaction between that species and a Blue-headed Pitta.

During the drier season in 2013, birds sang less and were observed less frequently. However, whenever they sang they did so in long series, repeated every few seconds as they moved through the understorey. We detected the birds across a larger area than in 2012, sometimes in different areas on the same day (e.g., 9 March, when we had three birds 442, 324 and 285 m away from each other, respectively) and across the Tawau River. This leads us to suspect that at least three territories were established, although there could have been more.

One pair, which may have been the same as that observed in 2012, spent several days around 7–20 April 2013 near one segment of the Tawau River, on the main trail. They were often flushed from the trail as they foraged in the strip of forest between the river, the trail and the nearby swamp, although we never saw them leave drier ground. The birds disappeared as suddenly as they arrived in the area, and we suspect that they departed (rather than became less detectable), because we regularly walked this trail throughout the season.

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Extinct and endangered ('E&E') birds in the ornithological collection of the Museum of Zoology of Torino University, Italy

by Luca Ghiraldi & Giorgio Aimassi

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Summary.—The historical ornithological collection of the Museum of Zoology of Torino University, now hosted at the Museo Regionale di Scienze Naturali di Torino, Italy (MRSN), includes more than 21,000 bird specimens and 500 complete skeletons representing *c*.6,000 taxa. The IUCN Red List of threatened species lists 256 bird species as either extinct or endangered ('E&E') from throughout the world. To provide a list of those species that should receive special care, a well-established methodology was applied to produce a list of 12 extinct and 36 endangered species held in the MRSN collection. Some of them, particularly those from New Zealand, although it is unclear where they were acquired, are remarkable for being amongst the first bird specimens to have arrived in European museums.

Natural history museums play a fundamental role in disseminating knowledge and understanding of Earth's biodiversity. Specimens held in these collections have always had an important educational role, providing data concerning the biology, ecology and conservation of species. Moreover, they can represent records of inestimable value, e.g. the physical evidence of localities that have experienced drastic changes in environmental conditions over time. They are therefore invaluable to scientific studies, permitting comparative analyses as to how species have changed over time in terms of morphometrics, abundance and / or distribution. Furthermore, due to modern techniques of extraction and analysis of DNA fragments and stable isotopes, it is possible to undertake molecular studies even of very old specimens. These materials assume even greater importance in the case of extinct and endangered ('E&E') species, for which they are irreplaceable (Adams *et al*. 2003). Consequently, they must be kept with great care, using special precautions and protocols to optimise their use and conservation (Knox & Walters 1994, Adams *et al*. 2003). Moreover, Cooper & Steinheimer (2003) highlighted the importance of inventories of these specimens, to alert the scientific community to the existence of such materials.

Many important European natural history museums have already published catalogues of their 'E&E' bird species (Stresemann 1954, Jouanin 1962, Howes 1969, Benson 1972, Fisher 1981, Knox & Walters 1994, Boev 2003, Mlíkovský & Sutorová 2010, Mlíkovský 2012, Gouraud 2014). However, in Italy the situation is problematic, due partly to the lack of a national museum (Andreone *et al*. 2014). The existence of more than 70 natural history museums, some of international importance but managed by different institutions, has impeded the development of a unified catalogue. The first attempt to compile a list of extinct and rare birds involved those held in the museums of Milano, Genova and Firenze (Violani *et al*. 1984); a second effort was made under the umbrella of the project 'VerTex' (Vertebrata Extincta) to census specimens of 'E&E' vertebrates stored in Italian natural history museums (Nicolosi *et al*. 2013). Unfortunately, this project was discontinued in 2013 due to lack of funds. The most recent project, 'Extinction, stories of disasters and other

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opportunities', funded by the Ministry of Education, University and Research, commenced in 2015 and remains in progress.

The present work, which forms part of the latter project, catalogues 'E&E' avian species in the collection of the Museum of Zoology of Torino University (MZUT AV), now hosted at the Museo Regionale di Scienze Naturali (MRSN, Torino, Italy). The historical collection contains more than 21,000 bird specimens and almost 500 complete skeletons, representing approximately 6,000 taxa. They are the result of collecting activities, exchanges, donations and purchases between the early 19th century and the second decade of the 20th century (Salvadori 1915, Tortonese 1957, Elter 1986).

Following the IUCN Red List of threatened species (BirdLife International 2018), the MZUT AV collection holds 259 threatened taxa (totalling 610 specimens), of which 12 are Extinct (EX), 39 Critically Endangered (CR), 56 Endangered (EN) and 152 Vulnerable (VU). As recommended by Adams *et al*. (2003), we applied a further selection to include only those species that meet specific quantitative criteria proposed by the IUCN Red List. Under the CR category we included only those species with small and fragmented ranges (B1 <100 km^2) or small and declining populations (C <250 mature individuals), whereas in the categories EN and VU those species included are numerically rare in the wild (D1 <250 and D1 <1,000 mature individuals for EN and VU, respectively). Under these criteria, threatened taxa in the MZUT AV collection number 20 CR, two EN and six VU.

In the CR category, we added two additional species that meet criteria A2—Magenta Petrel *Pterodroma magentae* and Kakapo *Strigops habroptila*—because despite failing to meet the other criteria and having populations in recovery, they are both confined to single islands with tiny populations (BirdLife International 2018). Moreover, the Magenta Petrel specimen is the species' holotype.

Under EN, we also added three species that meet criteria B1 and C2: Tahiti Reed Warbler *Acrocephalus caffer*, Akiapolaau *Hemignathus wilsoni* and Grey-breasted Parakeet *Pyrrhura griseipectus*. The first two were included because they each have a very small population and distribution, being now rare, restricted to a single island and experiencing ongoing declines in range and habitat quality (BirdLife International 2018); the third because it is represented by type specimens.

Finally, we added three species that meet criteria D2 to the VU list: Stitchbird *Notiomystis cincta*, Trindade Petrel *Pterodroma arminjoniana* and Masatierra Petrel *P. defilippiana*. Although they each have a population larger than 1,000 individuals, their breeding ranges are very restricted and are therefore highly susceptible to stochastic events or human impacts (BirdLife International 2018). Moreover, specimens of both *Pterodroma* represent the species' type series.

Here we provide separate lists for 'E&E' species following the taxonomy and nomenclature of del Hoyo & Collar (2014, 2016). We also present, where possible, information on the provenance of specimens (exploratory voyages, trade and commerce, exchange with other scientific institutions) from original labels, manuscript catalogues in the museum's library, or the printed catalogue of the historical ornithological collection (Elter 1986).

Some of the species mentioned herein, especially those from New Zealand, are remarkable as they represent among the first specimens of their species to arrive in Europe and, although their origin is uncertain, they evidence the fact that many travellers and scientists, including John Gould, sold or exchanged part of their materials to specialised dealers as Gustav Adolph Frank of Amsterdam (Jansen & Mije 2015).

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Extinct species

CASUARIIDAE

KING ISLAND EMU *Dromaius minor*[1]
Dromæus minor Spencer, 1906
MZUT AV2661; mount; unsexed juvenile; Australia, no date (but evidently December 1802); from Nicolas Baudin's expedition, exchanged with Muséum national d'Histoire naturelle, Paris.

Remarks.—The Torino museum came into possession of a 'very young' *Dromaius* sometime between 1819 and 1822 (Salvadori 1915); in the old manuscript catalogue it was marked no. 2816 and accompanied by the following note: 'young specimen coming from Péron's voyage aux Terres Australes'. In Salvadori's (1915) index, the Torino specimen, doubtfully identified as *D. ater*, is also listed as 'cotype?' but in the main text this hypothesis is not mentioned. Two decades earlier, Salvadori (1895), perhaps due to doubts concerning the identity of the Torino specimen, had written that *Dromaius ater* was 'only known from the single stuffed specimen and the skeleton in the Paris Museum'. In Elter (1986), the specimen is quoted as a syntype, but this is definitely not the case.

Jouanin (1959) believed that the Torino specimen was prepared in Paris in 1804, but did not know how it reached Italy. The *Le Géographe*, on which the young naturalist F. Péron had travelled, brought to France, in addition to three live 'emus', the remains of five other specimens, collected on both King Island and Kangaroo Island ('Cinq dépouilles provenant les unes de l'île King, les autres de l'île des Kangourous'), one of which should be the young *Dromaius* in Torino (Jouanin 1959). Hume & Walters (2012) treated this specimen in their chapter on *D. ater* but noted that its provenance is uncertain: it could also be from Kangaroo Island and would then be attributable to *D. baudinianus* Parker, 1984. Nevertheless, Jansen (2017) treated MZUT AV2661 as a *D. minor* and listed it among those specimens taken on King Island during the period 8–27 December 1802.

COLUMBIDAE

PASSENGER PIGEON *Ectopistes migratorius*
Columba migratoria Linnaeus, 1766
MZUT AV8743; mount; adult male; 'North America', no date; from L. de Gréaux in 1876.
MZUT AV15372; mount; adult female; USA, Pennsylvania, Philadelphia, 22 March 1823; donated by G. Deabbate in 1823.
MZUT AV15373; mount; unsexed juvenile; USA, Pennsylvania, Philadelphia; donated by G. Deabbate in 1823.

Remarks.—Laurent de Gréaux was a natural history dealer from Marseille (France), a member of the Société d'Histoire naturelle de Toulouse from 1874 (Anon. 1876) and a corresponding member of the Société d'Étude des Sciences Naturelles de Nîmes (Anon. 1877). He purchased the holotype of Josephine's Lorikeet *Charmosyna josefinae* in London, then sold it to Count Ercole Turati of Milano (Finsch 1872). Gaspare Deabbate was the General Consul of the Kingdom of Sardinia to the USA during 1820–27.

[1] The name *Dromaius ater* Vieillot, 1817, previously applied to this species, is a synonym of *Casuarius novaehollandiae* Latham, 1790 (Dickinson & Remsen, 2013: 6, footnote 16).

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ALCIDAE

GREAT AUK *Pinguinus impennis*
Alca impennis Linnaeus, 1758
MZUT AV16261; mount; unsexed adult; Iceland, no date; from H. Vogt in 1832.

Remarks.—Giuseppe Gené (1800–47), Director of the Zoological Museum of Torino in 1831–47, purchased this specimen from a 'Mr. Vogt' in 1832 (Salvadori 1915). It is noteworthy that Fatio (1868a) cited a specimen of *P. impennis* present in Neuchâtel museum (Switzerland), purchased in Mannheim (Germany) in 1832, by the same dealer Henri (= Heinrich) Vogt. This supports the hypothesis of Symington (2015) under which Vogt may have obtained several skins of *P. impennis* from what is now the Zoological Museum of the University of Copenhagen. The Great Auk in Torino is listed as no. 55 in Fuller (1999), wherein he stated that it seems reasonable to suppose that this specimen is one of 24 birds taken on Eldey (Iceland) in 1831.

Even the specimen at the Museo Civico di Zoologia Roma came from the Copenhagen museum (in 1832), but its arrival in Italy was rather tortuous (Arrigoni degli Oddi 1914, Marangoni & Gippoliti 2011). Furthermore, Fatio (1868b) reported three other specimens in the museums of Firenze, Milano and Torino, as well as an incomplete skeleton in Firenze. Violani *et al*. (1984) mentioned a second specimen housed in Milano, but not the skeleton in Firenze.

STRIGIDAE

LAUGHING OWL *Sceloglaux albifacies*
Athene albifacies G. R. Gray, 1845
MZUT AV16891; mount; unsexed adult; New Zealand, no date; purchased in Milano by G. Gené for MZUT in September 1844.

Remarks.—On an old label, the specimen is identified as *Athene novae zelandiae* (now Morepork *Ninox novaeseelandiae*), but this is easily explained because, at the time of purchase, *A. albifacies* was undescribed.

There is no reliable information as to how this specimen arrived in Europe. The only date we found in the manuscript catalogues (September 1844) clearly refers to the purchase by Prof. Giuseppe Gené for MZUT. The same date is linked to four other specimens from New Zealand purchased by Gené for MZUT, of New Zealand Falcon *Falco novaeseelandiae*, New Zealand Kaka *Nestor meridionalis* and South Island Piopio *Turnagra capensis* (see below).

It is noteworthy that in the Museo Civico di Storia Naturale di Milano (Violani *et al*. 1984) there are two specimens of extinct New Zealand taxa, Norfolk Island Pigeon *Hemiphaga novaeseelandiae spadicea* and *Turnagra capensis*, also purchased in 1844, from the dealers L. Bonomi and L. Colombo, respectively. We believe that one of them could have sold the specimens now in Torino to Gené.

Percy William Earl (1811–46) was an itinerant British collector who worked in New Zealand in 1843–45 and sold an important collection of birds to the British Museum (Natural History), London (Scofield *et al*. 2013). The holotype of *Athene albifacies* 'formed part of Mr. Percy Earl's collection' purchased by the British Museum presumably in late 1844 and registered in early 1845, while Gray was editing the bird volume of *The zoology of the Erebus & Terror expedition*. For this reason, Gray (1845) choose to describe in this volume several new taxa collected by Earl, causing confusion among many subsequent authors as to the provenance of his collections. If the date of purchase by MZUT from Gené (September 1844) is correct, this specimen may have been the first of this species to reach Europe, as it predated the arrival of Earl's in London (Scofield *et al.* 2013).

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Finally, we note that the date of description, 1844, reported universally (e.g., Peters 1940, Worthy 2010, Dickinson & Remsen 2013, del Hoyo & Collar 2014), should be corrected to 1845, based on the clarifications proffered by Mathews (1938). Unfortunately, due to a *lapsus*, Mathews referred to *Athene albifrons*, instead of *A. albifacies*: this error evidently induced subsequent authors to ignore Mathews' paper when dating the original description by G. R. Gray.

PSITTACIDAE

CAROLINA PARAKEET *Conuropsis carolinensis*
Psittacus carolinensis Linnaeus, 1758
MZUT AV11205; mount; unsexed adult; southern USA, no date; from Salvin in 1892, formerly in Elliott Coues' private collection.

Remarks.—During his stay at the British Museum (Natural History), London, to catalogue their parrots, Tommaso Salvadori received a personal gift from Osbert Salvin (1835–95) of a *C. carolinensis* that originally formed part of the Elliott Coues collection. Subsequently, Salvadori donated it to MZUT.

PARADISE PARROT *Psephotellus pulcherrimus*
Platycercus pulcherrimus Gould, 1845
MZUT AV7798; previously mounted; adult male; Australia, no date; purchased from L. de Gréaux, in 1870.

ORIOLIDAE

SOUTH ISLAND PIOPIO *Turnagra capensis*
Tanagra capensis Sparrman, 1787
MZUT AV2962; previously mounted; unsexed adult; New Zealand, no date; purchased by F. Defilippi for MZUT, in 1846.
MZUT AV4244; previously mounted; unsexed adult; New Zealand, no date; purchased in Milano by G. Gené for MZUT, in September 1844.

Remarks.—Filippo Defilippi (1814–67) succeeded G. Gené as head of the Zoological Museum of Torino, of which he was director in 1848–67. It is probable that at least MZUT AV4244 has the same provenance as one of two specimens in the Museo Civico di Storia Naturale di Milano (no. 12968, unsexed, mounted, from 'Nov. Zealand'). Based on a manuscript catalogue produced by Defilippi, we know that it was purchased from L. Colombo in 1844 (Violani *et al*. 1984).

MONARCHIDAE

NUKU HIVA MONARCH *Pomarea nukuhivae*
Pomarea mendozae nukuhivae Murphy & Mathews, 1928
MZUT AV2953; previously mounted; adult female; Tahiti (*sic*); from a Mr Colombi, in 1846.

Remarks.—Originally labelled as Tahiti Monarch *P. nigra*, MZUT AV2953 is undoubtedly a female *P. m. nukuhivae* (A. Cibois pers. comm.). See below for another specimen labelled as *P. nigra*. In MZUT there are 125 specimens from 'Colombi', mostly received in 1845–46; the labels of some indicate that Colombi was from Brest (Brittany, France), but we know nothing more about him.

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CALLAEIDAE

HUIA *Heteralocha acutirostris*
Neomorpha acutirostris Gould, 1837
MZUT AV13749; mount; adult male; New Zealand, no date; from G. A. Frank, in 1847.
MZUT AV14030; mount; adult female; New Zealand, no date; from G. A. Frank, in 1847.

Remarks.—Salvadori (1915) only mentioned specimen no. 547 (MZUT AV13749), specifying that Torino museum purchased it in 1847 from Gustav Adolph Frank (1808–80), a dealer in natural history items and books in Amsterdam. Elter (1986) reported both specimens.

FRINGILLIDAE

KONA GROSBEAK *Chloridops kona*
Chloridops kona S. B. Wilson, 1888
MZUT AV11660; mount; adult male; USA, Hawaii, 'Kona district', slopes of Mauna Loa Volcano at 1,200 m, September 1892; collected by R. C. L. Perkins, and donated by Alfred Newton in 1901 or 1903.

Remarks.—Salvadori (1915) reported that in 1901 or 1903, due to the interest of his friend Alfred Newton, the Torino museum received a gift of seven specimens (actually eight) collected in the 'Sandwich Islands'. All of these were collected by Robert Cyril Layton Perkins (1866–1955) of Cambridge University during an expedition to Hawaii financed by the Royal Society of London and the British Association for the Advancement of Science. MZUT AV11660 was taken during the first period that Perkins spent in Hawaii, between March 1892 and September 1894 (Perkins 1893, Liebherr & Polhemus 1997). Torino is not listed among those institutions that hold specimens of this species; moreover, the collection date of MZUT AV11660 (September 1892) coincides with that of the last specimen known (Hume & Walters 2012).

KAUAI AKIALOA *Akialoa stejnegeri*
Hemignathus stejnegeri S. B. Wilson, 1889
MZUT AV11657; mount; adult male; USA, Hawaii, Kaua'i Island, 1900; collected by R. C. L. Perkins.

Remarks.—In the MZUT manuscript catalogue, AV11657 is named *Hemignathus procerus*. According to Olson & James (1995) the name *Hemignathus stejnegeri* S. B. Wilson, 1889, has priority over *H. procerus* Cabanis, 1890; the dating of Wilson's work (1889) is confirmed by Evenhuis (2003) and Dickinson (2011). However, in Dickinson & Christidis (2014) the description of *stejnegeri* is dated as 1890. The Torino museum was not listed among those institutions that possess specimens of the species (Hume & Walters 2012).

KAKAWAHIE *Paroreomyza flammea*
Loxops flammea S. B. Wilson, 1890
MZUT AV11654; mount; female; USA, Hawaii, Moloka'i Island, 1900; collected by R. C. L. Perkins.

Remarks.—Torino was not listed among those museums that possess specimens of the species (Hume & Walters 2012).

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Threatened species

COLUMBIDAE

SILVERY PIGEON *Columba argentina* **CR**
Columba argentina Bonaparte, 1857
MZUT AV11391; previously mounted; adult male; Indonesia, Mentawai, Sioban (Sipora Island), 17 July 1894; from the Elio Modigliani collection (no. 244).

Remarks.—The original label reads *Columba grisea* (G. R. Gray), collection no. 244, letter 'A' and 'Oban' as collecting locality. This specimen was cited as *C. grisea* in Salvadori (1894) along with six other specimens collected on 17, 19 and 25 July 1894. *Carpophaga grisea* G. R. Gray, 1844 (not *Columba grisea* Bonnaterre) is a *nomen nudum*; see Peters (1937). Elio Modigliani (1860–1932), anthropologist and zoologist, made three expeditions to Indonesia. During his last journey to the Mentawai Islands, he collected 211 specimens of 34 taxa, some of which were donated to MZUT (Salvadori 1894, Mazzotti 2011).

TOOTH-BILLED PIGEON *Didunculus strigirostris* **CR**
Gnathodon strigirostris Jardine, 1845
MZUT AV19159; mount; adult female; Samoan Islands, no date; purchased from J. C. Godeffroy in 1870.

Remarks.—On 18 February 1870 the MZUT purchased a collection of 62 birds from Johann Cesar Godeffroy of Hamburg (Germany). In addition to the skin of specimen MZUT AV19159, the skeleton was also preserved (Salvadori 1915).

TROCHILIDAE

JUAN FERNANDEZ FIRECROWN *Sephanoides fernandensis* **CR**
Trochilus fernandensis P. P. King, 1831
MZUT AV8146; mount; immature male; Chile, Juan Fernández Island, November 1864; donated by the Museo Nacional de Historia Natural, Santiago.
MZUT AV19938; mount; adult male; adult; Chile, Juan Fernandez Island, December 1864; donated by Museo Nacional de Historia Natural, Santiago.
MZUT AV19761; mount; adult female; Chile, Juan Fernandez Island, October 1869; exchange with Museo di Storia Naturale e del Territorio, Università di Pisa (Italy).

Remarks.—MZUT AV8146 and AV19938 were obtained during the circumnavigation voyage by the Italian warship *Magenta*. On 6 October 1867, Enrico H. Giglioli visited the Museo Nacional de Historia Natural, Santiago, where its Director Rodulfo Armando Philippi and his assistant L. Landbeck presented him with numerous Chilean specimens of mammals and birds, including these two hummingbirds (Giglioli 1876). MZUT AV19761 was collected by Carlo Regnoli (1838–73), an Italian physician, paleontologist and archaeologist (Anon. 1873, Natale *et al*. 2006). The MZUT collection contains 40 specimens from the Regnoli collection, mainly from Peru and Chile.

BLACK-BREASTED PUFFLEG *Eriocnemis nigrivestis* **CR**
Trochilus nigrivestis Bourcier & Mulsant, 1852
MZUT AV2551; skin; adult male; Ecuador, Gualea (north-west of Quito), July 1897; collected by E. Festa.
MZUT AV2552; skin; adult male; Ecuador, Nanegal (north-west of Quito), June 1897; collected by E. Festa.
MZUT AV2553; skin; adult female; Ecuador, Nanegal (north-west of Quito), June 1897; collected by E. Festa.

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MZUT AV11571; skin; adult male; Ecuador, Nanegal (north-west of Quito), June 1897; collected by E. Festa.
MZUT AV11572; skin; adult female; Ecuador, Nanegal (north-west of Quito), June 1897; collected by E. Festa.

Remarks.—Enrico Festa (1868–1939) was an Italian naturalist and explorer. He worked at the Royal Zoological Museum of Torino University, initially as an assistant and then as honorary deputy manager. During 1895–99 he visited Panama, Colombia and Ecuador where he collected zoological material, including birds that were studied in collaboration with Tommaso Salvadori (Arcangeli 1940, Mazzotti 2011).

OTIDAE

GREAT INDIAN BUSTARD *Ardeotis nigriceps* **CR**
Otis nigriceps Vigors, 1831
MZUT AV4785; mount; adult male; 'Bengal' (India or Bangladesh), October 1845; purchased from G. A. Frank.
MZUT AV4786; mount; adult female; 'Bengal' (India or Bangladesh), October 1845; purchased from G. A. Frank.

PROCELLARIIDAE

TRINDADE PETREL *Pterodroma arminjoniana* **VU**
Æstrelata arminjoniana Giglioli & Salvadori, 1869
MZUT AV6687; mount; unsexed adult; Brazil, Trindade Island (20°31'S, 29°19'W), 23 January 1868; collected during the circumnavigation voyage by the warship *Magenta*.
MZUT AV6688; mount; unsexed adult; Brazil, Trindade Island, 23 January 1868; collected during the *Magenta* voyage.
MZUT AV6685; mount; unsexed adult; Brazil, Trindade Island, 23 January 1868; collected during the *Magenta* voyage.
MZUT AV6686; mount; unsexed adult; Brazil, Trindade Island, 23 January 1868; collected during the *Magenta* voyage.

Remarks.—MZUT AV6687 and AV6688 are syntypes of *Æstrelata arminjoniana* Giglioli & Salvadori, 1869; MZUT AV6685 and AV6686 are syntypes of *Æstrelata trinitatis* Giglioli & Salvadori, 1869, the dark morph of *Pterodroma arminjoniana* (*cf*. Hellmayr & Conover 1948).

MASATIERRA PETREL *Pterodroma defilippiana* **VU**
Æstrelata defilippiana Giglioli & Salvadori, 1869
MZUT AV18779; mount; unsexed adult; southern Pacific Ocean between Callao (Lima, Peru) and Valparaiso (Chile), 31 August 1867; collected during the *Magenta* voyage.
MZUT AV18780; mount; unsexed adult; southern Pacific Ocean between Callao (Lima, Peru) and Valparaiso (Chile); 31 August 1867; collected during the *Magenta* voyage.

Remarks.—These specimens are syntypes of *Æstrelata defilippiana* Giglioli & Salvadori, 1869. Giglioli (1876) stated that, after lunch on 31 August 1867, at *c*.26°S, 89°W, a boat was prepared for collecting pelagic birds, including these two specimens.

MAGENTA PETREL *Pterodroma magentae* **CR**
Æstrelata magentae Giglioli & Salvadori, 1869
MZUT AV6689; mount; unsexed adult; southern Pacific Ocean, 39°38'S, 125°58'W, 22 July 1867; collected during the *Magenta* voyage.

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Remarks.—The holotype of *Æstrelata magentae* Giglioli & Salvadori, 1869, which species went unobserved for a century following its description (Crockett 1994, Imber *et al*. 1998). Although the population of *P. magentae* is slowly recovering, the species is restricted to a single colony of 150–200 individuals on the Chatham Islands, east of New Zealand (BirdLife International 2018). Specimens are very rare in museum collections: in addition to the holotype, Te Papa Tongarewa (Museum of New Zealand) holds an adult male and a juvenile (https://collections.tepapa.govt.nz/topic/2802) and the Canterbury Museum, New Zealand, a fourth specimen (Pacific Ocean, *ante* 1910), misidentified until 2008 as Tahiti Petrel *Pseudobulweria rostrata* (Lawrence *et al*. 2008).

THRESKIORNITHIDAE

NORTHERN BALD IBIS *Geronticus eremita* **EN**
Upupa eremita Linnaeus, 1758
MZUT AV19119; skin; adult male; Ethiopia, Shewa, Chelekleka (Chalalaka) Lake, 4 December 1879; from the O. Antinori collection (no. 1177).
MZUT AV19120; skin; adult female; adult; Ethiopia, Shewa, Chelekleka (Chalalaka) Lake, 14 December 1879; from the O. Antinori collection (no. 1186).
MZUT AV19121; skin; adult male; Ethiopia, Shewa, Entoto, 7 December 1885; from the V. Ragazzi collection (no. 387).
MZUT AV19122; skin; immature male; Ethiopia, Shewa, Entoto, 7 December 1885; from the V. Ragazzi collection (no. 386).
MZUT AV20607; mount; unsexed adult; Algeria, no date; from Parzudaki, in 1858.

Remarks.—Orazio Antinori (1811–82) and Vincenzo Ragazzi (1856–1929) provided a large number of specimens to the Torino museum: currently MRSN holds 980 Antinori and 702 Ragazzi specimens, of which 766 and 651, respectively, are from Ethiopia. Biographical information on these great Italian explorers can be found in Mazzotti (2011) and Mari & Ansaloni (2012).

MZUT AV20607, which was not mentioned by Elter (1986), was purchased from Parzudaki in 1858. Salvadori (1915) reported that in 1856–58 'Parzudaki' sold numerous birds to Prof. Defilippi for the Torino museum. Charles & Emile Parzudaki were natural history dealers in Paris between *c*.1838 and 1866 (Gouraud *et al*. 2016).

FREGATIDAE

CHRISTMAS FRIGATEBIRD *Fregata andrewsi* **CR**
Fregata andrewsi Mathews, 1914
MZUT AV6097; mount; unsexed juvenile; Christmas Island, 24 April 1866; collected during the *Magenta* voyage.

Remarks.—On 24 April 1866, the Italian warship *Magenta* was at 10°44'S, 104°28'E, some *c*.35–40 nautical miles from Christmas Island in the Indian Ocean (Giglioli 1870, 1876). Giglioli originally identified the specimen as a juvenile Ascension Frigatebird *F. aquila* (Linnaeus, 1758) but it was re-identified as *F. andrewsi*, probably by Salvadori, after the species was described by Mathews (1914). Photographs and measurements of the bill and wing confirm the re-identification (I. A. W. McAllan pers. comm.).

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RECURVIROSTRIDAE

BLACK STILT *Himantopus novaezelandiae* **CR**
Himantopus novæ-zelandiæ Gould, 1841
MZUT AV6940; previously mounted; adult male; New Zealand, no date; from O. Finsch, in 1869.

Remarks.—Otto Finsch (1839–1917), the German ethnographer, naturalist and explorer, was curator or director of natural history museums in Leiden (the Netherlands) and Bremen (Germany) (Mearns & Mearns 1998). Finsch visited New Zealand only in 1881 and 1885, but he exchanged specimens with J. Haast in 1860; therefore, this specimen was not collected by Finsch himself, but probably came from one of these exchanges (P. Scofield pers. comm.).

SCOLOPACIDAE

ESKIMO CURLEW *Numenius borealis* **CR**
Scolopax borealis J. R. Forster, 1772
MZUT AV2904; previously mounted; adult female; 'South America', no date; from M. É. Moricand, in *c*.1832.
MZUT AV2951; previously mounted; unsexed immature?; 'South America', no date; from Dr R. Olivieri, in 1853.
MZUT AV9848; previously mounted; unsexed adult; Chile, western Patagonia, Jago Bay (Magellan Strait), 5 December 1867; collected during the *Magenta* voyage.

Remarks.—MZUT AV2951, labelled *Numenius minutus*, was re-identified as *N. borealis* by C. Pulcher (pers. comm.). In early December 1867 the Italian warship *Magenta* crossed the Strait of Magellan into the Atlantic Ocean. Jago Bay is located at *c*.52°33'S, 69°55'W (Giglioli 1876). Moïse Étienne Moricand (1779–1854) was a naturalist and museum administrator in the Museum d'histoire naturelle de Genève (Switzerland). We know nothing concerning Dr R. Olivieri.

SLENDER-BILLED CURLEW *Numenius tenuirostris* **CR**
Numenius tenuirostris Vieillot, 1817
MZUT AV2900; mount; immature female; Italy, Piemonte, environs of Torino, 3 September 1828; from Mr Alason.
MZUT AV2901; mount; immature female; Italy, Piemonte, environs of Torino, 3 September 1828; from Mr Alason.
MZUT AV6521; previously mounted; immature female; Italy, Piemonte, 1868; purchased from Bonomi.
MZUT AV6522; previously mounted; immature male; Italy, Piemonte, 1868; purchased from Bonomi.
MZUT AV12247; mount; adult male; Italy, Toscana, San Rossore (Pisa), 1875; donated by H. M. Vittorio Emanuele III, in 1901.
MZUT AV12248; mount; adult female; Italy, Toscana, San Rossore (Pisa), 1875; donated by H. M. Vittorio Emanuele III, in 1901.
MZUT AV12249; mount; adult female; Italy, Piemonte, Villastellone (Torino), 1881; donated by H. M. Vittorio Emanuele III, in 1901.
MZUT AV19577; mount; unsexed adult; Italy, Toscana, no date (before 1877); donated by E. Sella, ex. Benvenuti.

Remarks.—Alason assisted F. A. Bonelli (1784–1830) to gather a rich collection of birds from the 'Sardinian States', donating to the museum numerous specimens from Piemonte, some of them rare or remarkable (Salvadori 1915).

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The Bonomi family of Milano were known since the early 19th century for their trade in, and taxidermy of, animals, mainly birds, from all over the world. The first representative we are aware of was Carlo Francesco Bonomi, who in 1828 was awarded a gold medal for his business (Anon. 1828). Other taxidermists in the family, which Violani (2009) considered one of the main suppliers of Italian natural history museums, included Enrico, Pietro, Luigi and Clelia. Luigi Bonomi was the first taxidermist for MZUT; on his death, in 1883, his daughter Clelia was named second taxidermist (ASUT 2011).

Eugenio Sella (1820–82), cousin of the statesman Quintino, donated to the museum a series of 510 specimens of Italian birds in 1877 (Salvadori 1915).

In 1901 the King of Italy, Vittorio Emanuele III (1869–1947), donated a collection of 998 European birds, including those collected by Vittorio Emanuele II, the last King of Sardinia (1849–61) and the first King of Italy (1861–78).

ACCIPITRIDAE

SPANISH IMPERIAL EAGLE *Aquila adalberti* **VU**

Aquila adalberti C. L. Brehm, 1861

MZUT AV12533; mount; unsexed; Spain, no date; donated by H. M. Vittorio Emanuele III.
MZUT AV12867; mount; adult male; Spain; purchased from Verreaux in 1872.

Remarks.—The Maison Verreaux, established in 1803 at the Place des Vosges in Paris, was the earliest company dealing in natural history objects (Daszkiewicz 1997). It played an important role during the golden age of natural history collecting, with a catalogue offering thousands of birds, eggs and nests, as well as mammals, shells, reptiles, amphibians, insects, etc. In addition to its commercial reputation, it was known for promoting and financing collecting expeditions.

RUFOUS-TAILED HAWK *Buteo ventralis* **VU**

Buteo ventralis Gould, 1837

MZUT AV8177; mount; immature male; Chile, Punta Arenas, December 1864; donated by Museo Nacional de Historia Natural, Santiago.

Remarks.—This specimen was obtained during the circumnavigation of the Italian warship *Magenta* when, on 6 October 1867, Enrico H. Giglioli visited the Museo Nacional de Historia Natural, Santiago (Giglioli 1876).

ALCEDINIDAE

KOFIAU PARADISE-KINGFISHER *Tanysiptera ellioti* **VU**

Tanysiptera ellioti Sharpe, 1870

MZUT AV10056; previously mounted; adult female; Indonesia, West Papua, Kofiau Island, August 1875; collected by A. A. Bruijn and donated by G. Doria in 1882.

Remarks.—This specimen is one of the two females referred to by 'd–e' in Salvadori (1880: 448). It was donated to the museum by Giacomo Doria (1840–1913) (Salvadori 1915), the founder of the Museo Civico di Storia Naturale 'Giacomo Doria', Genova (Italy), and was collected by Antoine Augustus Bruijn (1842–90), a Dutch navy officer, naturalist and trader in natural items from the Dutch East Indies. He and his men collected many birds in the Moluccas and West Papua. Parts of these collections were donated to the Genova museum, where they were studied by Tommaso Salvadori, who in exchange acquired many duplicates for MZUT.

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GABULIDAE

THREE-TOED JACAMAR *Jacamaralcyon tridactyla* **VU**
Galbula tridactyla Vieillot, 1817
MZUT AV1080; previously mounted; unsexed adult; 'South America'; donated by Dr Ricord in 1843.
MZUT AV15057; previously mounted; unsexed adult; 'South America'; no date.

Remarks.—Alexandre Ricord (1798–1876) was a surgeon who devoted his life to natural history. He travelled in tropical America between 1826 and 1834, collecting many zoological specimens. Salvadori (1915) reported that in 1843 Dr Ricord sent an interesting series of birds from various locations, including Brazil, Cuba and Haiti.

STRIGOPIDAE

KAKAPO *Strigops habroptila* **CR**
Strigops habroptilus G. R. Gray, 1845
MZUT AV1068; mount; unsexed specimen; New Zealand, South Island, July 1851; purchased from G. A. Frank.

PSITTACIDAE

PUERTO RICAN AMAZON *Amazona vittata* **CR**
Psittacus vittatus Boddaert, 1783
MZUT AV1939; previously mounted; adult female; 'Santo Domingo', but captive; donated by Mrs Bongioanni in April 1822.
MZUT AV9448; previously mounted; unsexed adult; captive; from the Royal Zoological Garden of Torino, in 1879.

Remarks.—MZUT AV1939 cannot be from Santo Domingo (i.e. the Dominican Republic), because *A. vittata* is confined to Puerto Rico. We have been unable to discover anything about Mrs Bongioanni.

YELLOW-FACED PARROTLET *Forpus xanthops* **VU**
Psittacula xanthops Salvin, 1895
MZUT AV5759; skin; adult male; Peru, Huamachuco, Viña Marañón, 5,000 ft., 1 March 1895; from Berlepsch, ex. O. T. Baron collection.

Remarks.—This specimen, donated by Hans Berlepsch (1850–1915), originally formed part of the collection of Oskar Theodore Baron (1847–1926), a German engineer who travelled in northern Peru. The type series, also collected by Baron in the previous year (March 1894), is from the same locality (Salvin 1895).

GREY-BREASTED PARAKEET *Pyrrhura griseipectus* **EN**
Pyrrhura griseipectus Salvadori, 1900
MZUT AV10583; previously mounted; unsexed; no locality; 1888; donated by Count Peracca.
MZUT AV10584; previously mounted; unsexed; no locality; 1888; donated by Count Peracca.

Remarks.—These specimens are syntypes; their locality is unknown, but Salvadori suspected they came from 'Guiana', although the species is now known to be endemic to north-east Brazil. They had been kept in captivity by Count Peracca (Salvadori 1900), assistant at the Institute of Zoology of the Torino University.

SPIX'S MACAW *Cyanopsitta spixii* **CR (PEW)**
Sittace spixii Wagler, 1832

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MZUT AV14581; previously mounted; immature male; Brazil, Bahia, 1858; purchased from Parzudaki.

YELLOW-EARED PARROT *Ognorhynchus icterotis* **EN**
Conurus icterotis Massena & Souancé, 1854
MZUT AV7786; previously mounted; unsexed (or female?) adult; Colombia ('Nouvelle Grenade'), Bogotá, 1868?; purchased from Mr De Gréaux.

Remarks.—The label that was attached to the base mentions Bogotá (Colombia); the old label: 1868, *Psittacara icterotis*, [...] Brasil [deleted], Nuova Granata, L. 150, 205/1870, «on n'en connait que 2 exemplaires 1 à Londres 1 à M. Turati, aucun autre Musée ne le posside [*sic*]».

De Gréaux was not entirely correct, but he was right to believe that the species was very rare in European collections: a few years earlier, Finsch (1867) was aware of just three, all from 'Neu-Granada', in the British Museum (arguably the holotype, *cf*. Salvadori 1891, Warren 1966), in Bremen and in the Museum Heineanum, the last the type of *Gnathosittaca heinei* Cabanis.

ORANGE-BELLIED PARROT *Neophema chrysogaster* **CR**
Psittacus chrysogaster Latham, 1790
MZUT AV1893; previously mounted; adult female; Australia, no date; purchased by F. A. Bonelli in 1820.

Remarks.—The label attached to the base of the wooden stand is inscribed '*Neophema chrysogastra* (Lath.)? New Holland' and the manuscript catalogue '*Euphema aurantia*, Gould?'. Salvadori (1891) described genus *Neophema* and stated that *N. chrysogastra* and *N. aurantia* were synonyms. The pedestal label was probably written by Salvadori himself, who was evidently unsure of the specimen's identification.

RED-THROATED LORIKEET *Charmosyna amabilis* **CR**
Trichoglossus (*Glossopsitta*) *amabilis* E. P. Ramsay, 1875
MZUT AV11219; previously mounted; adult male; Fiji Islands, January 1889; from Hans Berlepsch, ex. C. Ribbe.

Remarks.—Salvadori (1915) reported that in December 1891 Count Berlepsch of Gmunden (Austria) sent 36 birds from various locations to the Torino museum in an exchange. Carl Ribbe (1860–1934) was a German explorer, entomologist and dealer in insects.

TYRANNIDAE

KINGLET CALYPTURA *Calyptura cristata* **CR**
Pardalotus cristatus Vieillot, 1818
MZUT AV16101; previously mounted; unsexed adult; Brazil, no date.

Remarks.—Hume & Walters (2012) considered *C. cristata* to be Possibly Extinct, but BirdLife International (2018) continue to treat the species as Critically Endangered, with its population estimated at fewer than <50 mature individuals.

MONARCHIDAE

TAHITI MONARCH *Pomarea nigra* **CR**
Muscicapa nigra Sparrman, 1786
MZUT AV2950; previously mounted; male; (Tahiti?); from Colombi, in 1846.

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Remarks.—As the specimen's provenance is uncertain, it might be referrable to one of the races of Marquesas Monarch *Pomarea mendozae*, i.e. *P. m. mendozae* (from Hiva Oa and Tahuata Island, Extinct) or *P. m. motanensis* (from Mohotani Island, Endangered).

CORVIDAE

JAVAN GREEN MAGPIE *Cissa thalassina* **CR**
Kitta thalassina Temminck, 1826
MZUT AV17214; previously mounted; unsexed; Indonesia, Java, no date; donated by the Marquis of Breme, in 1847.

Remarks.—Ferdinando Arborio Gattinara di Breme (1807–69), an Italian entomologist, ornithologist, painter and politician, donated his ornithological collection to King Vittorio Emanuele II. Initially housed in Venaria, at La Mandria, the collection was subsequently transferred to Moncalieri Castle; in 1901 King Vittorio Emanuele III donated the birds to Torino and Roma museums (Salvadori 1902, Maschietti *et al*. 1988, Marangoni & Gippoliti 2011).

CALLAEIDAE

SOUTH ISLAND KOKAKO *Callaeas cinereus* **CR**
Glaucopis cinerea J. F. Gmelin, 1788
MZUT AV3585; previously mounted; unsexed; New Zealand, no date; purchased by A. Caffer in Rio de Janeiro in 1839.
MZUT AV16330; previously mounted; unsexed; New Zealand, 1843.

Remarks.—Hume & Walters (2012) treated this species as extinct. In 1839–40 Antonio Caffer, assistant to the Royal Zoological Museum of Torino, embarked on the frigate *Regina* for a journey around the globe. A storm near the Falkland Islands seriously damaged the ship, which was forced to return first to Rio de Janeiro, Brazil, where Caffer purchased about 2,400 zoological specimens, and then to Genova (Mottin & Casolino 1999).

NOTIOMYSTIDAE

STITCHBIRD *Notiomystis cincta* **VU**
Meliphaga cincta du Bus de Gisignies, 1839
MZUT AV4818; previously mounted; unsexed; New Zealand, no date; purchased from G. A. Frank, in 1847.
MZUT AV17281; previously mounted; unsexed; New Zealand, no date; purchased from G. A. Frank, in 1847.

ACROCEPHALIDAE

TAHITI REED WARBLER *Acrocephalus caffer* **EN**
Sitta caffra Sparrman, 1786
MZUT AV2946; skin; unsexed; French Polynesia, Society Islands, Tahiti, no date; from Colombi, in 1846.
MZUT AV15751; skin; unsexed; French Polynesia, Society Islands, Tahiti, no date; from Colombi, in 1846.

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PYCNONOTIDAE

MAURITIUS BULBUL *Hypsipetes olivaceus* **VU**
H[*ypsipetes*]. *olivacea* Jardine & Selby, 1837
MZUT AV6261; previously mounted; adult male; Mauritius, 1867; purchased from Verreaux.
MZUT AV6269; previously mounted; female; Mauritius, 1867; purchased from Verreaux.

Remarks.—These specimens were previously identified as Reunion Bulbul *H. borbonicus*, but their mensural data and collecting locality clearly indicate *H. olivaceus*.

STURNIDAE

BLACK-WINGED MYNA *Acridotheres melanopterus* **CR**
Gracula melanoptera Daudin, 1800
MZUT AV18071; skin; unsexed; Indonesia, Java, Tangeran River, 24 March 1867; collected during the *Magenta* voyage.
MZUT AV18072; skin; unsexed; Indonesia, Java, Tangeran River, 24 March 1867; collected during the *Magenta* voyage.
MZUT AV18073; skin; unsexed; Indonesia, Java, Tangeran River, 24 March 1867; collected during the *Magenta* voyage.

Remarks.—The occurrence of this species near the Tangeran River (Jakarta) is mentioned by Giglioli (1876).

JAVAN PIED STARLING *Gracupica jalla* **CR**
Pastor jalla Horsfield, 1821
MZUT AV5904; skin; unsexed; Indonesia, 'Purmeran' Island (northern Java), 5 March 1867; collected during the *Magenta* voyage.
MZUT AV5905; skin; unsexed; Indonesia, 'Purmeran' Island (northern Java), 5 March 1867; collected during the *Magenta* voyage.

Remarks.—The species' presence on Pulo Purmeran, near Ornust Island, off Jakarta, which had a naval base to repair and equip ships, is mentioned by Giglioli (1876).

FRINGILLIDAE

AKIAPOLAAU *Hemignathus wilsoni* **EN**
Heterorhynchus wilsoni Rothschild, 1893
MZUT AV11656; mount; male; USA, Hawaii, 1900; collected by R. C. L. Perkins.

AKOHEKOHE *Palmeria dolei* **CR**
Himatione dolei S. B. Wilson, 1891
MZUT AV11653; mount; adult male; USA, Hawaii, Moloka'i Island (4,000–5,000 ft.), 22 September 1893; collected by R. C. L. Perkins.

Remarks.—The species still occurs on Maui in the Hawaiian Islands, but is extinct on Moloka'i, where the last record was in 1907 (BirdLife International 2018).

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A cryptic new species of bulbul from Borneo

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Summary.—Cream-vented Bulbul *Pycnonotus simplex* of Borneo was previously considered to be polymorphic in iris colour, having either red or white (creamy-yellow) irides. Mitochondrial DNA sequence comparisons, however, indicate that white- and red-eyed Bornean individuals are not closely related to one another. Instead, white-eyed birds are sister to Ashy-fronted Bulbul *P. cinereifrons* of Palawan Island, in the south-west Philippines, and red-eyed birds are sister to white-eyed *P. simplex* of the Thai-Malay Peninsula. Consequently, we elect to treat the white-eyed Bornean population as a distinct, previously overlooked species. In respect to plumage, white- and red-eyed individuals are almost identical, varying only slightly in the amount of yellow coloration in their feathers. The two taxa are sympatric at some localities, but white-eyed individuals are rarer and more consistently associated with mature forest than red-eyed birds.

Cream-vented Bulbul *Pycnonotus simplex* is a uniformly olive-brown species that occurs from southern Indochina throughout the Sunda Islands, except Palawan in the south-western Philippines (Fig. 1). Its classification has been complicated by its variable iris colour (Hoogerwerf 1966, Mees 1986, Dickinson & Dekker 2002), which has led to a confused taxonomic history and disagreement concerning the validity of iris colour as a subspecific character (Hoogerwerf 1966, Mees 1986). Although as many as six subspecies of *P. simplex* have been named (Table 1), only three or four are currently recognised (Dickinson & Christidis 2014, Eaton *et al*. 2016, Clements *et al*. 2017). Here, we follow the classification of Dickinson & Christidis (2014) because of its thorough documentation. It lists three subspecies.

Nominate *P. s. simplex* Lesson, 1839, occurs from south-eastern Myanmar to Sumatra, the southern Natuna Islands and Borneo. Individuals on the Asian mainland and Sumatra have white to grey or yellowish-white irides (Meyer de Schauensee 1958, Mees 1986). Populations on Borneo, Billiton, and Bangka Islands have primarily red irides (Mees 1986), a distinction that caused Chasen & Kloss (1929) to treat them subspecifically as *P. s. perplexus*. Yet another subspecies, *P. s. oblitus*, was originally described from the southern Natuna Islands based on its red irides and supposedly longer, heavier bill (Deignan 1954). However, in a thorough review of the species' taxonomy, Mees (1986) noted that individuals with 'white' irides (i.e., pale yellow or creamy yellow) also occur occasionally on Borneo, often in close proximity to red-eyed individuals, and he also found no size difference between *P. s. oblitus* and specimens from Borneo. Mees agreed with Hoogerwerf (1966) that iris colour is not a reliable subspecific character in these bulbuls and treated *P. s. perplexus* and *P. s. oblitus* as junior synonyms of *P. s. simplex*. As a result, *P. s. simplex* now includes both red- and white-eyed individuals.

The second subspecies, *P. s. prillwitzi* E. J. O. Hartert, 1902, occurs on Java, but its iris colour was not noted in the original description. Later, Hoogerwerf (1996) indicated that Javan birds have red, orange or reddish-brown irides. This subspecies was described

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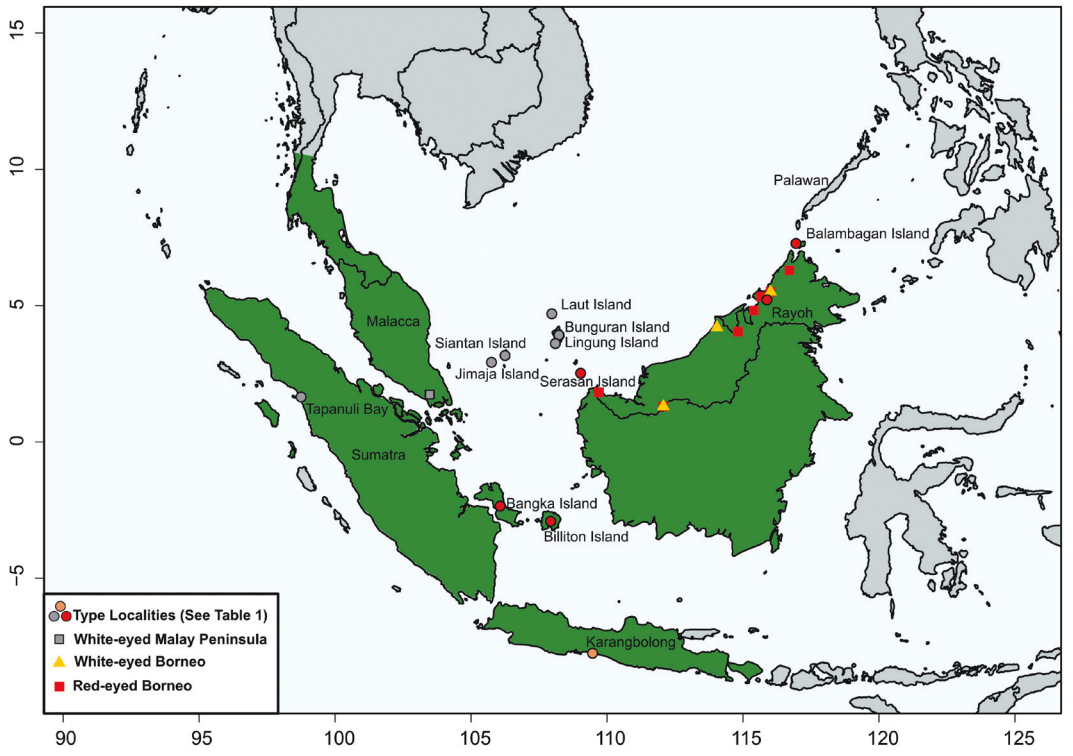

Figure 1. Map of Sundaland showing range of Cream-vented Bulbul *Pycnonotus simplex* with labelled type localities of subspecies from Table 1 and the collecting sites of *P. simplex* specimens whose ND2 was sequenced.

as brighter overall than other subspecies, with greener upperparts and more yellowish underparts (Hartert 1902). The third subspecies, *P. s. halizonus* Oberholser, 1917, which includes *P. s. axanthinus* Oberholser, 1932, as a junior synonym, occurs on the northern Natuna and Anamba Islands. It was described as having white irides and being larger than individuals from Borneo or the Thai-Malay Peninsula (Oberholser 1917).

Recent work has shown that iris colour actually can be an important trait for differentiating bulbul taxa that previously were considered conspecific based on similarities in plumage and vocalisations (Garg *et al*. 2016). On Borneo, two common bulbul species that are similar in plumage and voice to each other and to *P. simplex* are readily distinguished by their eye coloration. Whereas *P. simplex* has dark red, creamy or white irides, Red-eyed Bulbul *P. brunneus* has a distinctly orange or two-toned iris (red at the edge and orange towards the centre) and Spectacled Bulbul *P. erythropthalmos* has a dark red iris surrounded by an eye-ring of yellow skin. Based on these observations, eye colour would appear to play a key role in recognition among some bulbul species.

In the course of genetic comparisons for ongoing studies of Bornean bird biogeography and phylogeography (e.g., Sheldon *et al*. 2015, Lim *et al*. 2017, Shakya *et al*. 2018), we discovered that red- and white-eyed *P. s. simplex* on Borneo are not members of the same species. They are not even sister taxa. White-eyed individuals—although remarkably similar to red-eyed birds in plumage—are members of a distinct species.

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TABLE 1
Past and current names of *Pycnonotus simplex* populations.

Name	**Current Designation** (based on Dickinson & Christidis 2014)	Journal	Localities in original description	**Iris colour in original description**
P. simplex Lesson, 1839	*P. s. simplex*	*Rev. Zool*. 2: 167	'Sumatra'	-
Microtarsus olivaceus Moore, 1854	*P. s. simplex*	*Cat. Birds Mus. East India Co*. 1: 249	'Malacca'	-
P. olivaceus chloeodis Oberholser, 1912	*P. s. simplex*	*Smiths. Misc. Coll*. 60(7): 11	'Tapanuli Bay, north-western Sumatra'	-
P simplex perplexus Chasen & Kloss, 1929	*P. s. simplex*	*J. Orn*., Ergänzungsb. 2: 116	'Balembangan Island (Sabah, type locality) 'Rayoh' (Sabah)	crimson/ chrome/scarlet
P. simplex oblitus Deignan, 1954	*P. s. simplex*	*J. Wash. Acad. Sci*. 44: 124	'Pulau Serasan, southern Natuna Islands' (type locality) 'western Borneo' 'Billiton and Bangka Islands'	red
P. prillwitzi E. J. O. Hartert, 1902	*P. s. prillwitzi*	*Novit. Zool*. 9: 561	'Karangbolong, S. Java'	*
P. simplex halizonus Oberholser, 1917	*P. s. halizonus*	*Bull. US Natl. Mus*. 98: 43	'Pulo Jimaja, Anamba Islands' (type locality) 'Pulo Siantan'	white
P. simplex axanthinus Oberholser, 1932	*P. s. halizonus*	*Bull. US Natl. Mus*. 159: 78	'Bunguran Island, Natuna Islands, South China Sea' (type locality) 'Pulo Laut' 'Pulo Lingung'	white

* Iris colour was not stated in Hartert's description, but specimens from Java have red, orange or reddish-brown irides (Hoogerwerf 1966).

Methods

We compiled a dataset of mitochondrial ND2 (NADH dehydrogenase subunit 2) sequences of 15 *P. simplex* individuals from Borneo (11 red-eyed and four white-eyed) and one from the Thai-Malay Peninsula (white-eyed), as well as outgroup sequences of four *P. brunneus*, two Ashy-fronted Bulbuls *P. cinereifrons*, nine Olive-winged Bulbuls *P. plumosus*, one *P. erythropthalmos*, one Straw-headed Bulbul *P. zeylanicus* and two Buff-vented Bulbuls *Iole charlottae* (Table 2). These outgroups were selected based on a recent phylogenetic study of the Pycnonotidae (Shakya & Sheldon 2017). Sequences were either newly generated or obtained from GenBank. For newly generated sequences, we extracted total genomic DNA from frozen or alcohol-preserved samples using a DNEasy Blood and Tissue Kit (Qiagen, Hilden, Germany) following the manufacturer's protocol. PCR amplifications of ND2 were performed using primer pairs L5215 (Hackett 1996) and HTrpC (STRI) as described in Shakya & Sheldon (2017). Sequences were aligned using MUSCLE (Edgar 2004), and maximum-likelihood (ML) tree searches were conducted using RAxML v8 (Stamatakis 2014) with the GTRGAMMA model for three partitions corresponding to each codon position. A total of 1,000 non-parametric bootstraps was run to obtain branch support values in the best tree generated from RAxML.

We also examined and measured skin specimens in the collections of the Louisiana State University Museum of Natural Science (LSUMNS), Baton Rouge, LA, and the Western Foundation of Vertebrate Zoology (WFVZ), Camarillo, CA, USA. Specifically, we measured bill length (from the nares to the tip), bill width (at nares), bill depth (at nares),

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TABLE 2
Specimen, tissue, and GenBank numbers of taxa included in phylogenetic analyses.

Species[1]	Specimen No.	Tissue No.	Locality[2]	Iris colour	GenBank No.
Pycnonotus simplex	LSUMZ 176482	LSUMNS B-47018	Serinsim, Sabah	red	MK298052
Pycnonotus simplex	LSUMZ 176485	LSUMNS B-47164	Klias Forest Reserve, Sabah	red	MK298053
Pycnonotus simplex		LSUMNS B-52090	Johor, Malay Peninsula	brown*	MK298054
Pycnonotus simplex	LSUMZ 186302	LSUMNS B-58561	Pueh, Sarawak	red	MK298055
Pycnonotus simplex	LSUMZ 181682	LSUMNS B-61611	Ulu Kimanis, Sabah	red	MK298056
Pycnonotus simplex		LSUMNS B-88077	Mt. Mulu National Park, Sarawak	red	MK298059
Pycnonotus simplex		LSUMNS B-88418	Ahmad Takong, Lawas, Sarawak	red	MK298060
Pycnonotus simplex	USNM 656154		Batang Ai National Park, Sarawak	red	MH908199
Pycnonotus simplex	USNM 656156		Batang Ai National Park, Sarawak	red	MH908200
Pycnonotus simplex	USNM 656168		Batang Ai National Park, Sarawak	red	MH908211
Pycnonotus simplex	USNM 656277		Batang Ai National Park, Sarawak	red	MH908312
Pycnonotus simplex	USNM 656279		Batang Ai National Park Sarawak	red	MH908314
Pycnonotus pseudosimplex	KU 113008	KU 17777	Ulu Kimanis, Sabah	light yellow	GU112671
Pycnonotus pseudosimplex	LSUMZ 181671	LSUMNS B-61615	Ulu Kimanis, Sabah	pale yellow	MK298057
Pycnonotus pseudosimplex	LSUMZ 188187	LSUMNS B-84971	Lambir Hills National Park, Sarawak	creamy yellow	MK298058
Pycnonotus pseudosimplex	USNM 656157		Batang Ai National Park, Sarawak	light yellow	MH908201
Pycnonotus brunneus		LSUMNS B-36341	Crocker Range National Park HQ, Keningau, Sabah	orange	DQ402233
Pycnonotus brunneus		LSUMNS B-47074	Serinsim, Sabah	orange	MK298042
Pycnonotus brunneus	LSUMZ 179308	LSUMNS B-57043	Samarakan, Tatau District, Sarawak	orange	MK298043
Pycnonotus brunneus		LSUMNS B-79723	Sebako, Mt. Pueh, Sarawak	orange	MK298044
Pycnonotus plumosus		LSUMNS B-23354	Membakut, Sabah	red	DQ402239
Pycnonotus plumosus		LSUMNS B-47033	Serinsim, Sabah	red	MK298046
Pycnonotus plumosus	LSUMZ 176502	LSUMNS B-47151	Klias Forest Reserve, Sabah	red	MK298047
Pycnonotus plumosus		LSUMNS B-52242	Niah National Park, Sarawak	red	MK298048
Pycnonotus plumosus	LSUMZ 186219	LSUMNS B-58541	Mt. Pueh, Sarawak	red	MK298049
Pycnonotus plumosus	LSUMZ 186220	LSUMNS B-58562	Pueh village, Sarawak	red	MK298050
Pycnonotus plumosus		LSUMNS B-88202	Mt. Penrissen, Sarawak	red	MK298051
Pycnonotus plumosus	KU 112990	KU 17707	Inobang, Sabah	red	GU112686
Pycnonotus plumosus		M0099	Singapore	red	KT321611
Pycnonotus cinereifrons	KU 99194	KU 12660	Palawan	chestnut	GU112684
Pycnonotus cinereifrons	KU 110303	KU 12806	Palawan	red	GU112685
Pycnonotus erythropthalmos	LSUMZ 188188	LSUMNS B-85012	Lambir Hills National Park, Sarawak	red	MK298045
Pycnonotus zeylanicus		LSUMNS B-23321	Lumat, Sabah	red	DQ402240
Iole charlottae	KU 113005	KU 17765	Ulu Kimanis, Sabah	white	GU112690
Iole charlottae	USNM 656293		Batang Ai National Park, Sarawak	white	MH908328

*Juveniles have brown eyes, which eventually become white on the Thai-Malay Peninsula (Wells 2007).
[1]Classification follows Dickinson & Christidis (2014).
[2]Sites in Sabah are described in Sheldon (2015).

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wing-chord length, tail length and tarsus length. We did not re-examine type specimens of *P. simplex* subspecies because original or revisional descriptions of subspecies outside Borneo distinguished them from Bornean red- and white-eyed individuals either by plumage colour or size (Oberholser 1917, Hoogerwerf 1966, Mees 1986). Also, plumage colour in specimens of *P. simplex* changes rapidly with age (Hoogerwerf 1966) and, thus, re-examination of plumage at this stage would be uninformative.

Results

Genetic comparisons indicate that white- and red-eyed *P. simplex* from Borneo do not form a monophyletic group (Fig. 2). Red-eyed Bornean birds are sister to white-eyed birds from the Thai-Malay Peninsula, whereas white-eyed Bornean birds are sister to *P. cinereifrons* of Palawan. ND2 sequences of white-eyed Bornean birds differ by a mean 14% from red-eyed Bornean birds and 12% from *P. cinereifrons*. Compared to these relatively large distances, ND2 of red-eyed Bornean birds differs by just 4% from white-eyed *P. simplex* of the Thai-Malay Peninsula.

Mensural data from museum skins indicate similarity in most dimensions between red-eyed and white-eyed individuals (Table 3). Wing, tail and tarsus lengths did not differ

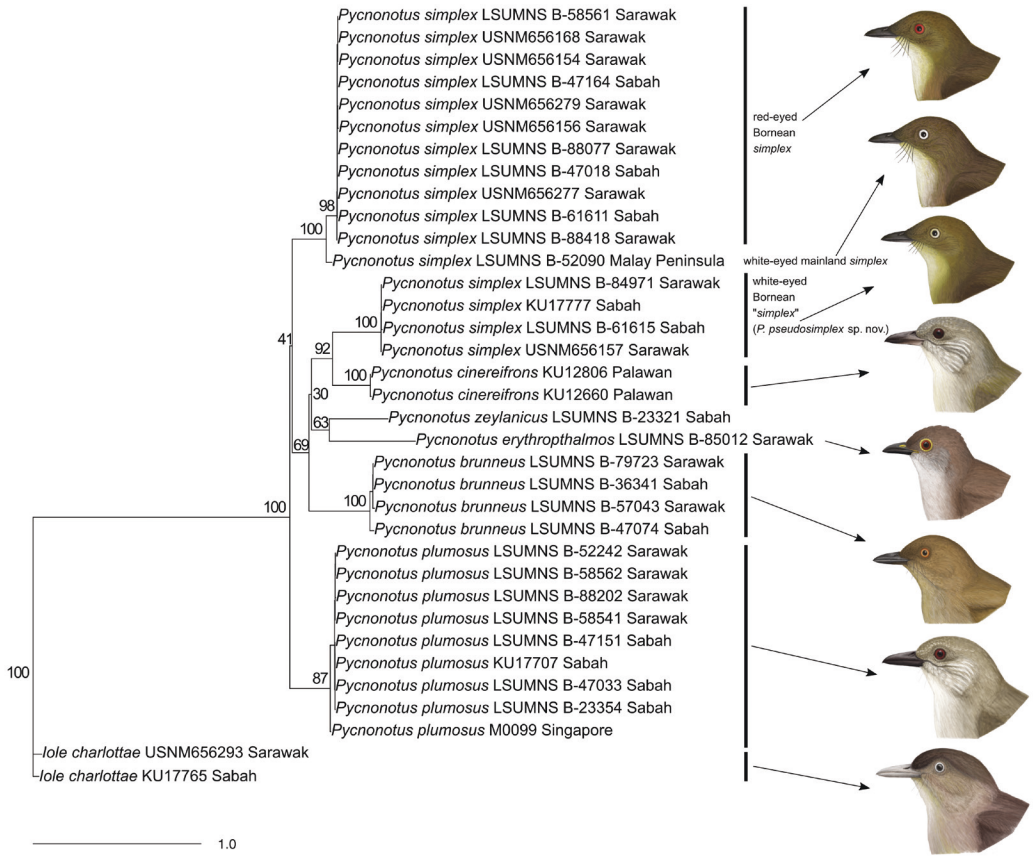

Figure 2. Maximum likelihood tree generated from mitochondrial ND2 sequences. Numbers adjacent to branches indicate bootstrap support. Illustrations of heads of each species are shown to the right (depictions by Subir B. Shakya).

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TABLE 3
Measurements of the new species and *P. s. simplex* from Borneo.

Species	Museum	No.	Sex	Locality[1]	Iris colour[2]	Mass (g)	Wing-chord length (mm)	Tail length (mm)	Culmen length (from nares) (mm)	Culmen width (at nares) (mm)	Culmen depth (at nares) (mm)	Tarsus length (mm)
sp. nov.	WFVZ	38747	M	Bole River, Sabah	straw	19.0	74	67.3	9.1	3.6	4.3	21.6
sp. nov.	WFVZ	38775	M	Saliwangan, Sabah	pale yellow	18.0	76	70.5	9.3	3.9	4.1	19.4
sp. nov.	WFVZ	38742	F	Bole River, Sabah	cream dark yellow	18.1	73	72.4	8.6	3.7	4.3	17.9
sp. nov.	WFVZ	38778	F	Saliwangan, Sabah	pale yellow	12.4	71	62.8	8.5	3.4	3.5	19.6
sp. nov.	WFVZ	38743	M	Bole River, Sabah	cream yellow	20.8	72	76.9	8.7	3.9	3.9	17.0
sp. nov.	WFVZ	38746	F	Bole River, Sabah	creamy yellow	17.6	73	65.9	8.6	3.1	3.9	17.4
sp. nov.	WFVZ	38754	M	Megatai (Mangkatai), Sabah	pale yellow	21.2	76	73.8	9.4	3.6	4.5	16.2
sp. nov.	WFVZ	38776	M	Saliwangan, Sabah	pale yellow	16.0	77	71.6	8.4	3.5	3.6	19.3
sp. nov.	WFVZ	38782	F	Saliwangan, Sabah	pale yellow	15.0	76	69.4	8.8	3.7	3.7	19.5
sp. nov.	WFVZ	38780	M	Saliwangan, Sabah	straw yellow	17.9	75	70.3	9.3	3.7	3.8	17.5
sp. nov.	LSUMZ	188187	M	Lambir Hills National Park, Sarawak	cream yellow	17.6	76	67.9	9.4	4.3	4.2	19.2
sp. nov.	LSUMZ	181671	F	Ulu Kimanis, Sabah	pale yellow	19.9	69	65.2	8.6	3.8	4.3	20.1
					Mean	**17.8**	**74.0**	**69.5**	**8.9**	**3.7**	**4.0**	**18.7**
					SD	**2.4**	**2.3**	**3.8**	**0.4**	**0.3**	**0.3**	**1.5**
simplex	LSUMZ	188186	M	Lambir Hills National Park, Sarawak	red	20.0	71	67.3	9.0	4.4	4.6	18.1
simplex	LSUMZ	187653	F	Kelabit Highlands, Sarawak	red	19.0	71	70.2	9.2	4.0	4.1	19.1
simplex	LSUMZ	187654	F	Kelabit Highlands, Sarawak	red	18.5	74	71.2	8.5	3.8	4.3	16.9
simplex	LSUMZ	181670	M	Ulu Kimanis, Sabah	red	21.1	77	72.9	9.4	3.6	4.8	15.8
simplex	LSUMZ	176482	M	Serinsim, Sabah	red	20.8	75	71.7	9.5	3.7	4.3	18.5
simplex	LSUMZ	181681	M	Ulu Kimanis, Sabah	red	19.1	79	73.9	9.7	4.0	4.7	20.1
simplex	LSUMZ	176484	M	Klias Forest Reserve, Sabah	red	19.2	78	67.0	9.6	4.4	4.9	18.9
simplex	LSUMZ	176486	F	Klias Forest Reserve, Sabah	red	24.6	74	68.4	9.1	4.1	4.4	20.2
simplex	LSUMZ	177789	F	Ulu Tungud Forest Reserve, Sabah	red	22.0	76	68.9	9.0	4.5	4.6	19.1
simplex	LSUMZ	181715	F	Tatau, Sarawak	red	24.0	74	73.4	9.9	4.3	4.3	20.4
simplex	LSUMZ	187650	F	Kelabit Highlands, Sarawak	red	19.7	74	74.7	9.2	4.1	4.4	18.1
					Mean	**20.7**	**74.8**	**70.9**	**9.3**	**4.1**	**4.5**	**18.6**
					SD	**2.0**	**2.4**	**2.6**	**0.4**	**0.3**	**0.2**	**1.3**

[1]Sites in Sabah are described in Sheldon (2015).
[2]Iris colour from specimen labels.

significantly. However, red-eyed birds appear to be slightly heavier than white-eyed birds: red, mean 20.7 ± 2.0 g (n = 11); white, mean 17.8 ± 2.4 g (n = 12). Red-eyed birds also appear to have slightly larger bills in all dimensions. No incidental biological circumstances appear to cause the size differences; e.g., the mass variation does not result from more breeding females in one taxon than the other.

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Discussion

Taxonomy.—Genetic comparisons using mitochondrial ND2 sequences reveal that white- and red-eyed individuals of *P. simplex* from Borneo are not members of the same species. Their segregation by iris colour is backed by a deep ND2 sequence divergence (14%). Red-eyed Bornean birds are sister to white-eyed *P. s. simplex* of the Thai-Malay Peninsula at 4% ND2 divergence, whereas white-eyed Bornean birds are sister to *P. cinereifrons* of Palawan at 12% ND2 divergence. The perfect association of ND2 haplotype with iris colour across the region where the two morphotypes co-occur suggests assortative mating and the absence of mitochondrial gene introgression. For the red-eyed Bornean population, iris colour difference is adequate for recognition as a separate subspecies (*P. s. perplexus*; Chasen & Kloss, 1929, Eaton *et al.* 2016), or possibly even species, from white-eyed *P. s. simplex* of the Thai-Malay Peninsula and Sumatra. Because the two taxa are relatively closely related in respect to ND2 distance, species-level reclassification should depend on future research into gene flow and song. Plumage variation is unlikely to be helpful because of the similarity between these populations and the tendency for colours to change in museum specimens (Hoogerwerf 1966, Mees 1986). For the white-eyed Bornean population, its large genetic distance from *P. cinereifrons* and distinct morphology (Fig. 2) are sufficient to recognise it as a species.

There are no other taxa whose names apply to the Bornean white-eyed population. *P. simplex* subspecies have been described from Sumatra, the Anamba Islands, the northern Natuna Islands, the southern Natuna Islands, Java, and northern Borneo (Table 1, Fig. 1). Iris colour and size connect white-eyed populations of Sumatra and mainland Asia in subspecies *simplex* (Fig. 1). Larger size distinguishes the white-eyed subspecies *halizonus* (including its junior synonym *axanthinus*) of the Anamba and northern Natuna Islands from other white-eyed populations: e.g., mean wing length for *halizonus* 83.6 mm (n = 4) vs. 74 mm (n = 12) for Bornean white-eyed individuals. The red-eyed subspecies on the southern Natuna Islands (*oblitus*) belongs with Borneo's red-eyed population based on iris colour, size and plumage (Mees 1986). Eye colour of the Javan population (*prillwitzi*) varies from red to orange or red-brown, and its plumage is more distinctive than any other population of *P. simplex*, including red- and white-eyed Bornean populations (Hoogerwerf 1966). Apart from these taxa of *P. simplex*, there is no evidence that early taxonomists confused other species of similar-looking bulbuls with the white-eyed Bornean population of *P. simplex*. *Pycnonotus brunneus* has two subspecies*: P. b. brunneus* (including *P. b. zaphaeus*) and *P. b. zapolius*. Both of these were described as having red irides. *P. erythropthalmos* (including *P. e. salvadorii*, sometimes recognised for Borneo) has a red iris with a yellow eye-ring. Because no name applies to the Bornean white-eyed population, we name it:

Pycnonotus pseudosimplex, sp. nov.
Cream-eyed Bulbul

Holotype.—Study skin, Louisiana State University Museum of Zoology (LSUMZ 188187), Baton Rouge; tissue, LSU Museum of Natural Science (LSUMNS B-84971); adult male; Malaysia, Sarawak, Miri Division, Miri, Lambir Hills National Park, 04°12'N, 114°25'E; elevation *c*.120 m (from Google Earth); habitat: secondary forest continuous with old-growth hill forest; collected 23 April 2013; prepared by Frederick H. Sheldon (FHS), original catalogue number FHS 1022; photo by John Mittermeier (Fig. 3A); GenBank accession no. MK298058.

Diagnosis.—The iris of *P. pseudosimplex* is creamy yellow instead of crimson-red as in Cream-vented Bulbul *P. s. simplex* of Borneo. Its plumage also differs from that of *P. s. simplex*

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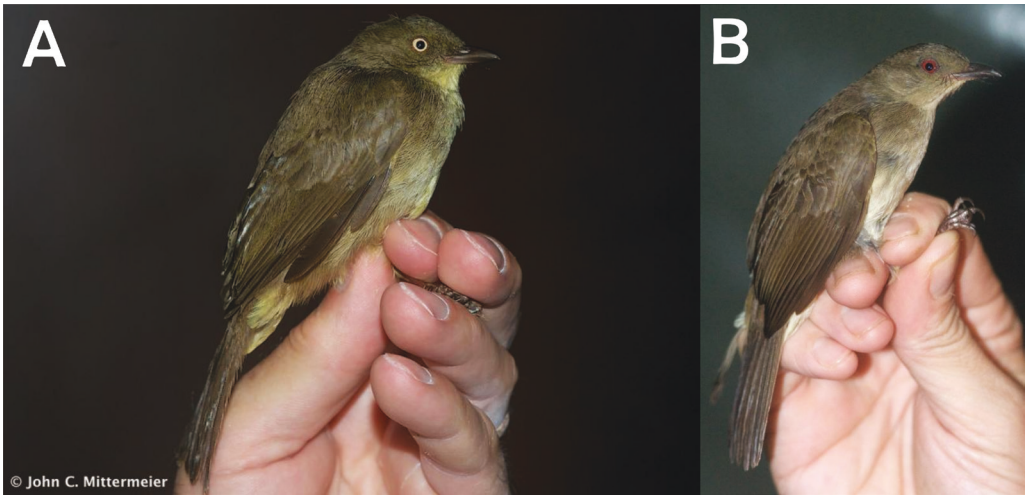

Figure 3. Photographs from Lambir Hills National Park, Miri Division, Sarawak, Malaysia of (A) Cream-eyed Bulbul *Pycnonotus pseudosimplex* sp. nov., and (B) Cream-vented Bulbul *P. simplex* (© John C. Mittermeier)

in being yellower on the throat and vent, creating greater contrast with the darker breast and flanks. From *P. cinereifrons*, *P. pseudosimplex* differs in being much smaller: *P. cinereifrons* mean 31.7 g (n = 3); *P. pseudosimplex* mean 20.7 g (n = 11). *P. cinereifrons* also has an olive tinge to the leading edge of its remiges, which is especially obvious on the folded wings of specimens (similar to *P. plumosus* of Borneo). From *P. brunneus*, *P. pseudosimplex* differs in having a white iris instead of an orange or two-toned iris. Similarly, *P. erythropthalmos* differs in having a dark red iris and a circle of yellow skin around the eyes.

Description of holotype.—Approximate colour names used for description, with standard colour names from Ridgway (1912) and alphanumeric colour codes from Munsell (1950) in parentheses. Crown, nape and back uniform olive-brown (Olive Brown; 5Y3/4) becoming yellower on rump and uppertail-coverts (Dresden Brown; 2.5Y4/4). Tail dark brown (Chestnut Brown; 10YR3/2). Cheeks similar in colour to crown (Olive Brown; 5Y3/4) with paler shaft-streaks to feathers. Throat pale yellow (Olive Buff; 5Y8.5/4); breast slightly darker than throat with darker olive-brown diffuse streaks (5Y4/2). Flank feathers olive (Light Brownish Olive; 2.5Y5/6). Undertail feathers cream-coloured (Naples Yellow; 5Y7/6). Wing like tail (Chestnut Brown; 10YR3/2) with olive-yellow edges. Soft part colours recorded on collection: bill black; iris creamy yellow; legs and toes dark brown. No moult; testis 2 × 1 mm, skull: 100% ossified; stomach: full of fruit with 1 mm-long seeds.

Measurements of type.—See Table 3.

Paratypes.—We designate 11 paratypes, which include specimen LSUMZ 181671 and ten specimens held at WFVZ: 38742, 38743, 38746, 38747, 38754, 38775, 38776, 38778, 38780, 38782 (listed in Table 3). The paratypes were collected in various parts of Sabah, Malaysian Borneo (unlike the holotype, which was taken in Sarawak, Malaysian Borneo). Measurements of all paratypes and their iris colours are reported in Table 3.

Etymology.—For more than 100 years this species has been confused with *P. simplex*, i.e., since Carl Lumholtz collected the first white-eyed specimen in 'Boeloengan' (Balungan Regency) along the Kayan River in eastern Kalimantan, Indonesian Borneo, in 1914 (Lumholtz 1920, Voous 1961). Apart from eye colour, the two species are almost indistinguishable; hence, we refer to the new species as 'false' or 'pseudo' *simplex*. The common name, Cream-eyed Bulbul, describes the main identifying character of the new

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species. It also evokes a time when *P. simplex* was known as the White-eyed Brown Bulbul, as opposed to the Red-eyed Brown Bulbul *P. brunneus* of Borneo (Smythies 1960).

Habitat.—*P. simplex* and *P. pseudosimplex* appear to be sympatric in mature forest interior and edge. Individuals of both species whose DNA was compared in this study were collected in the same localities during recent years: viz., Ulu Kimanis, Crocker Range National Park, Sabah, in 2008; Lambir Hills National Park, Sarawak, in 2013; and Batang Ai National Park, Sarawak, in 2018 (Fig. 1, Table 2). Both taxa were also mist-netted together in the early 1980s elsewhere in Sabah: at Bole River, Saliwangan Baru, and Mangkatai (Megatai) (localities described in Sheldon 2015). Although previous authors have stated that white- and red-eyed individuals co-occur throughout Borneo (Hoogerwerf 1966, Mees 1986), our experience and specimen records suggest that white-eyed individuals are considerably rarer and perhaps more habitat-restricted. *P. simplex* occurs to 1,100 m (Kelabit Highlands) and in several forest types of varying quality: good-soil dipterocarp, *kerangas* and peatswamp; primary, secondary, and heavily disturbed forest; and plantations. We have found *P. pseudosimplex* (only by mist-netting) to 500 m (Ulu Kimanis) near the edge of mature good-soil dipterocarp, and in *kerangas* forest nearer to sea level.

Morphology and voice.—Given their distinct ancestry, the striking similarity in plumage between *P. simplex* and *P. pseudosimplex* is remarkable. This is particularly true in specimens, less so in photographs (Fig. 3). They also closely resemble other species of brown bulbuls on Borneo to which they are not especially closely related: Red-eyed Bulbul and Spectacled Bulbul (Fig. 2). Perhaps these species are strongly selected for the cryptic advantage of dull brown plumage, but that observation does not hold for other bulbuls that occasionally occupy forest-edge habitat, such as Black-headed *P. atriceps* and Yellow-vented Bulbuls *P. goiavier*, which are both much more brightly coloured.

We are unaware of any vocal differences between *P. simplex* and *P. pseudosimplex*, although we would expect some. *P. simplex* is far more common than *P. pseudosimplex* and thus more likely to be represented in sound archives, but without accompanying iris colour data it is currently impossible to know which species is vocalising in recordings. In general, all of Borneo's brown bulbuls have similar songs that are not as distinctive (to the human ear) as Black-headed, Yellow-vented, or other species of bulbuls. Although vocalisations are certainly important, eye colour might be the main trait for species recognition among brown bulbuls. This has been observed in Streak-eared Bulbul *P. blanfordi* of Indochina and the Thai-Malay Peninsula (Garg *et al*. 2016). A large mitochondrial distance occurs between two vocally and visually similar subspecies, *P. b. blanfordi* and *P. b. conradi*, which are also most easily distinguished by iris colour: *P. b. blanfordi* has dark red irides, whereas *P. b. conradi* usually has dark grey irides (Garg *et al*. 2016). On Borneo, field comparisons of *P. pseudosimplex* with other brown bulbuls—especially how the species use their markedly distinct eye colours—are likely to yield rich information on the behavioural ecology of an otherwise generally under-appreciated group of birds.

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Notes on the breeding biology of birds in riverine floodplains of western Amazonia

by Tomaz Nascimento de Melo & Harold F. Greeney

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Summary.—We present new information on the breeding biology of six bird species from riverine floodplains in Brazilian and Ecuadorian Amazonia, principally from the Madeira River, near Porto Velho, Rondônia, Brazil, but also the Napo River in eastern Ecuador. We describe for the first time the nest of White-bellied Spinetail *Mazaria propinqua*. The data presented contribute to our cumulative knowledge of the natural history of birds in floodplain forests, a historically neglected environment in the Amazon.

In general, knowledge of the breeding biology of Neotropical birds remains limited, and many species still lack basic descriptions of their nests and eggs (Marini *et al*. 2010, Xiao *et al*. 2017). In the Amazon Basin, many species are practically unknown in terms of basic aspects of their natural history. This lack of knowledge is even more profound for birds that occur in the biome's floodplains (Remsen & Parker 1983), which historically have received less attention than upland species (Cohn-Haft *et al*. 2007). Here, we provide new data on the breeding biology of six species nesting in this floodplain habitat, based on field work in Brazil and Ecuador.

The Ecuadorian study site (HFG) was on the banks of the upper Napo River near Ahuano, prov. Napo, at 375 m (01°01'57.4"S, 77°35'11.7"W). This area is flat and rocky, with isolated patches of regenerating vegetation dominated by *Gynerium* cane and small, fast-growing trees and shrubs (e.g., *Inga*, *Cecropia*, *Calliandra*). The area is flooded several times annually, usually in May–July (see Greeney 2014 for further information). The Brazilian locality, studied by TNM, lies on the upper Madeira River, in the municipality of Porto Velho and the district of Jaci Paraná, state of Rondônia, in south-west Brazilian Amazonia. The Madeira is the largest muddy-water affluent of the Solimões / Amazonas system, and one of the largest rivers in the world, accounting for 50% of sediment input and 15% of total discharge in the Solimões / Amazonas system (Goulding *et al*. 2003, Latrubesse *et al*. 2017). The Madeira basin covers 1,380 km^2, or 20.1% of the Amazon Basin (Goulding *et al*. 2003). The river rises in the Bolivian Andes and has a total length of 3,400 km, of which 1,500 km flows through Brazilian territory. Mean rainfall in the Madeira basin varies from 2,000 to 2,500 mm, with the wet season in December–April and the peak flood downstream of Porto Velho in March–April, with large variations in water level, 10.8–12.4 m difference between the dry and wet seasons (Goulding *et al*. 2003). Data were collected sporadically, using binoculars. Nest descriptions follow the nomenclature proposed by Simon & Pacheco (2005).

WHITE-BEARDED HERMIT *Phaethornis hispidus*

On 15 June 2018 TNM found an empty hummingbird nest in the understorey of *várzea* forest *c*.56 km downstream of Porto Velho (08°35'33.7"S, 63°34'54.3"W). When revisited on 9 July 2018, the nest contained two nestlings, with their eyes still closed (Fig. 1). After a few minutes, an adult *P. hispidus* appeared and fed the nestlings. The nest, a funnel-shaped cup,

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Figure 1. White-bearded Hermit *Phaethornis hispidus* nest with two nestlings, Rondônia, Brazil, June 2018 (Tomaz Nascimento de Melo)

was sited 1.01 m above ground in a *Costus* (Costaceae) plant (Fig. 1). The cup measured 31 × 52 mm internally, and was 130 mm tall externally, with an elongated 'tail' of 70 mm at the base of the cup. The nest comprised fine, pale, dry palm fibres, tightly bound with spider webs, and attached to the underside of a damaged strip of leaf. Overall, the nest's

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Figure 2. Plain-winged Antshrike *Thamnophilus schistaceus* fledgling, Rondônia, Brazil, June 2018 (Tomaz Nascimento de Melo)

shape, composition, height and attachment were similar to those of a nest of the species found in June 2016, in Mato Grosso state, Brazil (C. P. Figueiredo; https://www.wikiaves.com/1234488). The elongated leaf of *Costus* sp. used here, offered a similar substrate to the leaves of understorey palms, which are among the most frequently used nest substrates of the genus *Phaethornis* (Ruschi 1949, Oniki 1970, Greeney *et al*. 2018).

PLAIN-WINGED ANTSHRIKE*Thamnophilus schistaceus*

On 15 June 2018 a pair of *T. schistaceus* was observed in the same floodplain forest as that where the nest of *Phaethornis hispidus* was found. The two birds gave constant alarm calls and circled me. Searching for a possible nest, a single fledgling was found, perched 2 m above ground (Fig. 2). From its appearance, the young had probably fledged the same or previous day. Nests have been described from Brazil in February and October, and from Peru in March and September (Zimmer & Isler 2003).

WHITE-BELLIED SPINETAIL *Mazaria propinqua*

On 17 February 2011, HFG observed an adult spinetail carrying food to a nest at the Ecuadorian locality described above. Three days later, while examining the nest, a single fledgling flew from its entrance and disappeared into a nearby tangle of vegetation. On 24 February he collected the nest and made the following observations. The nest was an enclosed, globular mass of dry vegetative material, entered via a laterally oriented tube, and sited 60 cm above ground. It was supported from below by three nearly horizontal crisscrossed stalks of *Gynerium* cane and many smaller stems and leaf blades. Overall, the nest was 300

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mm long, including the globular portion that contained the nest chamber and the 120 mm-long entrance tube. Externally, the tube was *c.*130 mm wide and 110 mm tall, with a near-circular, upward-facing opening at the distal end, 40 mm in diameter. The main portion of the nest was 160 mm wide externally (measured perpendicularly to the entrance tube) and 200 mm tall. The nest and entrance fairly uniformly comprised coarsely interwoven dead sticks and thick leaf petioles, with the exception of a 5–6 cm-thick layer of additional materials piled atop the nest chamber. The additional materials, including *Gynerium* leaf blades, bark strips and a few pieces of plastic, were wider and more pliable than the sticks used elsewhere in the construction, and undoubtedly served both as camouflage and waterproofing. Internally, the nest chamber was roughly spherical, 80 mm in diameter. It was unlined except a *c.*1–2 cm-thick cup of soft materials covering the bottom and forming a loose, poorly shaped cup (Fig. 3A). Internally, the cup was approximately 60 mm wide and 15–20 mm deep (post-fledge), and comprised fragments of skeletonised leaves, small, soft, papery dicot leaves, seed down, and fragments of snake skin.

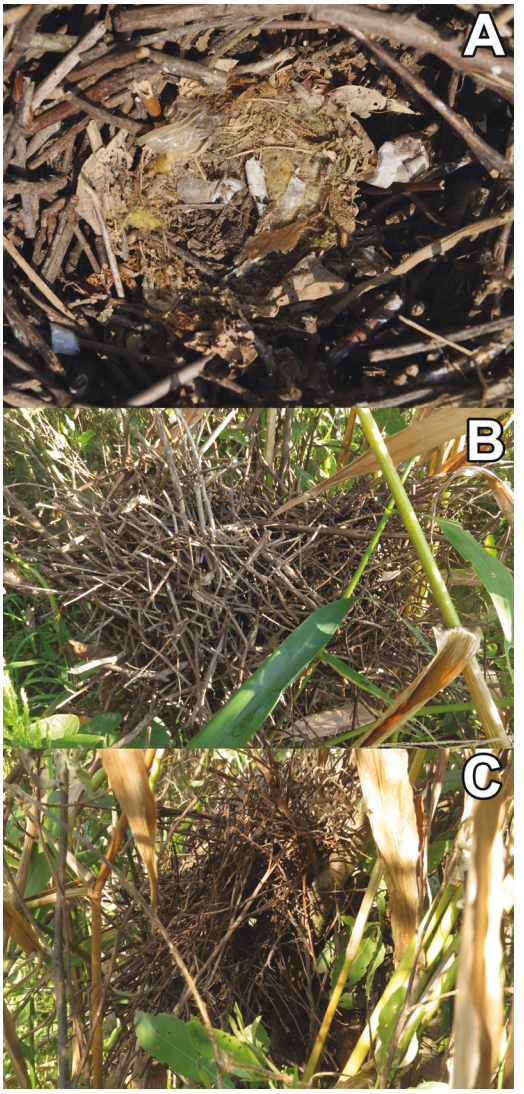

Figure 3. Nests of White-bellied Spinetail *Mazaria propinqua* showing interior chamber of the nest found on the upper Napo River, Ecuador, in February 2011 (A), and the nest found on a river island in the Madeira River, Rondônia, Brazil, July 2018, in lateral view (B) and its entrance (C) (A: Harold F. Greeney; B–C: Tomaz Nascimento de Melo)

On 6 July 2018 a pair was observed building a nest on Ilha dos Bufalos (09°10′51.6″S, 64°30′45.2″W), Jaci Paraná, Brazil. The site is dominated by *Tessaria integrifolia* (Asteraceae) reaching 4–5 m above ground and by *Echinochloa* sp. (Poaceae), up to 1 m tall. The only material used to construct the nest was fine twigs of *T. integrifolia*. The two birds observed building vocalised frequently. The nest was sited 1.63 m above ground and the interior measured 130 × 105 mm (Fig. 3). A complete but apparently old nest was found within 5 m of that under construction, presumably from an earlier breeding effort. This latter nest conformed to the closed globular type (Fig. 3B), the entrance via a horizontal tube (Fig. 3C) of the same shape and material of that under construction. Like the nest under construction, it was sited in the fork of a *T. integrifolia* 1.26 m above ground, and measured 220 mm high by 230 mm long by 150 mm wide, with an access tube 80 mm long and an entrance hole 45 × 38 mm.

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Although a photo on Wikiaves illustrates a nest, also found on an island in the Madeira in December (R. S. Moreira; https://www.wikiaves.com.br/1561495), and two pairs were reported to be constructing nests on an island in the Branco River, northern Brazil, in mid October (Naka *et al*. 2007), ours are the first descriptions of this species' nest (Schulenberg & Rosenberg 2016), which is similar to that of related species of Furnariidae (Zyskowski & Prum 1999). The Ecuadorian nest fledged during the dry–wet season transition in that region (Blake & Loiselle 2012). The active nests in July and December indicate that the species breeds both early and late in the wet season along the Madeira River.

SPECKLED SPINETAIL *Cranioleuca gutturata*

On 15 June 2018 a nest under construction was found in a lowland forest, *c*.200 m from the *Phaethornis hispidus* nest described above. An adult was observed collecting green mosses in a nearby tree and depositing the material in the nest, which was a globular closed construction *c*.200 mm tall, of dry leaves and green mosses, especially the latter (Fig. 4), with a lateral entrance. The nest was sited on the fork of a branch of *Protium* sp. (Burseraceae), *c*.7 m above ground. On returning to the site on 10 July, the nest was apparently empty and no adult was observed. It is unknown whether the nest had been abandoned or not. There are very few published data concerning the species' breeding biology: Remsen (2003) mentioned nestbuilding in mid August in Peru, and the nest reported here was obviously similar to that described previously. A nest found in January, also in Brazil, was of similar shape and size, but with less green moss used in the construction (D. P. Fernandes; https://www.wikiaves.com/1234488).

Figure 4. Nest of Specked Spinetail *Cranioleuca gutturata* in floodplain *várzea* forest, Rondônia, Brazil, June 2018 (Tomaz Nascimento de Melo)

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Figure 5. Nest of Spotted Tody-Flycatcher *Todirostrum maculatum* constructed on the root of a *Capsiandra* sp. (Fabaceae) near the Madeira River, Rondônia, Brazil, July 2018 (Tomaz Nascimento de Melo)

SPOTTED TODY-FLYCATCHER *Todirostrum maculatum*

On 8 July 2018 a nest was found on Ilha do Veados, 53 km downstream of Porto Velho (08°33'52.8"S, 63°38'46.6"W). Just one nestling was present, already with open eyes and completely feathered, and was being fed by the adults. The nest was sited in the aerial portion of a root of a *Capsiandra* sp. (Fabaceae), *c*.5 m from the bank of the Madeira River and 1.29 m above ground. It was a closed / oval structure, 200 mm long by 75 mm wide. Its lower portion also comprised an elongated 'tail' of 210 mm (Fig. 5). The nest entrance, located at one side, measured 25 × 35 mm. This species' breeding biology is comparatively well known, with eggs found throughout the year across its range, and the nest reported above is similar to previous descriptions (Walther 2004).

EULER'S FLYCATCHER *Lathrotriccus euleri*

On 6 September 2017 a nest was discovered in the same lowland forest where those of *Phaethornis hispidus* and *Cranioleuca gutturata* were found, sited in a dried cocoa *Theobroma cacao* fruit (Malvaceae), 1.24 m above ground (Fig. 6). The entrance was a hole in the side of the fruit, and the interior was covered by dark rootlets, small fibres and green moss, forming a shallow cup. It was not possible to take measurements, but the nest held two pinkish eggs with reddish-brown spots at the large end. Only one adult was observed at the nest. This species constucts a cup-shaped nest of fibres, and uses small holes (Farnsworth & Lebbin 2004). Londoño (2014) depicted a similar nest, in the Peruvian Amazon, with two apparently identical eggs, but constructed in a natural cavity. Possibly this is the first formal description of a nest of *L. euleri* in Amazonia, but its breeding biology in the south

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Figure 6. Nest and eggs of Euler's Flycatcher *Lathrotriccus euleri* in a dried cocoa *Theobroma cacao* fruit (Malvaceae), Rondônia, Brazil, September 2017 (Tomaz Nascimento de Melo)

and south-east of its range is well known (Di Giacomo & López Lanús 1998, Aguilar *et al*. 1999, Marini *et al*. 2007, Auer & Bassar 2009). There, nests are shallow cups constructed in natural cavities in trees, fallen logs or in ravines, with a mean height above ground of 2 m. The clutch is two or three eggs.

Although Stouffer *et al*. (2013) did not identify a well-defined breeding season for central Amazonian upland birds, landscapes in the floodplains are subject to strong transformation between the dry and wet seasons due to the dynamics of the flood (Wittmann *et al*. 2010), which can alter the availability of nest sites (Beja *et al*. 2010). Of the species for which breeding activity was registered in the Madeira floodplain, five bred when water levels were falling (June/July) and one in the dry season (September). Although the same sites were sampled as in the early wet season (December), when the Madeira River is at its highest level (March) TNM did not find any evidence of nesting activity. However, Leite *et al*. (2016) found an active nest of Leaden Antwren *Myrmotherula assimilis* at the Juruá River during its peak flood (March). Environments in the floodplains change completely between the dry and wet season, creating different opportunities for nesting, presumably depending on the natural history attributes of a given species.

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Clarifying the nomenclature of *Pomarea* species (Monarchidae) from the Society Islands

by Edward C. Dickinson, Michael Lee, Alice Cibois, Patrick Boussès & Jérôme Fuchs

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Summary.—We re-examine evidence from the voyage of the corvette *La Coquille* in respect of the *Pomarea* monarch flycatchers from Tahiti and Maupiti, and conclude that *Pomarea maupitiensis* Garnot, 1829, should be recognised as a distinct but extinct species for which we designate a lectotype, necessarily represented by the image in a colour plate.

Monarch flycatchers of the genus *Pomarea*, a genus endemic to Eastern Polynesia including the Society, Marquesas and Cook Islands, were listed by Mayr (1986) who accepted five species. Subsequently, based on phylogenetic evidence, these species were discussed by Cibois *et al*. (2004), Coates *et al*. (2006), Andersen *et al*. (2015) and, most recently, Thibault & Cibois (2017). See Appendix.

James Cook visited Tahiti in 1773 (16 August–17 September) and 1774 (22 April–4 June) during his second voyage (Beaglehole 1969). The naturalists aboard Cook's vessel at this time were Johann & Georg Forster and Anders Sparrman. Birds collected in Tahiti included two monarch flycatchers, one almost all black and the other largely yellow-ochre. Johann Forster described the former as *Muscicapa atra* in his *Descriptiones animalium*, but this work remained a manuscript until it was published posthumously in 1844 by Lichtenstein, who provided both a preface and many annotations (Zimmer 1926: 228). Sparrman (1786) also named, and figured, it as *Muscicapa nigra* in a work which Zimmer (1926: 599) said covered 'new or otherwise interesting species of birds held in the private museum of Gustavus Carlson' (Fig. 1).

In works that eschewed the use of Latin names, Latham (1783: 342) reported a yellow-ochre bird from Otaheite (= Tahiti) which he referred to as the Luteous Flycatcher then, later, noting Sparrman's publication, he (Latham 1787: 174) reported the black Tahitian bird as the Society Flycatcher. Gmelin (1789: 944) noting the lack of a scientific name for the former named it *Muscicapa lutea*—a name also found in the long-delayed publication of Forster's *Descriptiones animalium*, where Forster suggested that two species had been found in Tahiti.

Additional to early records arising from Cook's voyages, relevant collections were made by René Primevère Lesson (1794–1849) and Prosper Garnot (1794–1838), naval surgeons and zoologists to the scientific expedition of the French naval corvette *La Coquille*, which circumnavigated the globe in 1822–25, under the command of Louis Isidore Duperrey (1786–1865) who was overall author of the expedition report (Duperrey 1825–30). *La Coquille* visited Tahiti on 3–22 May and Bora Bora on 25 May–9 June 1823 (Lee & Holyoak 2017). It is the publications of Lesson and Garnot in respect of monarch flycatchers that we re-examine here. As we shall see, their publications introduced the names *Muscicapa pomarea* and *Muscicapa maupitiensis* in ways that caused confusion.

Bonaparte (1850: 326) placed *Muscicapa nigra* in genus *Monarcha*, and mentioned both *pomarea* and *maupitiensis* as synonyms. Later Bonaparte (1854) proposed the genus-group name *Pomarea*, with *P. nigra* as its type species by monotypy.

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Figure 1. Pl. 23 from Sparrman's *Museum Carlsonianum*, Fasc. 1, 1786. Anders Sparrman (1748–1820), a Swede, joined James Cook's second voyage in Cape Town in late 1772, and returned there in 1775. Tahiti was visited on 16 August to 17 September 1773, and 22 April to 4 June 1774. Reproduced from the volume accessible at the Biodiversity Heritage Library (www.biodiversitylibrary.org/item/128098#page/103/mode/1up).

Mixed messages from Lesson and Garnot

Lesson (1828a: 192–194), with some contribution from Garnot, in his *Manuel d'ornithologie*—available as a published work on 14 June 1828 (see Dickinson *et al*. 2015)—chose not to use the earlier names from Cook's voyage, despite mentioning Sparrman's description, and provided the name *Muscicapa pomarea*. This name he attributed to 'Less. et Garn.' and associated it with Pl. 17 of the 'Atlas' from the *Voyage de la Coquille* (Figs. 2a,b).

On p. 192 in the *Manuel d'ornithologie* the authors, generally accepted as Lesson & Garnot, described the male, which they said inhabited the island of Tahiti, and on p. 193 reported that what they considered to be the female was what Latham had called the Luteous Flycatcher, and gave Latham's 1783 Latin description (but without mentioning the name *Muscicapa lutea*). Following that, and still treated as *Muscicapa pomarea*, is a description of an 'old male' (evidently based on Fig. B in Pl. 17). Later, on p. 194, it is said that the latter bird was obtained on the island of Maupiti by M. de Blosseville. Garnot then

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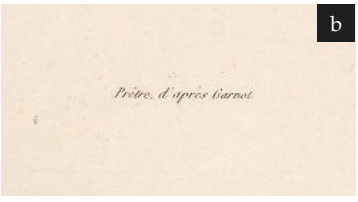
a

Figure 2a. Pl. 17 from the *Voyage de la Coquille*: A (top) said to be of a male and from Tahiti; image B (lower right) said to be an old male, from Maupiti; image C (lower left) said to be a female.



b

Figure 2b. Detail from Fig. 2a: 'Prêtre after Garnot'. Thus Garnot was the first to paint this. All images reproduced from Pl. 17 of the volume of the *Voyage de la Coquille* accessible at the Biodiversity Heritage Library (www.biodiversitylibrary.org/item/119447#page/43/mode/1up).

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signs off, so we consider that short sentence to be his alone. However, he may have also written the description of the 'vieux mâle' given that he had possession of the specimen until its presumed loss, and some—perhaps all—of the images on this plate are based on his sketches (see Fig. 2b).

Jules Poret de Blosseville (1802–33), younger brother of the Vicomte Ernest Poret de Blosseville, a naval officer and hydrographer with an interest in zoology, was a member of the crew of *La Coquille* who obtained permission from Duperrey for a six-day survey of Maupiti while *La Coquille* visited Bora Bora. In 1827 he sailed to India and Burma, and in 1833 as captain of *La Lilloise* he was sent to explore the Denmark Strait, where his ship went down with all hands in August (Lee 2018).

In this initial account, Lesson & Garnot appear quite clear that the name *pomarea* was to be applied to Tahiti birds, but that the Maupiti 'old male' looked very different (see Fig. 1a). So our first conclusion is that *Muscicapa pomarea* is a subjective junior synonym of *Muscicapa nigra* Sparrman. We note, too, that the type series of *pomarea*, which must include the Maupiti bird, was apparently a composite from two islands of which the populations could be distinct taxa.

Pl. 17 from the zoology 'Atlas' of the *Voyage de la Coquille* (our Fig. 2a) was published in livr. 7 of the *Voyage* about a week later than the *Manuel* (see Cretella 2010, Dickinson *et al*. 2015). The legend labelled all three images 'Moucherolle Pomaré (*Muscicapa pomarea* N.)' and relied on the text to explain where these were collected. In fact, the name Pōmare comes from Tahiti, where it was and remained for many years the title of successive ruling chiefs.

On p. 298 in livr. 8 of the *Voyage de la Coquille* (November 1828) we find the following from Lesson (1828b):

> 'Les auteurs ont décrit sous deux noms un gobe-mouche que nous avons appelé *muscicapa Pomarea* (Atlas, pl. XVII), en l'honneur du *Pomaré*, chef des iles de la Société, et dont le gouvernement était empreint d'une sorte d'élévation. Cette espèce de gobe-mouche se trouve décrite, le mâle, sous le nom de *muscicapa nigra*, figuré planche XXIII, Fasc. I, du Museum Carlsonianum de Sparrman, tandis que la femelle est le type du *muscicapa lutea* de Latham. Cet oiseau varie singulièrement dans son plumage, non-seulement suivant ses sexes, mais aussi suivant les âges.'

> 'Authors have described under two names a flycatcher that we have called *Muscicapa pomarea* (Atlas, pl. 17) in honour of Pomaré, chief of the Society Islands, whose government was imbued with a special status. This species of flycatcher has [already] been described; the male was described as *Muscicapa nigra*, depicted in plate 23 [from] Fascicle 1 of Sparrman's *Museum Carlsonianum*, while the female is typical of *Muscicapa lutea* of Latham. This bird varies unusually in its plumage, not only based on sex, but also according to age.'

Note, first, that there is no specific mention here of either Tahiti or Maupiti (see Fig. 3) and, second, that Lesson, the author of this text, makes *pomarea* a synonym of the older name, *nigra*. One year later, on pp. 592–593 in livr. 13 of the *Voyage de la Coquille* (November 1829), Garnot supplied the following text from the *Manuel d'ornithologie* with a changed heading that introduced the name *maupitiensis* for the first time:

> '7° GOBE-MOUCHE DE MAUPITI, *Muscicapa Maupitiensis*, Garnot.
> *Muscicapa Pomarea*, Less., Man[uel]
> PLANCHE XVII, fig. A, B, C.

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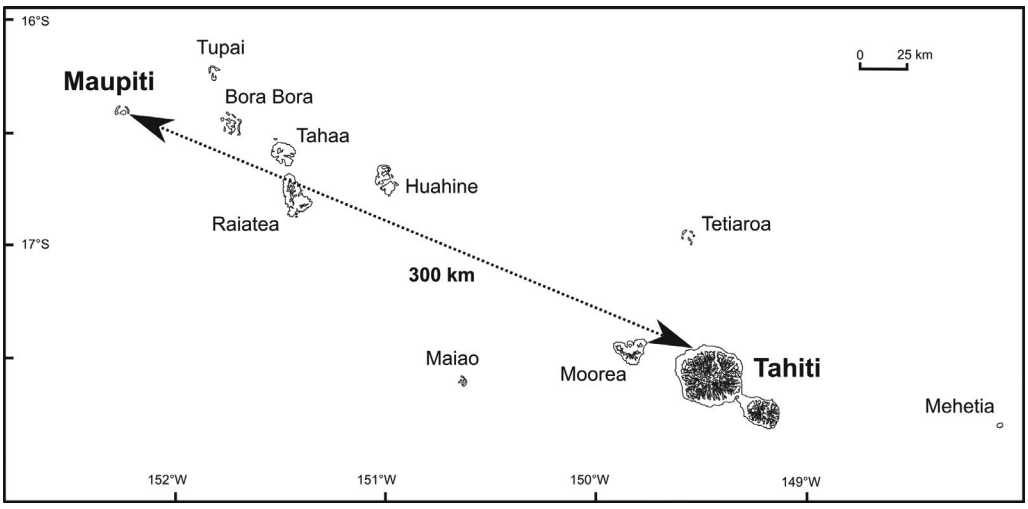

Figure 3. Map of the Society Islands showing the Leeward Islands, including Bora Bora and Maupiti, and the Windward Islands, including Tahiti.

Muscicapa nigra; corpore toto nigro; capite, dorso, rectricibus alarum nigris, nebulosis subcaeruleis, rostro pedibusque plumbeis. N.

Bien que ce gobe-mouche ait été décrit par Sparmann [*sic*], nous croyons devoir cependant en donner une nouvelle description, afin de faire connaitre avec exactitude le mâle et la femelle de cette espèce. Celui-ci, comme nous nous en sommes souvent assuré par la dissection, est le mâle. Son plumage…' [and later] 'La femelle, dont on a fait une espèce distincte dans les ouvrages d'ornithologie, en le décrivant sous le nom de moucherolle jaune d'O-tahiti (*muscicapa lutea*, Lath.), est, nous n'en pouvons douter, la femelle du gobe-mouche noir de la mer du Sud…'. [And finally] 'Le vieux mâle (pl. XVII, fig. B) diffère de la livrée précedente par les teintes de son plumage, qui ne se composent que de deux couleurs, le noir et le blanc. La première occupe la tête, le col et la poitrine, et quelques-unes de couvertures alaires: la seconde appartient aux autres parties; mais cependant plusieurs pennes alaires sont brunes. Le bec et les pieds sont plombés.

Cet oiseau a été rapporté de l'île de Maupiti par M. de Blosséville [*sic*]'

Translated this reads:

'7. MAUPITI FLYCATCHER, *Muscicapa maupitiensis*, Garnot.
Muscicapa pomarea, Lesson, *Manuel d'ornithologie*
PLATE XVII, fig. A, B, C.

Muscicapa nigra; corpore toto nigro; capite, dorso, rectricibus alarumm nigris,nebulosis subcaeruleis, rostro pedibusque plumbeis. N.

Although this flycatcher was described by Sparmann [*sic*] we believe ourselves obliged to provide a new description so that the male and female of this species are clearly known. Thus [Sparrman described] the male, and we are certain of this because we often dissected the bird. Its plumage…' [and later] 'The female, which ornithological

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Figure 4. The island of Maupiti in 1823, engraving by Tardieu, after Jules de Blosseville and Chazal. Pl. 18 from *Voyage de la Coquille. Atlas histoire du Voyage* (1828) (courtesy of the Auckland War Memorial Museum)

> works have treated as a distinct species based on its description under the name Tahiti Yellow Flycatcher (*Muscicapa lutea*, Latham) which we do not doubt is the female of the Southern Seas Flycatcher…'. [And finally] 'The old male differs from the previous plumage by its colours which are only two, the black and the white. The first applies to the head, neck and breast; the second applies to the rest of the plumage except for a number of wing feathers which are brown. The bill and feet are lead coloured.
>
> This bird was brought from Maupiti by M. de Blosseville.'

Some observations are required. First, Garnot (1829) introduced the name *maupitiensis*, placing it above the name *Muscicapa pomarea*, and attached to it descriptions of all three plumages. However, his first two descriptions clearly apply to Tahiti birds (and no mention is made of Maupiti in connection with them), but the third applies to the bird from Maupiti collected by de Blosseville. Garnot nonetheless applied the name to birds from both Maupiti and Tahiti, thus the original type series includes birds from both islands. Garnot's text appears to suggest that he was trying to make *pomarea* a synonym of *maupitiensis*. Here lies the source of confusion: confusion that must have led Mayr (1986), and perhaps some earlier author(s), to apply the name *pomarea* only to Maupiti birds.

On p. 643 of livr. 14 of the *Voyage de la Coquille*, in January 1830, Lesson appeared to accept the comments on pp. 592–593 by Garnot, by listing *Muscicapa pomarea* from 'les iles de la Société', but naturally he treated the younger name *maupitiensis* as a synonym. This may have reinforced in the minds of Mayr and others the idea that the *terra typica* was the same (whether Maupiti or Tahiti).

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Figure 5. Surviving 'male' syntype (MNHN-ZO-2016-276) of *Muscicapa pomarea* Lesson & Garnot, 1828 (also a syntype of *Muscicapa maupitiensis* Garnot, 1829, although not representative of the Maupiti population). Originally catalogued as no. 9458B, and typical of the subject of image A in Pl. 17 of the *Voyage de la Coquille* (© Muséum nationale d'Histoire naturelle, Paris)

Figure 6. Base of the mount for the pedestal supporting the mounted—but now dismounted—MNHN-ZO-2016-276, syntype of *Muscicapa pomarea* Lesson & Garnot, 1828, and of *Muscicapa maupitiensis* Garnot, 1829, although not taken on Maupiti; Ancien Catalogue no. 9458B (© Muséum nationale d'Histoire naturelle, Paris)

Combining the evidence of Lesson that *pomarea* is a synonym of *nigra*—a view shared by Garnot—with what we know of de Blosseville and the island of Maupiti, it is clear that Garnot's final sentence sought to indicate that the bird collected by de Blosseville was from Maupiti. We therefore designate the specimen depicted in fig. B of Pl. 17 as the lectotype of *Muscicapa maupitiensis* Garnot, 1829. This specimen is also a syntype of *Muscicapa pomarea* Lesson & Garnot, 1827, but it must not be considered representative of that taxon.

We also designate MNHN-ZO-2016-276 (see Fig. 5) as a lectotype of *Muscicapa pomarea* Lesson & Garnot, 1828; this we believe to validly represent the supposed adult male depicted in Pl. 17 of the *Voyage de la Coquille*. For some reason, this specimen of *M. pomarea* (now numbered as above) could not be found in the Muséum nationale d'Histoire naturelle, Paris (MNHN) when specimens were being sought for a molecular study.

However, it was perhaps not a male; Lesson and Garnot dissected specimens that were all black and found all to be male, and dissected yellow-ochre specimens and found them to be female, concluding, in error, that they were dealing with one sexually dichromatic species. In fact both adults are black (see Murphy & Mathews 1928: 2).

Early records suggest that the MNHN received four adult and four supposed juveniles from 'Tahiti' (J. J. F. J. Jansen *in litt*. 2018), but evidently some duplicates were not assigned catalogue numbers and now just one adult remains.

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Maupiti (see Figs. 3–4) is 11 km^2 in area and 380 m high, with an eroding volcanic cone. It lies *c*.300 km north-west of Tahiti, is the westernmost tall island in the Society Islands archipelago, and is believed to be the oldest.

We believe de Blosseville obtained a single specimen of the Maupiti bird and gave it to Garnot who was still suffering from a chronic gastric disease he had contracted in Peru some six weeks or so earlier. Garnot's scientific work during the time the ship spent in the Society Islands was therefore necessarily restricted. Seven months later, in Australia, this illness forced him to return alone to France with part of the collection, presumably including this specimen. His ship sank off the coast of South Africa in mid-July 1824 (Garnot 1829: 573–575). His sketches may have survived.

Following the recommendation of a referee, we asked Hein van Grouw to advise on whether the Maupiti bird depicted was likely to be an aberrant individual, knowing, of course, that no comparative Maupiti specimens exist. He replied: 'with all the background information I have now on this case it is in my opinion most likely that the black-and-white pattern in the pictured *maupitiensis* was not an aberration but indeed an adult feature of the species (perhaps only in the males), as is the case in the Chuuk Monarch *Metabolus rugensis*'.

Conclusions

The name *Muscicapa pomarea* Lesson & Garnot, 1828, must be treated as a synonym of *Muscicapa nigra* Sparrman, 1785. The single extant type specimen, is designated a lectotype so that, despite an originally composite type series, the name's type locality is Tahiti. The name *Muscicapa maupitiensis* Garnot, 1829, despite the same confused composite type series, was based on just one specimen (thought to have been lost at sea). Based on the depiction, this is designated a lectotype for the distinct population on the relatively distant island of Maupiti.

Acknowledgements

Particular thanks go to the Biodiversity Heritage Library for enabling access to the volumes of Duperrey's *Voyage autour du monde, exécuté par ordre du Roi, sur la corvette La Coquille*. Thanks also to Auckland Memorial Museum. We are also grateful to Guy Dutson, Robert Prŷs-Jones and Tommy Tyrberg for helpful comments on an early draft, for peer review Justin Jansen and an anonymous referee, and lastly Hein van Grouw for his views on the plumage of the Maupiti individual.

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Appendix: the Marquesas relatives and their phylogeny

The *Coquille* did not visit the Marquesas and the taxa of genus *Pomarea* from there and the Cook Islands—which complete the genus *Pomarea* within its circumscribed limits—were described only later in the 19th century. Further monarch flycatcher species were discovered in the Marquesas (see Hartlaub 1854, Murphy & Mathews 1928) and on Rarotonga in the Cook Islands (Rarotonga Monarch *P. dimidiata*; see Hartlaub & Finsch 1871); all are currently treated in the genus *Pomarea*. Murphy & Mathews (1928) reported on new material obtained by the Whitney South Sea Expedition and discussed four Marquesan species: Tahiti Monarch *P. nigra*, Marquesas Monarch *P. mendozae*, Iphis Monarch *P. iphis* and Fatu Hiva Monarch *P. whitneyi*. They implied that *nigra* is polytypic, but did not mention any subspecies other than the nominate (although *maupitiensis* is the only possibility), divided *mendozae* into four subspecies (of which two were described as new), and their new species *iphis* comprised two subspecies, while *whitneyi* was monotypic.

Cibois *et al*. (2004: 838), dealing with *Pomarea* species from the Cook, Society and Marquesas archipelagos, recognised six species, largely following Murphy & Mathews (1928), and implicitly treated *pomarea* as a subspecies of *nigra* (implying recognition of a neighbouring population which could only be that from

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Maupiti). Their phylogeny omitted *pomarea* for which they found no specimen to sample, and they declared: 'The extinct *P. pomarea* is only known from an 'old male' (Lesson & Garnot 1826–1830) which exhibits a black and white pattern'. This, of course, is a reference to the image of *maupitiensis*, although in their Table 5 they treated this taxon at species rank. Their treatment resembles that of Mayr (1986) and it seems it was he who first treated *pomarea* from Maupiti as a subspecies of *P. nigra*, albeit without signalling that it was extinct.

Treatment of the Monarchidae in the *Handbook of the birds of the world* commences with a global account of the family by Coates *et al*. (2006: 244–279), while the genus *Pomarea* is covered by five species accounts by Clement (2006: 297–299) where, on p. 298, he treated *P. nigra pomarea* as an extinct subspecies 'confined to' Maupiti. Dickinson & Christidis (2014: 246), citing Holyoak & Thibault (1984), treated a species *P. pomarea* from Maupiti, implying that *maupitiensis* must be a synonym and, like Mayr, did not list the taxon as extinct.

Andersen *et al*. (2015) sampled '91 of 99 recognised species of monarch flycatchers' of 16 genera, of which the species currently treated in the genus *Pomarea* all grouped within a single clade. But while the '*mendozae* complex', all of the Marquesan species (which Andersen *et al*. erroneously referred to as 'true *Pomarea*'), group well together, *P. nigra* (and by implication the unsampled Maupiti population) and *P. dimidiata* lie outwith this tight group. Thibault & Cibois (2017) reported the findings of Andersen *et al*. and accepted nine species in *Pomarea* of which four—including Maupiti Monarch—were considered extinct. They agreed that the Marquesan species formed a monophyletic group and the evidence from DNA of the taxa in the Marquesas suggests colonisation from north to south across that archipelago, which is volcanic. The Marquesan group appears distinct from and thus excludes *P. nigra*—the type species of *Pomarea*—and *P. dimidiata*.

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Species limits in the African Palm Swift *Cypsiurus parvus*

by Michael S. L. Mills, Peter Boesman & N. J. Collar

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Summary.—The Malagasy forms *gracilis* (Madagascar) and *griveaudi* (Comoro Islands) of African Palm Swift *Cypsiurus parvus* have very different vocalisations (short insect-like single buzzy notes and occasional drawn-out rising buzzes) from mainland African taxa (twitters and staccato notes, the former sometimes in longer series). They also have heavier dark markings on the throat and upper breast, paler bellies and distinctly shorter tail extensions. These characters in combination are here considered to demarcate the Malagasy forms as a species, Madagascar Palm Swift *C. gracilis*, separate from both the remaining taxa of *C. parvus* and Asian Palm Swift *C. balasiensis*.

African Palm Swift *Cypsiurus parvus* is distributed widely across sub-Saharan Africa, the Comoro Islands and Madagascar in eight subspecies: *C. p. parvus* from Senegambia east as far as south-west Arabia; *brachypterus* from Sierra Leone east to the Democratic Republic of Congo and Angola, plus the Gulf of Guinea islands; *C. p. myochrous* from South Sudan south to eastern Botswana and northern South Africa; *C. p. laemostigma* from Somalia to Mozambique; *C. p. hyphaenes* in northern Namibia and Botswana; *C. p. celer* in southern Mozambique and eastern South Africa; *C. p. griveaudi* in the Comoros; and *C. p. gracilis* in Madagascar (Fry 1988, Chantler 1999, Chantler & Driessens 2000, Dickinson & Remsen 2013, Safford 2013, del Hoyo & Collar 2014). Published diagnoses of these taxa (Brooke 1972, Clancey 1983, Fry 1988, Chantler & Driessens 2000) indicate that differences between the continental forms are relatively subtle, but that the insular forms in the Indian Ocean are collectively a little more distinctive.

On a visit to Madagascar in November 2017, MSLM noticed that the calls of the palm swifts were strikingly different from those with which he is familiar in mainland Africa. The possibility therefore emerged that the Malagasy taxa might merit further study, to reconsider their taxonomic status.

Methods

We assembled and analysed sound recordings of the calls of *C. parvus*, using all available online archives (Xeno-canto = 30 recordings, Macaulay Library = 3, and Avian Vocalizations Center = 3), a few commercial publications (Gibbon 1995, Chappuis 2000, Huguet & Chappuis 2003, Stjernstedt 2008) and four made in Madagascar by MSLM. This set of recordings provided a good geographical coverage, including all but one (*laemostigma*) of the eight races (see Appendix 1). For all of these we prepared sonograms and manually measured basic sound parameters using CoolEdit Pro.

We also examined and measured specimens in the American Museum of Natural History, New York, USA (AMNH), Muséum national d'Histoire naturelle, Paris, France (MNHN), Natural History Museum, Tring, UK (NHMUK) and Museum für Naturkunde, Berlin, Germany (ZMB). Mensural data (in mm) were taken from males using digital callipers accurate to two decimal places, for wing (curved) and tail (from point of insertion to the tip of the longer outermost rectrix, hereafter 'extension'). Birds without tail extensions

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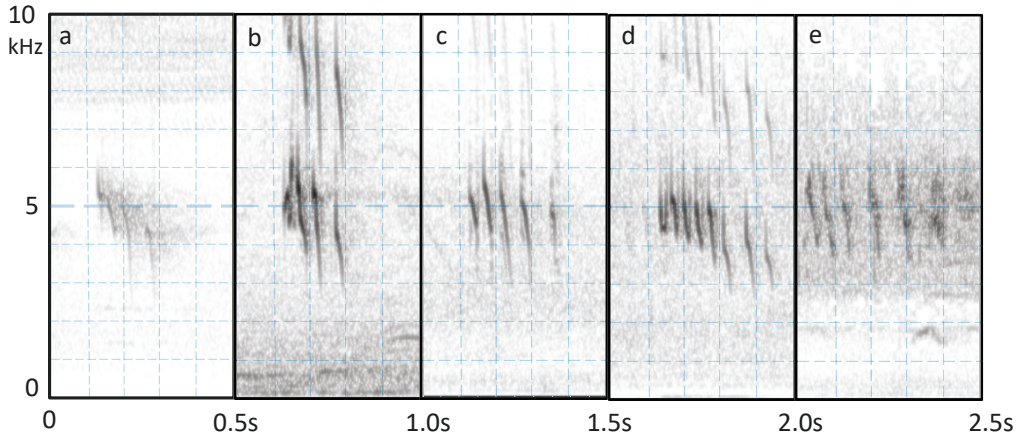

Figure 1. Examples of short calls uttered by single individuals, for mainland races of *Cypsiurus parvus*. From left to right (a–e): *parvus* (XC421450, B. Piot), *brachypterus* (XC348468, P. Verbelen), *myochrous* (XC280231, P. Boesman), *hyphaenes* (XC346765, P. Boesman) and *celer* (XC280232, P. Boesman).

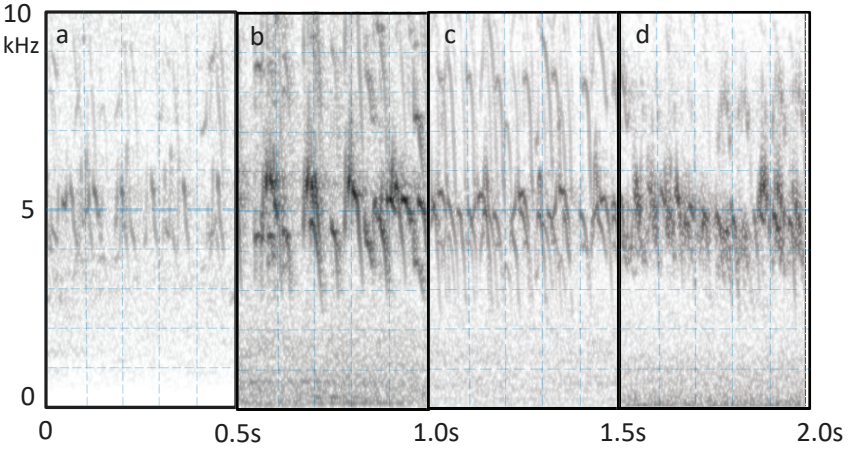

Figure 2. Examples of call series (extracts to illustrate note shapes) uttered by groups of birds, for mainland races of *Cypsiurus parvus*. From left to right (a–d): *parvus* (XC356729, B. Piot), *brachypterus* (XC348468, P. Verbelen), *myochrous* (XC396390, J. Bradley), *hyphaenes* (XC153527, R. de By).

were excluded, as were those showing signs of immaturity (scaly pattern on upperparts plus short tail extensions). Samples involved 27 *gracilis* (14 AMNH, 13 NHMUK), five *griveaudi* (three MNHN, two NHMUK), 14 *parvus* (all NHMUK), ten *brachypterus* (eight AMNH, two NHMUK), ten *myochrous* (one AMNH, nine NHMUK), one *hyphaenes* (in NHMUK), no *celer* and no *laemostigma*. The type of the last-named taxon, in ZMB, was examined and photographed (Fig. 6) but, lacking tail extensions, not measured. Four *laemostigma* in AMNH, three of them male, are immature or moulting, and otherwise neither this taxon nor *celer* could be found in several other European collections visited.

To gauge the degree of difference in voice, plumage and dimensions between Malagasy taxa and African mainland taxa, we used the scoring system proposed by Tobias *et al*. (2010), in which an exceptional character (radically different coloration, pattern, size or sound) scores four, a major character (pronounced difference in body part colour or pattern, measurement or vocalisation) three, medium character (clear difference, e.g. a distinct hue rather than different colour) two, and minor character (weak difference, e.g. a change in

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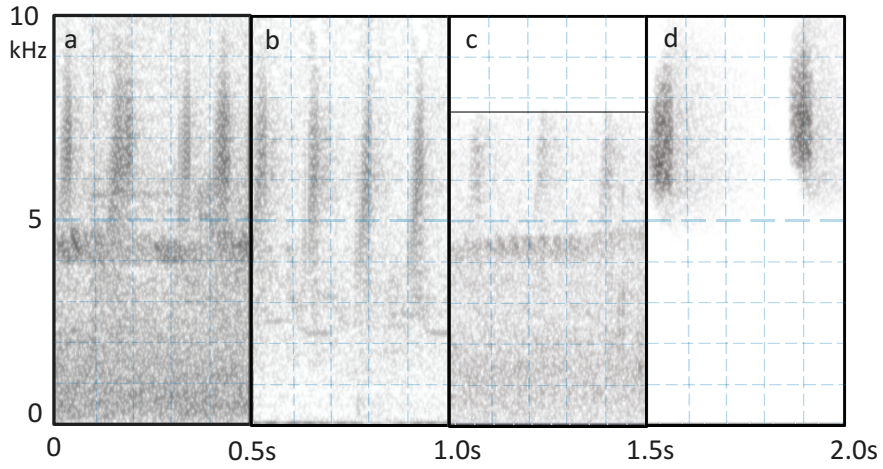

Figure 3. Examples of calls uttered by single individuals of Malagasy races of *Cypsiurus parvus*. From left to right: *gracilis* a: XC162876, M. Nelson; b: M. Mills; c: XC125058, A. Lastukhin (cut-off at 7.8 kHz) and *griveaudi* d: M. Herremans (heavily filtered).

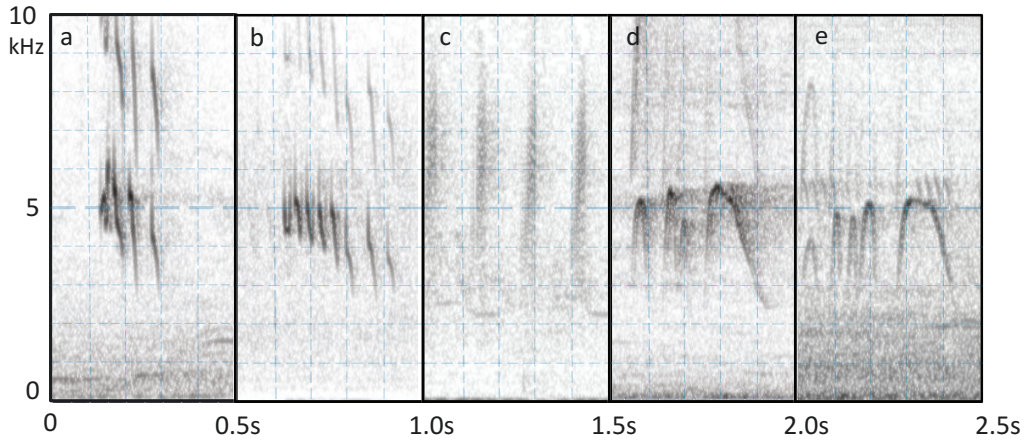

Figure 4. Examples of calls uttered by three vocal groups of *Cypsiurus parvus* ranked from west to east (and from left to right): *parvus* group a: XC348468, São Tomé, P. Verbelen; b: XC346765, Namibia, P. Boesman; *gracilis* group c: Madagascar, M. Mills; and *balasiensis* group d: XC286657, India, V. Puliyeri; e: XC362689, Thailand, A. Lastukhin.

shade) one; a threshold of seven is set to permit species status, which cannot be triggered by minor characters alone, and only three plumage characters, two vocal characters, two biometric characters (both vocal and mensural data assessed for effect size using Cohen's *d* where 0.2–2.0 is minor, 2–5 medium and 5–10 major) and one behavioural or ecological character (allowed 1) may be counted.

Results

Vocally, Malagasy birds form a very distinct group from those of the African mainland. All mainland subspecies (also including birds from the Gulf of Guinea islands) make calls that consist of twitters (somewhat like Little Swift *Apus affinis*). Single birds typically utter salvos ('short calls') of 2–6 downslurred elements (Figs. 1, 4), but birds in loose flocks give longer call series incorporating similar elements, as well as rather staccato notes (note

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TABLE 1
Means and standard deviations of length of wing and tail (see text) of taxa of African Palm Swift *Cypsiurus parvus* (males alone). * indicates Malagasy taxa.

taxon	sample	mean wing	S.D.	mean tail	S.D.
parvus	14	129.4	3.61	93.3	4.41
brachypterus	10	124	3.41	92.2	3.03
myochrous	10	126.5	4.04	94.1	4.86
laemostigma	—	—	—	—	—
hyphaenes	1	131	—	88	—
celer	—	—	—	—	—
**griveaudi*	5	127	2.92	81.4	1.52
**gracilis*	27	120.9	3.20	78.0	4.13

TABLE 2
Means and standard deviations of length of wing and tail of African and Malagasy taxa of African Palm Swift *Cypsiurus parvus* from Table 1.

	n	wing	tail
African *Cypsiurus*	35	127.1 ± 4.26	93.1 ± 4.21
Malagasy *Cypsiurus*	32	121.8 ± 3.85	78.5 ± 4.02

shapes are fairly constant over the entire range) (Fig. 2). In contrast, Malagasy birds give short, insect-like, single buzzy notes at irregular intervals (Figs. 3–4), and occasionally a drawn-out, somewhat rising buzz, with no resemblance to mainland birds (the single recording of *griveaudi* was supplemented by MSLM listening to—circumstances prevented recordings—birds during a visit to the Comoros in October 2018 to confirm their likeness to *gracilis*).

In plumage and measurements, Malagasy birds have heavier dark markings on the throat and upper breast than found in either nominate *parvus* or *laemostigma* (which have the heaviest streaking of the mainland taxa: Brooke 1972; pers. obs.). These markings extend as vague dark scaling onto the pale grey belly, whereas in African taxa they do not and the belly is uniform mid-grey (Figs. 5–6; also Chantler & Kirwan 2018). The undertail-coverts are a shade darker than the grey belly, forming a slight contrast, vs. none in mainland taxa; and the tail extensions are distinctly shorter (Tables 1–2). The form *griveaudi* was distinguished from *gracilis* for having the white of the chin to breast extending slightly further rearwards, and the scaling on the belly slightly more broadly tipped white, but it is 'not very strongly differentiated' (Benson 1960). We confirm these minor distinctions and add that it is clearly longer winged than *gracilis* (but indistinguishable from African taxa in this character; see Tables 1–2, Fig. 5) and slightly longer tailed (Table 1).

Quantification of vocal differences—although somewhat superfluous in this extreme case—here involves, first, max. pace of notes (= elements) in a single calling bird, which reach 18–30 notes per second in African mainland birds but just 3–10 notes in Malagasy birds (mean 23.1 ± 4.0 vs. 7.1 ± 2.1, effect size 5.02, Tobias score 3); and, second, frequency range (or bandwidth) of calls (twittering vs. buzz), registering as <1,000 Hz at any single point in recordings of African mainland populations, but 3,000–6,000 Hz in the Malagasy region (mean 325 ± 96 vs. 4,875 ± 854, effect size −7.49, Tobias score 3). In addition, the heavier breast markings of Malagasy birds are here scored 1 (minor difference), the dark scaling on pale grey (vs. no scaling on mid-grey) belly scores at least a further 1 (a minor but arguably stronger difference; see Figs. 5–6), the slightly darker undertail-coverts receive no

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Figure 5. Examples in NHMUK of six taxa treated as races of African Palm Swift *Cypsiurus parvus*, left to right: *gracilis* and *griveaudi* (Malagasy taxa), *hyphaenes*, *myochrous*, *brachypterus* and *parvus* African taxa). Note the stronger-marked throat and breast markings and paler, scaled bellies of the Malagasy taxa, but the longer wings of *griveaudi* than *gracilis* (Nigel J. Collar, © Natural History Museum, London)

score but the shorter tail extensions (Table 1; effect size −3.54) score 2 (medium difference). When the mean and standard deviation of five *griveaudi* tail extensions (data in Table 1) are assessed against those of 35 from the African mainland (data in Table 2) the effect size is −3.69.

In total, Malagasy birds score ten when the threshold for species rank is seven, and given such a high level of character divergence we consider it appropriate to propose that *C. p. gracilis* and *C. p. griveaudi* are better reclassified as Madagascar Palm Swift *Cypsiurus g. gracilis* (Madagascar) and *C. g. griveaudi* (Comoro Islands, including Mayotte).

Discussion

Swift vocalisations appear to be simple and largely invariable, so any distinct difference between populations is likely to have considerable taxonomic implications (Gahr 2000, Pellegrino *et al*. 2017). In the case of African Palm Swift this difference is so striking that reference to the scoring system of Tobias *et al*. (2010) seems supererogatory. The fact, however, that Malagasy birds also show a relatively high degree of morphological difference lends strong support to their discrimination as a separate species. Brooke (1972), who observed that *gracilis* 'lays a clutch of three eggs, not two as in African *parvus*' (a potential further point of divergence that requires confirmation by wider sampling), considered it 'best treated as a race of *parvus*' but accepted that it could be accorded species status because birds 'differ from nominate *parvus* far more than any African race does'. This

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Figure 6. Type of *Cypsiurus parvus laemostigma* (ZMB 49.338; above) compared to an example of *C. p. gracilis* (ZMB 36.546); note the plain grey breast and belly of the former (Nigel J. Collar)

possible alternative treatment was again considered by Brooke (1978), who mentioned that *gracilis* 'is clearly derived from the same stock as continental African birds and has nothing which suggests a closer relationship with *C. balasiensis*' (Asian Palm Swift—see below). It was repeated without comment by Chantler (1999) and Chantler & Driessens (2000), and consequently also by del Hoyo & Collar (2014) who, however, declared that 'NHMUK material suggests that morphological differences from African taxa are overstated in HBW [i.e. Chantler 1999] and based on average (rather than absolute) values'. This conclusion is now reversed on the basis of a closer examination of that material.

That the difference in voice between the two groups has not been noted before appears likely to reflect several factors. First, the study of birds of the two regions, African and Malagasy, has largely fallen to different groups of ornithologists whose familiarity has tended to remain with one or other but not both avifaunas. Second, vocalisations of swifts are rather poorly studied, as reflected in this case by the limited number of recordings available for a common, widespread species. Third, the calls certainly fall into the same class of high-pitched staccato sounds that only emerge as strikingly distinct once attention is concentrated on them. Nevertheless, the difference is well conveyed in the descriptions in the respective parts of *Birds of Africa*, with African mainland birds giving 'quiet, high-pitched sibilant chittering or twittering' (Fry 1988) and Malagasy birds uttering 'short vowel-less scratchy medium-pitched notes *tchh tchh tchh* repeated 1–10 times' (Safford 2013).

Brooke (1972) made the case, universally followed since, for regarding Asian Palm Swift *C. balasiensis* as a separate species from African, noting that adults lack the latter's streaked throat and elongated, emarginated extensions, and that juveniles lack a distinctive (lightly scaled) plumage. His measurements also showed that Asian is a markedly smaller bird even than the Malagasy taxa. To this we can add that the short call of Asian Palm Swift is a twittering quite different from African in having chatters of several fast notes consistently terminating in a longer emphasised note, *pi-ti-titrtrtr-TEEE* (Chantler & Boesman 2018; Fig.

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4), thus typically ascending and increasing, whereas in African Palm Swift it is exactly the opposite; and obviously there is even less similarity with Malagasy birds.

Madagascar Palm Swift appears to be common across most of its range, except the far arid south (R. J. Safford *in litt*. 2019), frequently associated with cultivated coconut palms and almost invariably in areas of secondary vegetation in which palm trees are present (Benson 1960, Louette 1988, Safford 2013). Its conservation status on both Madagascar and the Comoros therefore appears secure.

Acknowledgements

We thank the many field workers who have made their recordings publicly available for study (Appendix 1), and the staff of AMNH (Paul Sweet, Tom Trombone), MNHN (Patrick Boussès, Jérôme Fuchs), NHMUK (Mark Adams, Hein van Grouw) and ZMB (Sylke Frahnert, Pascal Eckhoff) for access to specimen material and literature consulted in this research. MSLM's visits to Madagascar and the Comoro Islands were enabled by Birding Africa (www.birdingafrica.com). Bob Dowsett, Roger Safford and an anonymous reviewer were most helpful referees.

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Appendix 1: list of recordings accessed

All recordings were listened to as a means to check taxon-specific features, and a subset of these (of sufficient quality) was used to measure basic sound parameters. XC: Xeno-canto, ML: Macaulay Library, AV: Avian Vocalization Center.

C. p. parvus (*n* = 4 recordings): XC356729 and XC421450, Senegal, B. Piot; XC425455, Gambia, P. Boesman; XC115456, Burkina Faso, G. Boano; ***C. p. brachypterus*** (*n* = 8): Huguet II/88a, Ivory Coast, C. Chappuis; ML95202, Príncipe, L. Macaulay; XC132985, São Tomé, T. Mark; XC348468–470, Príncipe, P. Verbelen; XC98889, Cameroon, M. Nelson; XC417114, Uganda, M. Wadstein; ***C. p. myochrous*** (*n* = 14): ML137444–445, Tanzania, L. Macaulay; XC138031, Uganda, B. Piot; XC201373, Tanzania, T. Chansac; XC280231, South Africa, P. Boesman; XC37703, Malawi, B. Piot; XC396390, Kenya, J. Bradley; XC365294 and XC366448, Malawi, F. Lambert; XC429538–540, Tanzania, F. Lambert; XC92213, Zambia, R. Nefdt; ***C. p. hyphaenes*** (*n* = 4): XC153527, Namibia, R. de By; XC346765, Namibia, P. Boesman; AV11924 and AV12341, Botswana, P. Rasmussen; ***C. p. celer*** (*n* = 2): XC280232, South Africa, P. Boesman; XC335425, South Africa, L. Rudman; ***C. p. griveaudi*** (*n* = 1): Huguet II/88b, Comores, M. Herremans; ***C. p. gracilis*** (*n* = 6): unpublished, Madagascar, M. Mills; XC125055–058 and XC128340, Madagascar, A. Lastukhin; XC162876, Madagascar, M. Nelson.

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Breeding data on Peruvian Thick-knee *Burhinus superciliaris* accumulated by R. A. Hughes in the vicinity of Mollendo, Peru

by M. Patrick O'Hagan & Morris D. Williams

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http://zoobank.org/urn:lsid:zoobank.org:pub:278EA6BF-26A7-43BA-A234-2C31FDB89A20

The purpose of this note is to make available the accumulated nesting data on Peruvian Thick-knee *Burhinus superciliaris* collected by R. A. Hughes (RAH) in Distrito Mollendo, Provincia Islay, Región Arequipa, Peru. To achieve this we present verbatim his short unpublished manuscript from 1982 (Appendix) with a brief commentary.

Until his untimely death, Robert A. 'Robin' Hughes (1934–91) was the only resident ornithologist on the Pacific coast of South America anywhere near the Peru / Chile border. He made several important published contributions from this relatively little-visited region (see González 1995, Plenge 2018), of which three include information pertaining to *B. superciliaris* (Hughes 1970, 1979, 1991).

Shortly before his death, RAH described *B. superciliaris* as a fairly common resident in several coastal habitats, his clearest published statement on the species' status in the area (Hughes 1991). Further south, occurrence of *B. superciliaris* in Tacna was reported subsequently by Pizarro (1995); breeding here was confirmed by MDW, who found a nest containing a pipped egg with chirping embryo on 12 February 2017.

Had RAH's manuscript appeared earlier, some subsequent misstatements on range, status and breeding season might have been avoided. Hume (1996), following Blake (1977), expressed doubt as to the continued occurrence of *B. superciliaris* in Chile; had the existence of a viable breeding population at Mollendo been known, occurrence in Chile, 250 km away, would surely not have been questioned, as there are no apparent intervening physical or ecological barriers in Moquegua or Tacna. It is now known to breed at several sites in northernmost Chile (Sallaberry *et al*. 1992, Howell & Webb 1995, Aguirre *et al*. 2006). The most up-to-date general overview can now be found in Hume & Kirwan (2019).

Comparing the Peruvian and Chilean *B. superciliaris* populations, Camacho (2012) gave the overall breeding season as four months, but knowledge of the 'very extended breeding season' documented by RAH stretches this to twice as long. Camacho (2012) also warned that the species was possibly becoming threatened in Chile. Fortunately, more recent (2013, 2017) data suggest that it remains fairly common in the Lluta River Valley, Región Arica and Parinacota (A. Jaramillo pers. comm.; MDW pers. obs.).

Finally, Hume & Kirwan (2019) still report that the breeding biology of *Burhinus superciliaris* remains little known. The data of RAH presented here, plus recent studies by O'Hagan & Williams (in prep. a,b), will hopefully go a considerable way to rectify this situation.

Acknowledgements

We are grateful to Manuel Plenge who rescued the RAH manuscript and provided us with a copy. He also extended many other bibliographic courtesies, and we further thank Ann & Brian Basinger for providing considerable assistance with references. Abby Wilcox and François Salhany conducted fieldwork on *B. superciliaris* with MDW in Chile in 2013. We thank Lady Amaro, Irma Franke, Janet Hinshaw, A. Jaramillo and R. Prŷs-Jones for references and unpublished data. We are pleased to place on permanent record these important data collected by Robin Hughes; we hope this paper enhances our collective memory of Robin.

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Appendix

Original manuscript of R.A. Hughes, dated 25 September 1982, entitled **Notes on the nesting of the Peruvian Thick-knee (*Burhinus superciliaris*) on the south coast of Peru.**

In the Condor 83:183 (1981) Williams described for the first time the nest and eggs of the Peruvian Thick-knee (*Burhinus superciliaris*). The nest was found on June 5, 1978, in desert scrub habitat near the western base of the Andes in the department of Lambayeque, north-west Peru.

Since so little is known of the nidification of this species, the following observations from the Mollendo district, department of Arequipa, southwest Peru, may be of interest.

On October 13, 1981, I found a nest containing two eggs on bare sandy desert some 2 kms inland and 80m above sea level. It was situated approximately 200m from a canal which separates the desert from irrigated farmland and was a shallow scrape in the sand, similar in all details to those described by Williams.

This is the only nest I have found, but I had the following earlier evidence of breeding in the Mollendo district:

On April 7, 1980, a young chick, less than a week old, was found crouching on the sand with its neck outstretched at a site very close to where the nest was found in October 1981.

On June 25, 1980, two large chicks, capable of running well but still unable to fly, were found at the edge of an alfalfa field adjacent to the irrigation canal. Some distance away, on the other side of the canal, an adult bird also was present.

On January 6, 1981, a large chick, only partly fledged, was noted as a traffic casualty on the Mollendo-Mejía coast road, some 3 kms from Mollendo.

The foregoing details suggest that the Peruvian Thick-knee has a very extended breeding season, at least along the south coast of Peru.

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A population of Greater Ground Robin *Amalocichla sclateriana* (Petroicidae) from central New Guinea

by Iain A. Woxvold & Leo Legra

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Greater Ground Robin *Amalocichla sclateriana* is a large, terrestrial petroicid endemic to the high mountain forests of New Guinea (Beehler & Pratt 2016). It is known from three isolated populations (Fig. 1)—*A. s. occidentalis* in the vicinity of Lake Habbema in the eastern Sudirman Range (Snow Mountains); *A. s. sclateriana* on the Papuan Peninsula; and a population in the Saruwaged Range on the Huon Peninsula (Freeman *et al*. 2013). There is a gap of more than 900 km between previously confirmed localities along New Guinea's central cordillera. However, the species is elusive (e.g. Mayr & Rand 1937) and scarce in some known localities, and there are unconfirmed aural records from central New Guinea at Tari Gap and in the Kaijende Highlands (Beehler 1993, Beehler & Sine 2007).

In 2017 a population of *A. sclateriana* was discovered by camera trapping on Hides Ridge (05°55.1'S, 142°41.7'E; Fig. 2), a broad limestone ridge extending some 20 km south-east from the Muller Range and rising to *c*.2,800 m above sea level west of the Tagari River valley in Hela Province, Papua New Guinea. The site is midway between previously confirmed localities at Lake Habbema and Mount Kumbak at the base of the Papuan Peninsula, and less than 65 km from unconfirmed sites at Tari Gap and Kaijende (Fig. 1).

As part of an ongoing monitoring programme, in May–August 2017 we deployed 20 white-flash digital camera traps (Reconyx PC850) within a *c*.150 ha sampling area on the

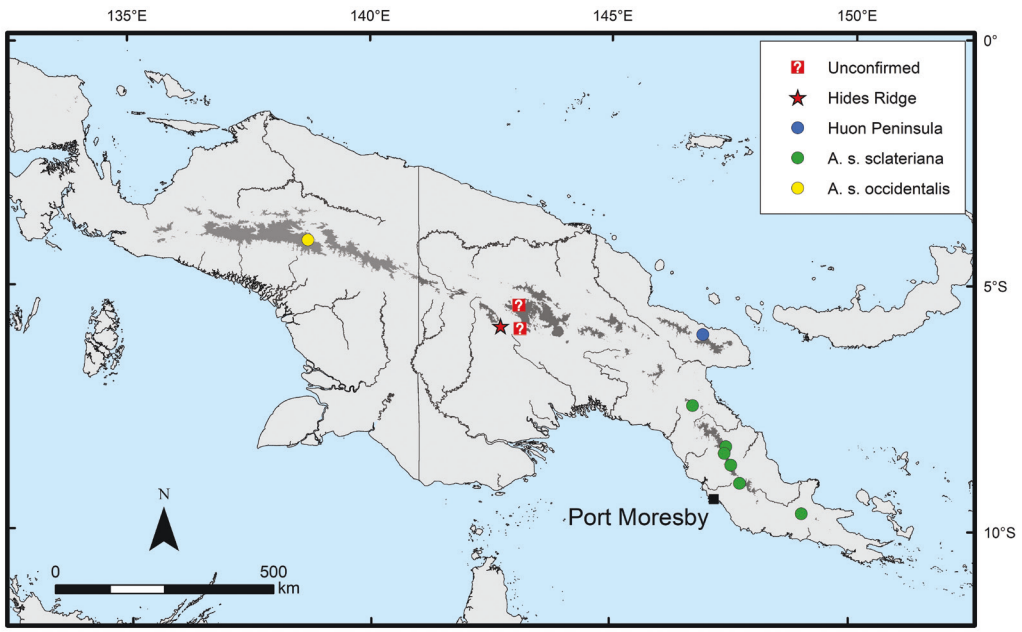

Figure 1. Confirmed localities of Greater Ground Robin *Amalocichla sclateriana* (Coates 1990, Beehler & Pratt 2016; www.vertnet.org). Land above 2,600 m is shaded darker grey.

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Figure 2. Camera trap images of Greater Ground Robin *Amalocichla sclateriana*, Hides Ridge, Hela Province, Papua New Guinea.

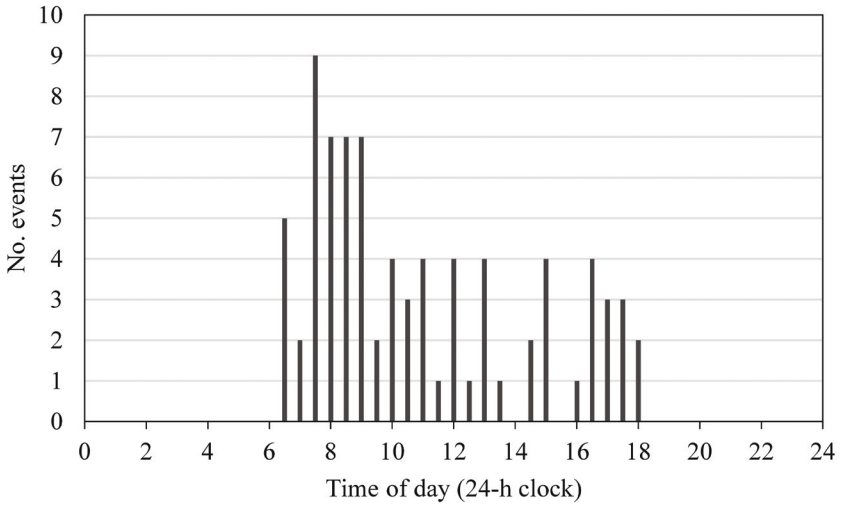

Figure 3. Activity pattern of Greater Ground Robin *Amalocichla sclateriana* on Hides Ridge. X-axis shows the start time for each 30-minute sampling period.

upper section of Hides Ridge, at 2,645–2,730 m, for a total of 1,848 camera days. Terrain is characterised by polygonal karst with networking and sub-parallel ridgelines interspersed by dolines and valleys. Vegetation is small-crowned evergreen montane forest with *Nothofagus* a canopy dominant. There are heavy epiphyte loads and, in many areas, a dense layer of moss covers the ground, rocks and most woody subcanopy surfaces.

Of 18 bird species camera trapped at the site, *A. sclateriana* was among the most frequently photographed, with 80 independent events (≥60 minutes apart; Burton *et al*. 2015) recorded across 14 camera positions (70%). This event rate was marginally higher than that recorded for Wattled Brushturkey *Aepypodius arfakianus* (77 events) and lower only than that of New Guinea Woodcock *Scolopax rosenbergii* (123 events) and Lesser Melampitta *Melampitta lugubris* (116 events). Individuals were photographed throughout the diurnal period with the major peak in activity between 07.30 h and 09.30 h (Fig. 3).

A. sclateriana was recorded at both the highest and lowest camera positions at this site. Its occurrence at 2,645 m is slightly below the previously reported lower limit of 2,700 m (Beehler & Pratt 2016). While the unconfirmed Tari Gap record is from *c*.2,400 m (Beehler

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1993), cameras deployed at a second site on Hides Ridge failed to detect the species at 2,190–2,390 m, where it was replaced by Lesser Ground Robin *A. incerta*.

Assuming *A. sclateriana* occurs locally as low as 2,600 m, Hides Ridge currently provides less than 900 ha of suitable habitat. Just 4 km to the north-west, more than 60,000 ha are available on the Muller Range. Hides Ridge and the Muller Range are connected by land above 2,300 m, and it is probable that suitable habitat was continuously present across these areas during the last glacial cycle, when montane *Nothofagus* forests were at about two-thirds of their present elevation (Johns *et al*. 2007). The current lack of records from the Muller Range may well reflect a lack of sampling—a seven-day survey at 2,875 m in the north-west of the range ('Apalu Reke' camp: Igag 2011) provides the only relevant published inventory—and we predict that *A. sclateriana* is present there.

To the east, the Kaijende–Tari area lies at the western edge of a much larger expanse of suitable habitat that extends across parts of five provinces to Mount Hagen and Mount Giluwe. It is separated from the Hides Ridge–Muller Range feature by nearly 24 km (between 2,600 m contours) with the highest link at 1,700 m across the Pori River valley. This region includes some of the most birdwatched sites in Papua New Guinea. At Tari Gap, the site of an unconfirmed encounter more than 25 years ago, the popular Ambua Lodge is less than 7 km by road west of the 2,600 m contour. However, the failure to confirm past records should not be taken as conclusive evidence that *A. sclateriana* is absent from this extensive area. The utility of camera traps in detecting this elusive species is here demonstrated, and we recommend their use in future searches.

Further work is required to determine whether the Hides Ridge population belongs to a known subspecies or represents a new, undescribed taxon.

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