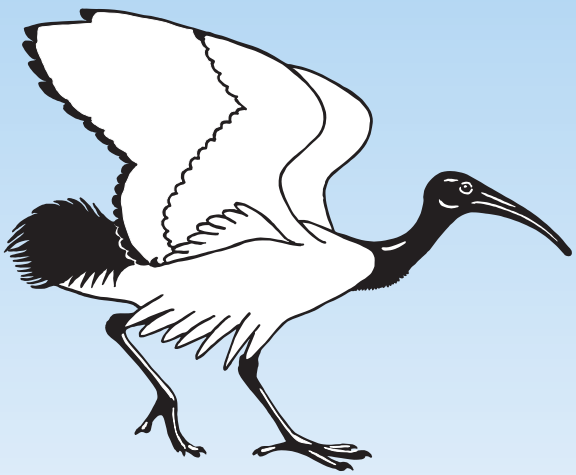
Bulletin of the British Ornithologists' Club



Volume 136 No. 1
March 2016

FORTHCOMING MEETINGS

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

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

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

It would be very helpful if those intending to come can notify the Chairman no later than the day before the meeting.

Tuesday 15 March 2016—6.30 pm—Dr Robert Prŷs-Jones—*'The Soul of the Collection': key developments in the documentation of the British Museum's bird collection, 1753 to 1909*

Abstract: In response to years of perceived mismanagement since its foundation in 1753, a Parliamentary Select Committee was set up in 1835 to investigate 'the condition, management and affairs of the British Museum'. A central concern of the inquiry was the question of documentation of specimens in the museum's possession and the communication of information concerning them to both the general public and interested specialists. Evidence presented suggested this had been flawed since the BM's inception, and the committee recommended that design and implementation of an improved system be treated as a matter of urgency. This presentation will analyse the nature of the problems that had arisen and the steps subsequently taken to address them, which culminated in the production of the extraordinary 27-volume *Catalogue of birds in the British Museum*, 1874–98, applauded at the time as a production of exceptional importance and still a key resource in museum ornithology.

Biography: Robert Prŷs-Jones has been Collections Manager, Birds, and Head of the Bird Group at the Natural History Museum at Tring for more than 20 years, with particular interests in the evolutionary biogeography of Indian Ocean island landbirds and in collections-related projects aimed at enhancing the information associated with museum specimens.

Tuesday 24 May 2016—5.30 pm—Annual General Meeting, followed at **6.30 pm** by **Dr Pat Morris**—*Birds of the parlour, a peep into some aspects of Victorian taxidermy*.

Abstract: This talk will address the motivation behind the Victorian love of taxidermy, which species were affected, who did the work and the extent to which it constitutes an area of social history that is in danger of being lost from view.

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'.

Saturday 17 September 2016—One-day joint meeting with the Neotropical Bird Club and Natural History Museum in the Flett Theatre, Natural History Museum, London SW7 5 BD. Programme details will be published in the June Bulletin and on the BOC website (http://www.boc-online.org).

NB: Note that because of the earlier-than-normal scheduling of the 2016 one-day meeting (i.e. September rather than November), the previously announced evening meeting for Tuesday 20 September 2016 has been deferred until a future date. The final evening meeting of the year will be on Tuesday 15 November 2016—details to be confirmed.

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Bulletin of the
BRITISH ORNITHOLOGISTS' CLUB

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CLUB ANNOUNCEMENTS

ANNUAL GENERAL MEETING

The Annual General Meeting of the British Ornithologists' Club will be held in the upstairs room at the Barley Mow, Horseferry Road, Westminster, London SW1P 2EE , at 5.30 pm on Tuesday 24 May 2016.

AGENDA

1. Apologies for absence.
2. Minutes of the Annual General Meeting held on Tuesday 19 May 2015 (see *Bull. Brit. Orn. Cl.* 135: 193, and the BOC website).
3. Receive and consider the Chairman's Review, The Trustees' Report and Accounts for 2015 (these will be available in the room before the start of the meeting).
4. The Bulletin Editor's Report—Mr G. M. Kirwan.
5. BOC: The Way Forward: resolution for consideration to be circulated separately.
6. Any other business (*any items should be received by the Hon. Secretary by 16 May 2016*).

REVIEW

Gedeon, K., Grüneberg, C., Mitschke, A., Sudfeldt, C., Eikhorst, W., Fischer, S., Flade, M., Frick, S., Geiersberger, I., Koop, B., Kramer, M., Krüger, T., Roth, N., Ryslavy, T., Stübing, S., Sudmann, S. R., Steffens, S., Vökler, F. & Witt, K. 2014. *Atlas Deutscher Brutvogelarten* [*Atlas of German breeding birds*]. Stiftung Vogelmonitoring Deutschland und Dachverband Deutscher Avifaunisten, Münster. 800 pp, many colour maps. ISBN 978-3-9815543-3-5. €98.

When birders these days, especially British ones, are considering European destinations for their holidays, Spain, Hungary or Finland often figure in their imaginations; Germany, despite being one of the largest countries in the union and situated at the heart of the continent, is certainly not an automatic first choice. Indeed, as a comparatively regular visitor to the country, I can attest to the fact that I have spent most of my time in museums and scarcely any in rural areas. Yet, as this gargantuan tome proves beyond all doubt, Germany's breeding avifauna is rich and distinctive, comprising a mix of species typical of virtually all parts of the European continent, thus Alpine Swift *Tachymarptis melba*, European Bee-eater *Merops apiaster* and Common Rock Thrush *Monticola saxatilis* share *lebensraum* with birds as diverse as White-tailed Eagle *Haliaeetus albicilla*, Great Bustard *Otis tarda*, Spotted Nutcracker *Nucifraga caryocatactes*, Aquatic Warbler *Acrocephalus paludicola*, Barred Warbler *Sylvia nisoria*, Collared *Ficedula albicollis* and Red-breasted Flycatchers *F. parva*, Citril Finch *Carduelis citrinella* and Rock Bunting *Emberiza cia*. Perhaps particularly notable for 'foreign' birdwatching visitors are ten species of breeding owls (including European Scops Owl *Otus scops*, which only recently became a regular summer visitor) and nine woodpeckers, although some of the desiderata in these groups are far from widespread in Germany.

The present work, which represents the ultimate output of five years of field work, between 2005 and 2009, and involved more than 4,000 observers (all of them named in one of the appendices!), documents a total of 280 bird species as breeders, of which 268 are considered regular (20 of these non-natives), with another 12 (five non-natives) reported breeding only a few times during the survey period. Kai Gedeon and his many co-authors are to be congratulated for seeing to production such a marvellous and attractive volume as a fitting culmination to an enormous project.

The first part of the book comprises six chapters that provide an introduction to the atlas project and its history, the landscape and geography of Germany, bird-monitoring programmes in the country, the different methodological approaches required to mapping and modelling the distributions of common, less frequent and rare species, as well as colonial breeders, the organisation of atlas work in different parts of the German federation, and finally an overview of the distribution and abundance of the country's breeding birds. In all, it is believed that somewhere between 70 million and 100 million pairs of birds currently breed in Germany, of which Common Blackbird *Turdus merula* and Common Chaffinch *Fringilla coelebs* number eight million pairs each, while Great Tits *Parus major* comprise five million pairs and an additional 19 species

each potentially amount to in excess of one million pairs, i.e. these 22 species represent in the region of 80% of the overall total!

Needless to say, the species accounts represent the vast majority of this lavish book, with the majority (221) of the regularly occurring species being treated within a double-page spread; the text, an attractive painting, and a map depicting the global range on the left-hand page, with two detailed maps showing (1) square occupancy and density across Germany during the survey period and (2) comparative distribution in 1985, as well as a single-paragraph English summary, on the opposite page. The 45 commonest species receive two double-page spreads each, with the additional pages occupied by maps showing modelled density in the survey period and a combination map overlaying the actual data and the modelled information. Finally, another 45 (occasional or extinct breeders) are treated more summarily, each with a short text, painting and global range map, and two species per page. This group includes taxa as diverse and exciting as Northern Bald Ibis *Geronticus eremita* (bred until the 17th century, reintroduced in neighbouring Austria in the last decade), Greater Spotted Eagle *Clanga clanga* (mixed pairs with Lesser Spotted Eagles *C. pomarina* recorded in several recent years), Pallid Harrier *Circus macrourus* (seven breeding records since 1850), Great Snipe *Gallinago media* (formerly regular in northern Germany, but extinct as a breeder since 1930), Black-winged Pratincole *Glareola nordmanni* (single unsuccessful breeding attempt in 1966), Pallas's Sandgrouse *Syrrhaptes paradoxus* (single nesting event in 1888), Citrine Wagtail *Motacilla citreola* (first recorded in the country in 1977, with somewhat sporadic breeding records since 1996) and Parrot Crossbill *Loxia pytyopsittacus* (very occasional indications of nesting, although none since the early 1980s).

The remainder of the book's content comprises a series of appendices, among them tables summarising the country's breeding birds with populations by state and analysing the data quality species by species, as well as the effects of climate on selected species, a gazetteer, and finally a bibliography comprising almost 2,100 references.

If, like me, English is your first language and any schoolboy German you once possessed has, regrettably, been largely forgotten, then you will be largely limited to the English summaries, which are provided not only for all of the main species accounts, but also the occasional and extinct breeders, while brief English abstracts are provided for the introductory chapters, there is an explanatory text for understanding the layout of the species accounts, and the legends for tables and figures are bilingual. All very welcome, and this degree of accessibility for non-German speakers should ensure that this exceptional book, not only in its content but its quality of production, will be widely read and cited. All those with a serious interest in the European avifauna are well advised to take a look at it. Some further information and an English-language order form are available online: http://www.dda-web.de/index.php?cat=pub&subcat=adebar_en

Guy M. Kirwan

ERRATA

In the paper by Tennyson *et al*. (2015) A new species of extinct *Pterodroma* petrel (Procellariiformes: Procellariidae) from the Chatham Islands, New Zealand (*Bull. Brit. Orn. Cl*. 135: 267–277), on p. 274, two of the museum registration numbers (NMNZ S.35789.1 and NMNZ S.35789.2) for the paratype specimens of *Pterodroma imberi* sp. nov. are incorrect. The correct numbers are NMNZ S.37589.1 and NMNZ S.37589.2, as presented in Table 1 on p. 269. In addition, the cytochrome-*b* GenBank no. for Atlantic Petrel *P. incerta* and cytochrome-*b* genetic distance between *P. incerta* and *P. imberi* sp. nov. are missing from Table 2. The cytochrome-*b* GenBank number is HQ420315 and the cytochrome-*b* genetic distance is 5.44.

New distributional information for the birds of Flores, Indonesia, including new localities for the Endangered Flores Scops Owl *Otus alfredi*

by Andrew Hart Reeve & Samuel Rabenak

Received 22 January 2015

Summary.—The Indonesian island of Flores hosts a remarkable avifauna that is both highly endemic and highly threatened. Nevertheless, basic knowledge of these birds is incomplete. Here we present new distributional information for 18 of the island's bird species obtained during 2011; these include endemics such as Leaf Lorikeet *Trichoglossus weberi* and rarely recorded residents like Oriental Dwarf Kingfisher *Ceyx erithaca*. Our records of all Flores endemics are summarised, and we present new information on the habitat tolerance of two additional range-restricted species. Most significant is the discovery of the little-known and Endangered Flores Scops Owl *Otus alfredi* at three new localities in the hills of far-western Flores, more than doubling the known altitudinal range of this endemic, which was previously considered to be strictly montane. We report new information regarding the owl's habitat preferences, vocalisations and sympatric occurrence with the other two *Otus* scops owls on Flores.

Flores (08°S, 119–123°E; 13,500 km^2) is a young volcanic island in the western Lesser Sundas of Indonesia, within the biogeographic region of Wallacea. Part of the Northern Nusa Tenggara Endemic Bird Area (Stattersfield *et al*. 1998), it hosts a large number of range-restricted bird species. Three occur only on Flores, with two others additionally occurring on the small nearby island of Rinca generally considered to be 'Flores endemics' as well. Flores has received a relatively large degree of attention from ornithologists (see White & Bruce 1986 and Mees 2006) compared to other islands in Wallacea. Observations prior to the late 20th century were reviewed by Coates & Bishop (1997) and Verhoeye & Holmes (1998). During the second half of the last century, the work of J. Verheijen and E. Schmutz, two priests resident on Flores, added considerably to our knowledge of the island's birds. Schmutz's contributions included the first specimens of Flores Monarch *Symposiachrus sacerdotum*. In the 1990s, two different two-month ornithological expeditions to Flores were made by British universities (Butchart *et al*. 1996, Pilgrim *et al*. 2000), while BirdLife International / PKA and WWF spent seven months surveying 17 forest blocks on the island (Trainor & Lesmana 2000, Trainor *et al*. 2000).

Despite this attention, much remains to be learned about the island's birds and basic distributional data are incomplete. This is particularly true in respect of altitudinal ranges, as recent workers and visiting birdwatchers have tended not to publish precise elevational information. However, such data are important for biogeographical studies and conservation efforts. In August–October 2011, AHR surveyed forest birds in western Flores to gather data for community structure studies. During this field work and related scouting trips, observations were made expanding the known ranges of 18 species on Flores. These records pertain primarily to altitudinal distributions, and include several rarely recorded, threatened and endemic taxa. In addition, we summarise all of our observations of the five Flores endemics. We also present data on the habitat tolerances of two Lesser Sundas

endemics for which our observations contrast with assessments by Butchart *et al*. (1996) and Pilgrim *et al*. (2000).

The most important records involve the Endangered Flores Scops Owl *Otus alfredi*, an enigmatic and poorly known endemic of western Flores that was only recently confirmed to be a valid species (Widodo *et al*. 1999). Following its collection by A. Everett in 1896 in the Todo Mountains of south-west Flores, this owl went unrecorded for nearly a century before being mist-netted at Danau Ranamese and Poco Mandasawu (both in the Ruteng Mountains) in 1994 (Widodo *et al*. 1999). Pilgrim *et al*. (2000) reported another field observation at Danau Ranamese in 1997, and Hutchinson *et al*. (2007) made the first confirmed recordings of its vocalisations there in 2005. It is now observed with some regularity at Danau Ranamese by visiting birdwatchers (Simay *et al*. 2009). In 2010, two were seen (and one photographed) at Cunca Lolos in Mbeliling Forest Reserve (BirdLife Denmark 2010). These records, the first outside the Todo and Ruteng Mountains, extended the owl's known range *c*.30 km west. During 2011 field work, it was recorded on several occasions at three new sites in western Flores, including two localities near Danau Sano Nggoang, and a new locality within Mbeliling Forest Reserve. These observations are described below; the implications of this new information with respect to the owl's ecology and conservation status are addressed in the Discussion.

Study area and methods

Field work was conducted by AHR in August–October 2011, with formal surveys in September–October; SR joined AHR on several scouting trips. These months coincide with the transition from the dry to wet season on Flores. The primary purpose was to obtain data on avian community structures in mature forest and degraded habitat mosaics. Detailed information regarding study site features and survey methodology are presented in Reeve *et al*. (2015). Five to seven days were spent surveying each of four 1 km^2 plots in far-western Flores; two in mature forest, and two in human-modified degraded areas containing rice paddies, scrub and planted fruit trees, as well as patches of native vegetation. The first mature forest plot (08°36′06″S 119°59′30″E; 720–880 m) was in Mbeliling Forest Reserve. This reserve contains a large tract of moist semi-evergreen forest, and is crucial for the conservation of the island's restricted-range bird species; all five Flores endemics occur. The second mature forest site (08°45′11″S, 119°59′26″ E; 480–770 m) was just south of Sisok (or Sesok) Forest Reserve on the rugged slopes of the dormant Wai Sano volcano. The two degraded plots were adjacent to Galang (08°39′20″S, 120°02′13″E; 300–550 m) and Lamung villages (08°37′14″S, 119°59′21″E; 510–760 m). Opportunistic aural surveys were made after dark around the campsites in mature forest. Several noteworthy records were made at the crater lake Danau Sano Nggoang (08°42′S, 119°59′E; 660 m). Also visited were a number of sites frequented by birdwatchers, including Potawangka Road (or 'Nggorang Bowosie' in Pilgrim *et al*. 2000) and Puarlolo in far-western Flores, and Golo Lusang and Poco Ranaka in the highlands south of Ruteng (Simay *et al*. 2009). Important sites visited are shown in Fig. 1.

Selected species accounts

Here we present new distributional information for 18 bird species on Flores. Additional notes are included for all five of the Flores endemics, as well as for two Lesser Sundas endemics where our observations concerning habitat tolerance disagree with current assessments. Taxonomy and nomenclature follow Gill & Donsker (2015). Subspecies are given when known with certainty.

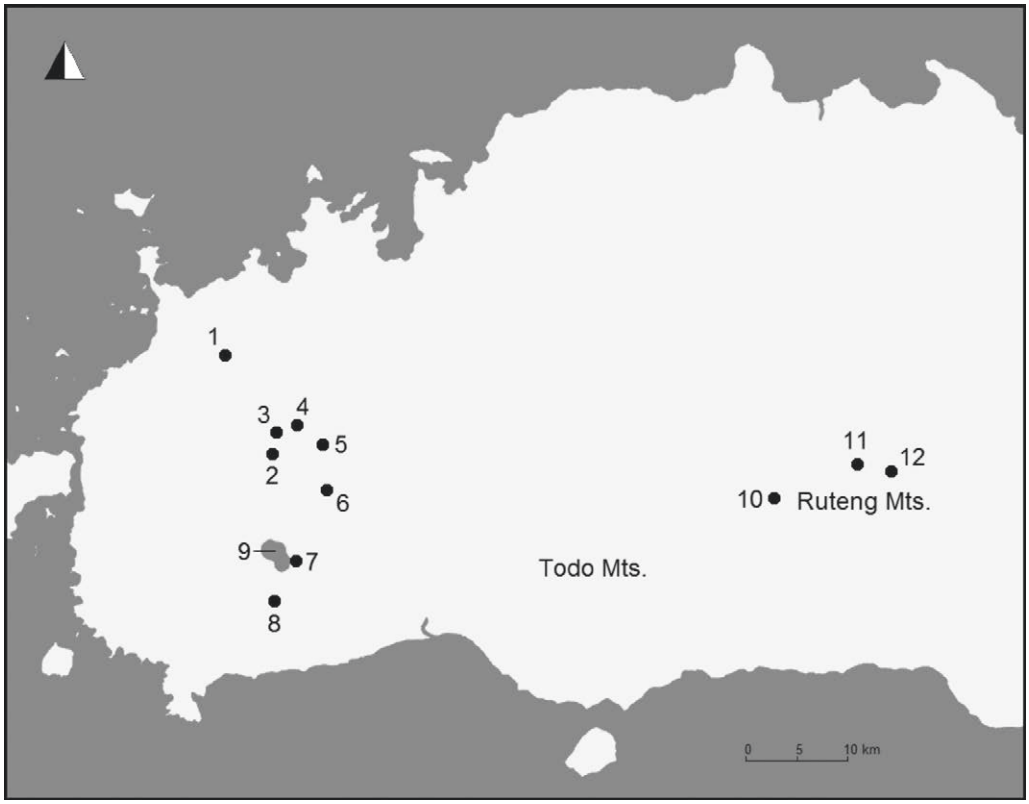

Figure 1. Map of western Flores showing important localities mentioned in the text. (1) Potawangka Road; (2) Lamung study plot; (3) Mbeliling Forest Reserve study plot; (4) Cunca Lolos; (5) Puarlolo; (6) Galang study plot; (7) Nunang; (8) Sisok forest study plot; (9) Danau Sano Nggoang; (10) Golo Lusang; (11) Poco Ranaka; and (12) Danau Ranamese.

CINNAMON BITTERN *Ixobrychus cinnamomeus*
Scarce on Flores, with just four records noted by Verhoeye & Holmes (1998). Mees (2006) identified eggs collected on Flores in 1955 as belonging to this species, establishing breeding. Coates & Bishop (1997) provided no information as to the species' altitudinal range on the island. Cinnamon Bittern was observed just once in 2011, when an adult was flushed from a flooded rice paddy in the Lamung study plot, at 520 m, on 6 October.

NANKEEN NIGHT HERON *Nycticorax caledonicus australasiae*
Rarely recorded on Flores, where birds are perhaps migrants from Australia (Coates & Bishop 1997, Verhoeye & Holmes 1998). An adult was observed resting on the south-east shore of Danau Sano Nggoang at 660 m in the evening of 1 September; probably the same individual was observed in the same place on 19 September. Coates & Bishop (1997) gave the upper altitudinal limit on Flores as 300 m, but Schmutz (1977) encountered the species at 'Nunang am See', which presumably refers to Danau Sano Nggoang, in 1969.

BARRED BUTTONQUAIL *Turnix suscitator powelli*
Coates & Bishop (1997) gave the upper altitudinal limit on Flores as 350 m. In 2011, it was observed only at the Galang study plot, with records at 350–500 m. Ten were seen there on

9–15 September. Other buttonquails encountered at this site were not seen well enough to discount Red-backed Buttonquail *T. maculosus*, which also occurs on Flores.

WHITE-WINGED TERN *Chlidonias leucopterus*
Primarily (or entirely) a passage migrant in Wallacea (Coates & Bishop 1997). First reported on Flores in 1996, and all of the island's records are from the sea or coast (Verhoeye & Holmes 1998). Single adult in non-breeding plumage on 1–2 September at 660 m, foraging along the south-east shore of Danau Sano Nggoang. Whiskered Tern *C. hybrida*, which in non-breeding plumage resembles White-winged Tern, was excluded based on the contrastingly dark outer primaries, dark tertial tips, a very faint line of black feathers connecting the eye with a dark ear-spot, and a relatively lightly streaked crown, without a distinct black nape collar.

METALLIC PIGEON *Columba vitiensis metallica*
Infrequently recorded on Flores in the past, but now observed regularly around Ruteng (J. Eaton pers. comm.) It has also been observed further west in Mbeliling forest and at Keli Mutu in central Flores (Verhoeye & Holmes 1998, Drijvers *et al*. 2000). The first and only record from Sisok was made on 24 September 2011, when a silent individual was seen perched in the canopy at 710 m in the study plot. Additional sight records were made at Mbeliling Forest Reserve study plot, with singles on 13–15 October. It was not heard calling at either site.

ISLAND COLLARED DOVE *Streptopelia bitorquata bitorquata*
Generally scarce and local in the Lesser Sundas (Coates & Bishop 1997, Schellekens *et al*. 2011), and Coates & Bishop (1997) provided no information concerning its altitudinal distribution on Flores. On 10, 12, 14 and 15 September, a total of 29 was recorded at 400–500 m in the Galang study plot, probably corresponding to at least 20 different individuals. The largest flocks contained six and 11 birds, respectively, but singles were also observed. Also noted in heavily degraded forest near the village of Werang (08°38′5″S, 120°00′3″E) at 330 m on 8 October. Observations by Schellekens *et al*. (2011) in mangroves south of Labuanbajo demonstrate that it occurs down to sea level on Flores, as on other islands in the Lesser Sundas (Coates & Bishop 1997).

BARRED CUCKOO-DOVE *Macropygia unchall unchall*
Coates & Bishop (1997) gave the lower altitudinal limit on Flores as 'c. 1,000 m'. Observed below 1,000 m in the Mbeliling Forest Reserve study plot on three dates, at 860–870 m. Probably the same individual was heard calling at dawn on 10, 12 and 14 October, and on the afternoon of 14th; visual confirmation was made on 12th. A second individual called simultaneously *c*.100 m distant on the morning of 14th.

BLACK-NAPED FRUIT DOVE *Ptilinopus melanospilus melanauchen*
Coates & Bishop (1997) stated that this species occurs no higher than 700 m on Flores, but a specimen was collected by Schmutz at 800 m near Nunang (Mees 2006). On 10–14 October, a total of seven was recorded at 750–880 m in the Mbeliling Forest Reserve study plot.

FLORES SCOPS OWL *Otus alfredi*
The first observation during the 2011 fieldwork was made in the village of Nunang (08°38′1″S, 120°00′1″E), at the edge of Sisok forest, near the south-east shore of Danau Sano Nggoang. SR had previously heard what he suspected was the species calling near the house

of a local villager involved with a BirdLife-coordinated ecotourism programme. On 1 September, at *c*.21.00 h, we played a recording by B. Demeulemeester at the edge of tall bamboo on a hillside near the house at *c*.700 m. Soon a bird responded with single call notes, which gradually became more frequent following further playback, and after a few minutes a second bird also began calling. Both continued calling vociferously in response to occasional playback. They remained hidden from view most of the time, but one was seen briefly by SR and the landowner on an exposed perch in the bamboo. We ceased playback after *c*.20 minutes and the birds stopped calling a few minutes later. AHR tried unsuccessfully to relocate the birds there on 19 September.

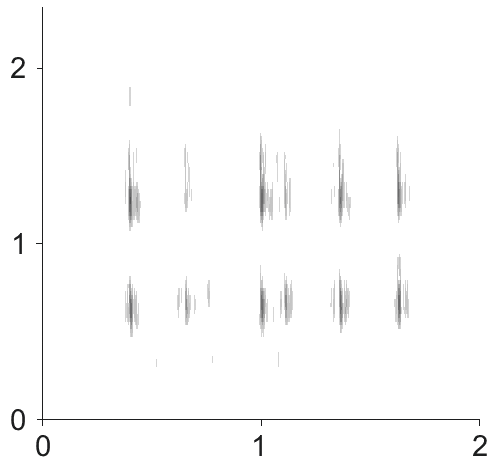

Figure 2. Sonogram of Flores Scops Owl *Otus alfredi* calls, recorded at 590 m in Sisok forest, Flores, on 22 September 2011. X-axis = time in seconds (1.0 seconds per tick), y-axis = frequency in kHz (1 kHz per tick).

On 22–25 September, a Flores Scops Owl was heard calling each evening from a campsite within the remote Sisok forest study plot, 3.5 km south-west of Nunang, on a ridge at 590 m. The forest was undisturbed, but the trees on the ridgetop were relatively short, with low, tangled crowns. This bird did not respond noticeably to playback on 22 September; it continued calling at the same tempo and did not move closer. A short sound-recording was made (Fig. 2). The bird was not seen, despite its close proximity.

The final observations were made at the Mbeliling Forest Reserve study plot, in mature forest around a campsite at 870 m. This was *c*.2 km west of the 2010 observations at Cunca Lolos (BirdLife Denmark 2010) and 5 km west of Puarlolo, where R. Drijvers recorded calls possibly of Flores Scops Owl in 1998 (Hutchinson *et al*. 2007). Flores Scops Owls were heard calling at the Mbeliling site each night on 10–15 October 2011. Much of the night of 9–10 October was spent listening for birds and Flores Scops Owl called from around midnight to 02.00 h, and again at 03.00–03.30 h. On the following evenings, the species was generally heard for briefer periods shortly after dark, between 18.30 and 19.30 h. There was no discernible response to playback. No more than one bird was ever heard calling at any given time, and none was seen.

Virtually all vocalisations heard were consistent with the bursts of staccato notes identified as territorial calls by Hutchinson *et al*. (2007). However, on several occasions we noted a progressional pattern to these calls, which has not apparently previously been documented. Birds initially gave single staccato notes, separated by a few seconds. Gradually, these phrases grew in length (two, three, four notes, etc.), until reaching a phrase length in the range of 7–10 notes after 3–5 minutes. Whether all bouts of territorial calling followed this pattern was not clear; vocalising birds were sometimes first noticed giving calls with multiple-note phrases, but this could have been because the calls are not particularly conspicuous until multiple notes are given in succession. Bouts of territorial calling were often concluded with a single note, higher pitched and louder than the preceding ones, and perhaps given upon taking flight, and / or in alarm.

ORIENTAL DWARF KINGFISHER *Ceyx erithaca motleyi*
The range of this South-East Asian species extends to the western Lesser Sundas as far east as Pantar (Trainor *et al*. 2012), but it is infrequently recorded from these islands (Coates & Bishop 1997, Verhoeye & Holmes 1998, Trainor *et al*. 2012). Verhoeye & Holmes (1998) reported just one record on Flores since the 19th century. Coates & Bishop (1997) stated that this species occurs no higher than '350+m' on Flores, but all three records in 2011 were above this altitude. On 1 September, a single was seen perched inside a small bamboo stand at the south-east shore of Danau Sano Nggoang at 660 m. The habitat there, bordering Nunang village, was highly degraded. On 28 September, a calling bird was seen at 390 m beside a river a few hundred metres downstream of Cunca Rami waterfall near Werang. It was in scrubby second growth, adjacent to a larger stand of intact forest. The final observation was made on 4 October at 600 m in mosaic habitat in the Lamung study plot. One bird was perched above a small, nearly dry streambed narrowly bordered by degraded forest.

Verhoeye & Holmes (1998) expressed concern for the conservation status of Oriental Dwarf Kingfisher on Flores, in light of its apparent rarity and large-scale destruction of lowland forest on the island. Our observations demonstrate that its altitudinal range on the island is wider than previously thought and indicate at least some tolerance of degraded habitat. We agree with Trainor *et al*. (2012) that it is probably frequently overlooked in the Lesser Sundas due to its inconspicuousness. Experience with the congeneric Variable Dwarf Kingfisher *C. lepidus* on the Moluccan islands of Buru and Seram (Reeve *et al*. 2014), and Obi (AHR pers. obs.) demonstrates that it is caught in mist-nets far more often than it is seen; mist-netting in appropriate habitat may therefore be preferable to audio-visual surveys to make accurate abundance estimates of *C. erithaca*.

RED-CHEEKED PARROT *Geoffroyus geoffroyi floresianus*
No previous records above 1,400 m on Flores (Coates & Bishop 1997), and it appears not to have been recorded higher than 1,440 m anywhere across its geographic range in Wallacea, New Guinea, and north-east Australia (Collar 1997, Reeve *et al*. 2014). It was seen twice above this on 9 August on the slopes of Poco Ranaka: a female perched in the canopy at 1,750 m, and another in silhouette as it flew overhead at 1,550 m. Also noteworthy was the observation, at Puarlolo (*c*.900 m) on 31 August, of an unusually large flock of 25–30 birds calling vociferously as they gradually made their way through the upper storey of the forest. Coates & Bishop (1997) gave max. flock size as ten.

LEAF LORIKEET *Trichoglossus weberi*
This Flores endemic has been split from the Rainbow Lorikeet *T. haematodus* species complex. Leaf Lorikeet was not previously known to occur above 1,400 m (Coates & Bishop 1997). On 8 August, two, followed shortly by a third, were seen flying overhead at Golo Lusang at 1,550 m. They perched out of sight, but were heard calling nearby. Further observations were made at three hill forest sites in far-western Flores. At the Lamung study plot, a total of eight flew overhead in pairs on the afternoons of 3–5 October, although it appears probable that they were travelling over without utilising the habitat at the site. It was fairly common at the Mbeliling Forest Reserve study plot, with a total of 19 (groups of 1–3) recorded during surveys on 10–16 October. The species was commonest along the eastern shore of Danau Sano Nggoang and in secondary forest around Nunang village, with observations during several visits in September. Surprisingly, however, it was not recorded in mature forest at the Sisok forest study plot, which is at approximately the same altitude and just 3–4 km from Nunang.

WALLACE'S HANGING PARROT *Loriculus flosculus*
A poorly known species endemic to Flores and nearby Rinca (Coates & Bishop 1997, Imansyah *et al*. 2008). Despite being familiar with its vocalisations, the only observation in 2011 was from Potawangka Road in far-western Flores, where it is already known to occur (Pilgrim *et al*. 2000, Simay *et al*. 2009). On 6 August, a group of three was observed close to the road, perched atop a 10-m tree that had shed most of its leaves and was not fruiting. The birds subsequently flew off, giving thin, high-pitched calls.

BROWN-CAPPED FANTAIL *Rhipidura diluta diluta*
This common species endemic to Flores, Lembata and Sumbawa has a broad altitudinal range from sea level to 2,140 m (Butchart *et al*. 1996). It occurs in a variety of forest habitats, with a well-documented tolerance for disturbed areas (Butchart *et al*. 1996, Verhoeye & Holmes 1998, Pilgrim *et al*. 2000). In 2011, it was one of the most abundant species in mature forest plots, but surprisingly was almost entirely absent from degraded mosaic plots at similar altitudes, with none recorded at Galang (9–15 September) and just one at Lamung (2–7 October). It seems this species may avoid fragmented forest interspersed with open areas, at least at these altitudes (300–760 m).

BLACK-NAPED MONARCH *Hypothymis azurea symmixta*
Coates & Bishop (1997) stated that this species reaches no higher than 700 m on Flores, but we recorded it regularly to 900 m. Records in 2011 included *c*.25 at 480–730 m in the Sisok forest study plot on 22–26 September, *c*.60 at 510–760 m in the Lamung study plot on 2–7 October, *c*.15 at 720–880 m in the Mbeliling Forest Reserve study plot on 10–16 October, and at least two at 900 m at Puarlolo on 31 August.

ASIAN PARADISE FLYCATCHER *Terpsiphone paradisi floris*
Not known to occur above 800 m on Flores (Coates & Bishop 1997). Approximately 20 were observed at 720–880 m in the Mbeliling Forest Reserve study plot on 10–16 October. Three (two males and a female) were recorded at 930 m at Puarlolo on 31 August; Trainor *et al*. (2000) previously noted the species' occurrence in the Puarlolo area, but gave no elevational details.

FLORES MONARCH *Symposiachrus sacerdotum*
This Endangered species is entirely restricted to the forests of far-western Flores at 300–1,000 m (Coates & Bishop 1997, Pilgrim *et al*. 2000). Recorded from three sites during the 2011 field work, all at or near known localities. Just three adults were recorded (*c*.500–700 m) during surveys in mature forest at the Sisok forest study plot (22–26 September); a fourth bird with an orange breast was probably a juvenile of this species, but was not seen sufficiently well to exclude Spectacled Monarch *S. trivirgatus* (*cf*. Butchart *et al*. 1996). It was ranked 18th (tied with 19th) in abundance of 25 species in the 1 km^2 plot. Flores Monarch was much more abundant in mature forest at the Mbeliling Forest Reserve study plot (720–880 m). During surveys on 10–16 October, 61 birds were counted: singles (n = 30), groups of two (n = 11) and trios (n = 3). It was the fifth most abundant of 37 species there. The species was also fairly common in tall secondary forest at Puarlolo on 30–31 August. Because the survey methodology used was designed to estimate relative rather than absolute abundances, it is impossible to make precise density estimates from these data. However, the results support the finding of Butchart *et al*. (1996) that Flores Monarch reaches its highest densities within a narrow belt of semi-evergreen rainforest at *c*.700–900 m.

FLORES CROW *Corvus florensis*
Endangered and endemic to western Flores and Rinca (BirdLife International 2015). On current knowledge, occurs at low densities in moist deciduous monsoon forest and semi-evergreen rainforest at 0–950 m, with some tolerance of degraded habitat (Butchart *et al*. 1996, Pilgrim *et al*. 2000). Our observations support this. Most records were made in the two study plots containing mature forest. In Sisok (480–770 m), 1–2 were noted daily on 22–26 September, including one that called in the same area on most mornings. In Mbeliling Forest Reserve (720–880 m), *c*.2 were recorded daily on 10–16 October; on 12 October, a group of four was encountered, two of them being chased by a scolding male Asian Paradise Flycatcher. Flores Crow was encountered only twice in study plots containing degraded habitat mosaics: two at Galang on 15 September and one at Lamung on 4 October. Other records included two in secondary forest along Potawangka Road (6 August), 1–2 in secondary forest at Puarlolo (*c*.900 m) on 30–31 August, a group of three at 660 m in trees along the north-east shore of Danau Sano Nggoang on 1 September, and one in secondary forest along the road from Werang to Bambor on 3 September.

BARN SWALLOW *Hirundo rustica*
This migrant regularly visits Wallacea during the boreal winter. Coates & Bishop (1997) gave its upper altitudinal limit in the Lesser Sundas as 400 m (on Lombok), but provided no information concerning its altitudinal distribution on Flores. Two were seen amongst a flock of Pacific Swallows *H. tahitica* over Danau Sano Nggoang at 660 m on 20 September.

PACIFIC SWALLOW *Hirundo tahitica javanica*
Coates & Bishop (1997) stated that the upper altitudinal limit on Flores is '350+m.' The species was observed on several dates at Danau Sano Nggoang (660 m): at least 100 were seen feeding on flying insects on 1, 2, 19, 20 and 27 September, mostly near the south-east shore. Schmutz (1977) previously recorded it at 'Nunang am See', which presumably refers to Danau Sano Nggoang.

ORIENTAL WHITE-EYE *Zosterops palpebrosus unicus*
Not known below 'c. 500 m' on Flores (Coates & Bishop 1997). Several observations were made at 400–500 m in the Galang study plot, including three on 11 September, two on 12 September and five on 14 September. Some of these records may refer to the same individuals. The similar-looking Lemon-bellied White-eye *Z. chloris* also occurs on Flores at these altitudes; identification of Oriental White-eye was based on the diagnostic bright yellow rump (visible as birds preened) and their calls (ascending trills).

SHORT-TAILED STARLING *Aplonis minor minor*
No previous records above 1,200 m on Flores (Coates & Bishop 1997). A total of five was seen at 1,500 m at Golo Lusang on 8 August; one disappeared into what appeared to be a nest hole in a tree.

GOLDEN-RUMPED FLOWERPECKER *Dicaeum annae*
Endemic to Flores and Sumbawa. Although Pilgrim *et al*. (2000) noted its wide habitat tolerance, Butchart *et al*. (1996) reported it to be reliant on primary semi-evergreen rainforest with little tolerance of habitat degradation, an evaluation echoed by Coates & Bishop (1997). In 2011, it was one of the most abundant species in mature forest plots, but large numbers were also recorded in degraded plots. In Galang, 31 were recorded (9–15 September) and it

was the 15th most numerous of 39 species encountered; in Lamung, 65 were recorded (2–7 October) and it was the seventh most numerous of 44 species.

SCALY-BREASTED MUNIA *Lonchura punctulata blasii*
Coates & Bishop (1997) gave the upper altitudinal limit of this common species as '1,000+m' on Flores. A flock of five, followed by another two, was seen at 1,500 m at Golo Lusang on 8 August.

Discussion

Our Flores Scops Owl records have positive implications for the conservation status of this Endangered species, as the new observations expand its known altitudinal range and habitat tolerances, and establish its presence in a new forest block in western Flores. It was previously known to occur only in montane moist semi-evergreen forest within a narrow elevational band at 1,050–1,400 m (Widodo *et al*. 1999). The 2011 records at Mbeliling Forest Reserve were made in habitat not markedly different from previously known sites. However, the new records at 590 m in Sisok were made in seasonally dry forest with a relatively large component of deciduous trees. Approximately 20% of the trees in the surrounding habitat (480–770 m) were deciduous and without leaves in September 2011. Observations there demonstrate that Flores Scops Owl can utilise habitat intermediate between the moist semi-evergreen forest of the Flores highlands and the seasonally dry monsoon forest at lower altitudes.

The two new localities in Sisok lie within a 'limited production forest', just outside the boundaries (to the north and south, respectively) of a formally protected reserve. We strongly suspect that the owl occurs within the reserve itself, as it contains similar habitat types at similar altitudes. As noted, the observations at Mbeliling were also made within a protected forest area. Also encouraging is the observation in degraded habitat at Nunang. Forest quality improves steadily south and east of the village, and the owls may be dependent on higher quality forest in their core territories. Nevertheless, this observation supports the suggestion by Hutchinson *et al*. (2007) that Flores Scops Owl can utilise degraded habitat if it is adjacent to better quality forest.

Our observations also shed fresh light upon the co-occurrence of Flores Scops Owl with the island's other scops owls, Moluccan Scops Owl *O. magicus* and Wallace's Scops Owl *O. silvicola*. As noted by Widodo *et al*. (1999) and Pilgrim *et al*. (2000), Wallace's Scops Owl occurs sympatrically with Flores Scops Owl. Wallace's Scops Owl was heard calling throughout the night of 9–10 October at Mbeliling Forest Reserve, often concurrently with Flores Scops Owl. However, Moluccan Scops Owl, which occurs at lower altitudes on Flores, has never been shown to co-occur with Flores Scops Owl. Some authors have speculated that interspecific competition with Moluccan Scops Owl has restricted Flores Scops Owl to altitudes above *c*.1,000 m (Collar *et al*. 2001, Hutchinson *et al*. 2007). Our observations refute this and demonstrate that the two species can occur sympatrically over at least 590–870 m. Moluccan Scops Owl was common and highly vocal at all three sites where *O. alfredi* was recorded, with the two species often calling simultaneously from nearby. Although virtually all birds went unseen, we observed nothing suggesting any direct interaction between the two species. All three scops owl species were heard calling within a 100 m radius at Mbeliling Forest Reserve on the night of 9–10 October.

Finally, it is worth discussing our observations in light of a recurrent problem regarding identification of Flores Scops Owl, namely a reported similarity of the owl's call to that of Red-legged Crake *Rallina fasciata* (Schmutz 1977, Coates & Bishop 1997, Hutchinson *et al*. 2007). We are not in doubt as to the identity of the birds we heard, as visual confirmation

was made on one date. Also, multiple recordings of both species have become available on the xeno-canto website, and differentiation is now fairly straightforward. However, it is odd that the owl has never previously been reported from Nunang, as this was the home of E. Schmutz, who spent considerable time observing birds in the area (Schmutz 1977). Perhaps Schmutz misattributed the owl's calls to the crake, resulting in it being overlooked.

The discovery that Flores Scops Owl occurs as low as 590 m significantly increases the size of its potential range in western Flores. Furthermore, the discovery of calling birds at three new sites (found more or less by chance) indicates that targeted searches would be worthwhile, and that the transition from the dry to the wet season may be a profitable period to undertake aural surveys. Such efforts are urgently required to clarify the distribution and abundance, habitat requirements, and ecology of this threatened owl.

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The pigeon names *Columba livia*, '*C. domestica*' and *C. oenas* and their type specimens

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Summary.—The name *Columba domestica* Linnaeus, 1758, is senior to *Columba livia* J. F. Gmelin, 1789, but both names apply to the same biological species, Rock Dove or Feral Pigeon, which is widely known as *C. livia*. The type series of *livia* is mixed, including specimens of Stock Dove *C. oenas*, wild Rock Dove, various domestic pigeon breeds and two other pigeon species that are not congeners. In the absence of a plate unambiguously depicting a wild bird being cited in the original description, a neotype for *livia* is designated based on a Fair Isle (Scotland) specimen. The name *domestica* is based on specimens of the 'runt' breed, originally illustrated by Aldrovandi (1600) and copied by Willughby (1678) and a female domestic specimen studied but not illustrated by the latter. The name *C. oenas* Linnaeus, 1758, is also based on a mixed series, including at least one Feral Pigeon. The individual illustrated in one of Aldrovandi's (1600) *oenas* plates is designated as a lectotype, type locality Bologna, Italy. The names *Columba gutturosa* Linnaeus, 1758, and *Columba cucullata* Linnaeus, 1758, cannot be suppressed given their limited usage. The issue of priority between *livia* and *domestica*, and between both of them and *gutturosa* and *cucullata*, requires ICZN attention. Other names introduced by Linnaeus (1758) or Gmelin (1789) based on domestic breeds are considered invalid, subject to implicit first reviser actions or *nomina oblita* with respect to *livia* and *domestica*.

Rock Dove *Columba livia* J. F. Gmelin, 1789, is a wild species once found throughout Eurasia and North Africa, on mountains and rugged sea cliffs. Feral Pigeons and domestic pigeons, also referred to as *C. livia*, or sometimes as *Columba livia domestica* Linnaeus, 1758, are derived from Rock Doves and form the same species. They are among the most familiar and cosmopolitan of all birds, occurring in towns, cities and on coastal cliffs throughout the world (e.g. Townsend 1915, Baptista *et al*. 1997). Rock Doves interbreed with Feral Pigeons and escaped domestics where they have contact (Stringham *et al*. 2012) and populations with the ancestral phenotype are now highly localised and endangered (Johnston *et al*. 1988).

Widespread leucism, melanism and selective breeding initiatives have resulted in populations of Feral Pigeons being among the most morphologically diverse of all birds. Variations caused by selective breeding were famously studied by Darwin (1859, 1868), who concluded that domestic breeds and Feral Pigeons were probably all descended from wild Rock Doves, a proposition previously mooted by Willughby (1676, 1678), Buffon (1771), Bewick (1797), Latham (1823) and others, and now supported by molecular studies (e.g. Dybus & Knapik 2005, Stringham *et al*. 2012).

Stock Dove *C. oenas* is a species of deciduous woodland, mostly in the Western Palearctic. Current species-level nomenclature is stable and near-universal: *Columba livia* J. F. Gmelin, 1789, for Rock Dove, Feral Pigeon and domestic varieties, and *Columba oenas* Linnaeus, 1758, for Stock Dove. However, the name *domestica* Linnaeus, 1758, often used as a subspecies name to denote feral or domestic birds, has priority over *livia* (Stejneger 1887,

Oberholser 1974), as do several other names for domestic pigeons listed in the Appendix, inconsistent with the Principle of Priority (Art. 23).

Banks & Browning (1995) argued for continuing usage of *C. livia* ahead of *C. domestica*, considering, among other reasons, that: (i) some sources for the description of *C. domestica* are Stock Doves; and (ii) the description of *C. livia* does not refer to sources other than Rock Dove. However, theirs is an incomplete and inaccurate summary of the type series for these names. As discussed below and in Parts 2 and 4, Supplementary Materials, the names *livia* and *oenas* are based on mixed type series including individuals of Rock Dove (or domestic or Feral Pigeons) and Stock Dove. The terms 'Rock Dove' and 'Stock Dove' (and not the scientific names) are used throughout this paper to refer to the two wild pigeon species associated with these vernacular names today. 'Feral Pigeon' refers here to wild and introduced populations of Rock Dove lacking the pure ancestral phenotype; and 'domestic' pigeons to any 'Columba livia' either caged or used as a passenger pigeon.

Taxonomic history of the names *domestica, livia* and *oenas*

Columba domestica was described by Linnaeus (1758: 162) as a form or variety of *Columba oenas* Linnaeus, 1758. Under Art. 45.6.4, the description of a variety at this time makes it available as a species-group name. Linnaeus (1758) apparently sought to encapsulate, as varieties within his *C. oenas*, both Stock Dove and Rock Pigeon. He also named various pigeon breeds as *gutturosa*, *cucullata*, *turbita*, *tremula*, *tabellaria*, *hispanica* and *hispida*, all as species. No rationale for this was presented by Linnaeus (1758). Linnaeus (1766) adopted a similar hierarchy and offered only minor additions, making a few minor changes to cross-referencing of earlier authors' works and introducing some new names (see Appendix). Other contemporary authors such as Brisson (1760) and Bewick (1797) treated Stock Doves and Rock Doves / Feral Pigeons as conspecific. Per Bewick (1797): 'The Stock Dove, Rock Pigeon and Wood Pigeon, with small differences, may be included under the same denomination, and are probably the origin of most of those beautiful varieties, which, in a state of domestication, are dependent on man'. Bewick's (1797) 'Wood Pigeon' does not refer to Woodpigeon *C. palumbus*, which he listed separately as 'Ring Dove', like Willughby (1676, 1678). Linnaeus (1758) had treated Stock and Rock Doves separately in earlier works (Linnaeus 1746). His later confusion may have been because, in Sweden, the Rock Dove 'has probably never been a natural breeding bird' (Ericson & Tyrberg 2004). There are no known examples of wild Rock Doves in the Linnaeus collection (Wallin 1997), nor are any present in Uppsala museum. Linnaeus had probably only come across feral or domesticated '*livia*', as well as Stock Doves. Retzius (1800) is the most recent author I am aware of who treated *livia* as a breed of *oenas*, although by then a different taxonomy had become widespread.

Pontoppidan (1763) recognised *C. oenas*, *C. palumbus* and various Linnaean breeds (*gutturosa*, *cucullata*, *turbita*, *tremula*, *tabellaria*) but not *domestica*. In a footnote under *Columba* he also listed additional names, presumably intended for domestic breeds, but with no detail beyond a vernacular name for each: *campana*, *galeata*, *tympanista*, *fulicaria*, *mercurialis*, *atricapilla*, *melanura*, *gyratrix*, *percussor* and *turca*. Brünnich (1764) recognised *cucullata*, *tremula*, *turbita*, *gutturosa* and *tabellaria* but not *domestica*. He also used Pontoppidan's (1763) *fulicaria*, *melanura*, *galeata*, *tympanista*, *mercurialis*, *turca* and *percussor* and the novel names *vertaga*, *melanocephala* and *prolifera*. Linnaeus (1766) named more pigeon breeds as *dasypus*, *laticauda* and *turcica*, all at species rank. Of Pontoppidan (1763) and Brünnich's (1764) new names, Linnaeus (1766) used only *gyratrix* and *galeata*, without mentioning their authorities. Forskål (1775: 5) named *Columba testaceoincarnata* (also referred to as *Columba incarnata* on p. VI) and *Columba vulgaris* for domestic breeds (p. VII). Statius Müller (1776) recognised only one species in this group: *Columba gutturosa*.

Gmelin (1789: 769) described *Columba livia*, apparently seeking to distinguish wild European populations of the Rock Dove, but confusingly including several references to texts that included Stock Dove within their descriptions (see Part 2, Supplementary Materials). He also established additional names for domestic breeds: *saxatilis*, *cristata* (a name then homonymous with *C.* [now *Goura*] *cristata* Pallas, 1764, or *C. cristata* Vosmaer, 1764), *norwegica*, *barbarica*, *eques* and *jubata*. He recognised only *galeata* and *percussor* of Pontoppidan (1763) and Brünnich's (1764) new names, but did not mention the latter author. He also subsumed all recognised names of Linnaeus (1758, 1766), Pontoppidan (1763) and Brünnich (1764) based on domestic breeds and various new ones of his own, as varieties of *domestica*. Finally, he made various amendments to Linnaeus' (1758, 1766) cross-references to previous works.

Latham (1790, 1823) also recognised *C. oenas* as a species separate from 'White-rumped Dove' *C. domestica*. He placed *livia* (which he considered the wild stem of the domestic pigeon and its breeds) and virtually all other Linnaean names for pigeon breeds as synonyms or races of *domestica*. Notably, Latham was from Britain, where Rock Doves, Stock Doves and Feral Pigeons all occur naturally or as introduced populations. Pennant *et al*. (1790) similarly used only *domestica* for Indian birds, ignoring other names given previously to breeds. Nilsson (1817) recognised only *C. oenas* and *C. domestica* (the latter under the new subspecies *C. d. fera* Nilsson, 1817) but did not refer to other names.

Temminck (1813), Reichenbach (1852) and Bonaparte (1854) appear to have established modern usage, albeit use of the junior synonym *livia* may have been inadvertent. Temminck (1813) included an accurate plate of a wild Rock Dove (Supplementary Materials, Fig. 4P), named *Columba livia*. He used *C. livia* (not *domestica*) and *C. oenas* for the two species-rank taxa, with *domestica* and all of the domestic varieties conspecific with *livia*. Cuvier (1817), Stephens (1819), Wagler (1827) and others adopted the same taxonomy.

Reichenbach (1852) also used *C. livia* (under a new genus *Lithoenas* Reichenbach) and *C. oenas* in preference to other names. However, *contra* Latham (1790), he mentioned *domestica* under *C. oenas* (not *livia*). Although he erred in his taxonomy, Reichenbach (1852) was correct that both *oenas* and *livia* are senior if *domestica* is considered a subspecies of *oenas* (when *oenas* is selected as having priority through first reviser action over *domestica* and assuming that other names for domestic breeds mentioned here do not apply to wild Rock Doves or are subject to reversal of the principle of priority). Under *oenas*, Reichenbach (1852) also mentioned '*C domesticae varietates icones tituli* 1–64', i.e. 64 illustrations captioned 'varieties of domestic pigeons'.

Bonaparte (1854) corrected Reichenbach's (1852) taxonomy. Bonaparte (1854) cited Oeillet Des Murs (1849) as authority for recognising *C. oenas* as a wild species, i.e. the Stock Dove, and noted that *C. livia* is the Rock Dove and wild originator of feral or domestic pigeons (not *oenas*). However, rather than reverting to Latham's (1823) names, he continued to use Reichenbach's (1852) sequence, i.e. *livia* for Rock Dove and Feral Pigeon, in preference to *domestica*, without justification or explanation. Neither Reichenbach (1852) nor Bonaparte (1854) mentioned other Linnaean names for domestic pigeons.

Bonaparte's contemporaries, e.g. von Heuglin (1856) and Brehm (1857), followed in using *C. livia* for Rock Dove. Bonaparte's (1854) names and taxonomy—which are erroneous with respect to priority—have stood until today (e.g. Hartert 1920, Peters 1937, Goodwin 1970, Peterson *et al*. 1983, Baptista *et al*. 1997, Svensson *et al*. 1999, Gibbs *et al*. 2001, Dickinson 2003, Dickinson & Remsen 2013, and the AOU and BOU checklists; for further examples, see Appendix). Despite widespread use of *C. livia* for Rock Doves and Feral Pigeons, Stejneger (1887) and Oberholser (1974) noted that *C. livia* and *C. domestica* are the same species and that *domestica* has priority. *C. domestica* was also used as a species-rank name with priority

by Townsend (1915). However, these are rare exceptions. Virtually all post-1850 literature uses *C. livia* for both wild and domestic forms.

The wild Rock Dove is nowadays considered to comprise up to 13 naturally occurring allopatric subspecies (Peters 1937, Gibbs *et al*. 2001), although the validity and distributions of some are difficult to assess due to intergradation with feral populations (Goodwin 1970). Currently recognised subspecies include nominate *livia*, which is considered to encompass natural populations remaining in the British Isles and west Mediterranean through Dalmatia and north Libya, east to the Urals, Caucasus and west Siberia (Gibbs *et al*. 2001), *gymnocycla* G. R. Gray, 1856 (Senegal to south Mali and Nigeria); *targia* Geyr von Schweppenburg, 1916 (central Sahara), *dakhlae* R. Meinertzhagen, 1928 (west Egypt), *schimperi* Bonaparte, 1854 (Nile Valley and eastern Egypt to east Sudan and north Eritrea), *palaestinae* von Zedlitz, 1912 (Israel to Syria, Sinai, west and south Arabia), *gaddi* Sarudny & von Loudon, 1906 (east Turkey, Armenia, Azerbaijan and Iran to Uzbekistan, west and north Afghanistan), *neglecta* Hume, 1873 (east Afghanistan, Tajikistan, Tien Shan Mountains, west Pakistan, west Himalayas) and *intermedia* Strickland, 1844 (Nepal, India, Sri Lanka) (Dickinson & Remsen 2013).

Although *domestica* is not in widespread use as a species-level name, there are many examples of recent usage of *C. livia domestica* as a trinomial or subspecies name (e.g. Beernaert *et al*. 2008; see Appendix for others) or in other formulations (e.g. *C. livia dom*.: Messana *et al*. 1997; *Columba livia* var. *domestica*: Dybus & Knapik 2005; *Colombia livia* forma *domestica*: Kramarova 1991; *Colombia livia* f. *domestica*: Villar *et al*. 2010). Use of 'f.', 'forma' or 'var.' denotes infra-subspecific rank (*cf*. Art. 45.6), which is not regulated by the Code. Use of the name *domestica* at this rank does not constitute use as a 'name' under the Code. The abbreviation 'dom.' could indicate name *domestica* or represent an informal denoting of domestic origin, wherein the abbreviation does not form part of the name (Art. 5.3). The status of an individual or population is also denoted in some papers and books using vernacular expressions, e.g. 'domestic *Columba livia*', 'feral *Columba livia*'. From a priority perspective, instances of the trinomial '*C. livia domestica*' (a nomenclatural impossibility) might be considered questionable, but employ *domestica* Linnaeus, 1758, as a presumably valid subspecies name.

Art. 17.2 and Art. 23.8, which relate to names based on hybrids, are not applicable to *domestica*. Several molecular studies have sampled *C. livia*, including sequencing of its entire genome from a domesticated bird (Kan *et al*. 2010) and studies of mtDNA variation covering most of the domestic varieties described by Linnaeus (1758, 1766) and Gmelin (1789), e.g. Dybus & Knapik (2005) and Stringham *et al*. (2012). Domestic varieties appear to have resulted from selective breeding rather than hybridisation with other pigeons (e.g. Price 2002, Kan *et al*. 2010, Stringham *et al*. 2012), although different wild populations may have been captured and their genotype inserted over the history of pigeon domestication (Stringham *et al*. 2012). It has been argued that names based on specimens of domestic breeds are unavailable on account of being based on hybrids (e.g. Dennler de la Tour 1959, 1968), but several such names were recently added to the Official List (ICZN 2003). Separately, because many authors have used the name *C. domestica* since 1899 (mostly as a subspecies, but in a handful of cases specifically), Arts. 23.9.1.1 and 23.9.1.2 cannot be used to reverse priority in favour of *C. livia*. Priority between *livia* and *domestica* therefore requires ICZN attention (Donegan 2007). The outcome and certain commissioner comments in ICZN (2008) concerning the similar case of *Streptopelia risoria* vs. *S. roseogrisea*, suggest that a case may not be accepted until the type specimens for all relevant names are first clarified.

Description of *Columba livia* and designation of a neotype

A detailed analysis of publications referred to in the description of *Columba livia* J. F. Gmelin, 1789, and potential type specimens appears in Part 2, Supplementary Materials. The name is based on a mixed type series including: (i) a probable wild Rock Dove specimen discussed by Brisson (1760), once in the Cabinet du Roi, now lost or destroyed; (ii) the specimen illustrated as Martinet's *et al*. (1772) 'Biset', a pigeon in the species group *livia* with a near-ancestral state plumage; (iii) various domestic or Feral Pigeons mostly from Europe (but also Persia and Jamaica), including those illustrated in Figs. 1G–I and K–M, Supplementary Materials, and others referenced in textual accounts; (iv) multiple Stock Doves, including those illustrated in Figs. 1A–F, Supplementary Materials, and others referenced in textual accounts; (v) a specimen of Rodrigues Pigeon *Nesoenas rodericana* discussed by Legaut (1708); (vi) Scaly-naped Pigeons *Patagioenas squamosa* or another unrelated Caribbean pigeon species observed by Du Tertre (1667); and (vii) other unillustrated Rock Doves, Feral Pigeons, domestic pigeons and Stock Doves studied by authors referred to in Part 2, Supplementary Materials. All of these specimens are known or presumed to be lost or destroyed (Art. 75.3.4).

Under Art. 74.1, a lectotype can be designated from among a type series to become the unique name bearer in instances where a type series is mixed, provided it is consistent with accepted taxonomic application of the relevant name (Recommendation 74A). For *livia*, this would include only wild ancestral-state specimens of the nominate subspecies from Western Europe. Although several of the accounts cited in the original description of *livia* refer only to wild Rock Doves, none of the illustrated individuals is clearly such a bird. The 'Biset' of Martinet *et al*. (1772) is a candidate for stabilising nomenclature at species level and could have the same basis as Brisson's (1760) bird, but it shows signs of being intermediate with domestic or feral populations and in some respects therefore deviates from Brisson's (1760) description. Its designation as a lectotype could result in instability in subspecies nomenclature, which would then depend on the history of domestication and provenance of a lost specimen. The Cabinet du Roi specimen studied by Brisson (1760), if different, is also a potential lectotype, but this collection is considered lost (Stresemann 1975). I searched for but could not locate these specimens at MNHN. Therefore, it is preferable, given the nature of materials used in the description and unresolved priority issues, for the name *livia* to be stabilised via selection of a neotype unambiguously based on a wild Western European specimen. This would reflect the apparent intention of Gmelin (1789) when *livia* was described, to include wild 'stem' phenotypes within his name, as evidenced by references to the 'Biset' of Buffon (1771) and Martinet *et al*. (1772), and Brisson's (1760) text, and application of this name by Temminck (1813) and subsequent authors.

No specimen of *C. livia* referred to in the original description or works referenced therein is believed extant. No type specimen or neotype has subsequently been selected for *C. livia*. Hartert *et al*. (1912) designated a 'restricted typical locality' for *C. livia* ('South Europe'). This type locality was accepted by Vaurie (1965) and Schodde & Mason (1997), among others, but it lacks obvious rationale unless one traces the descriptions back to Gessner's (1555: 295: Fig. 1A, Supplementary Materials) De Livia Columba or Aldrovandi's (1600: 504: Figs. 1B–C, Supplementary Materials) *livia*, which are Stock Doves. Such a type locality does not clarify taxonomy sufficiently given the type series, because Rock Dove, Feral Pigeon and Stock Dove all occur in southern Europe.

Under Art. 75.3, a neotype can validly be designated only 'when there is an exceptional need'. The word 'exceptional' requires consideration. Differences of view may exist between taxonomists as to the importance of a type specimen being a specimen available for study

Figure 1A. Aldrovandi (1600: 499), a Stock Dove, and the lectotype of *S. oenas* as designated here; B. Watercolour version of same.

with locality data, vs., at the other extreme, an unvouchered individual discussed in an old text. In my view, there is an exceptional need in this case for a neotype. First, the present situation of acquiescence in the usage of established names is untenable under the Principle of Priority. Clarification of the type for *livia*, combined with ICZN action on the issue of priority, is the more correct means to stabilise nomenclature. Second, designating any of the possible lectotypes for *livia* could disrupt subspecies taxonomy, which would depend upon the ancestry of an unavailable specimen. Third, *livia* is one of the most commonly used bird names for an abundant and economically important species of worldwide distribution, making this an exceptional case. Uncertainty caused by a mixed type series is undesirable and lectotypification is an inadequate remedy in this case.

For purposes of Art. 75, I designate a neotype for *C. livia* to stabilise its nomenclature. A new name-bearing type is necessary to define its name objectively. This designation is made with the express purpose of clarifying the taxonomic status (Art. 75.3.1) of *C. livia* and its subspecies, especially in light of the forthcoming ICZN case, priority issues affecting this name, *domestica* and *oenas*, and the inadequacy of long-lost specimens as lectotypes. Under Art. 76.3, the collection locality of the neotype results in a new type locality, to replace Hartert's *et al*. (1912) restricted type locality.

Columba livia neotype—adult male, Natural History Museum, Tring, UK (NHMUK 1934.1.1.1804) previously from H. F. Witherby collection, collected by G. Wilson on Fair Isle, Shetland, UK (*c*.59°31′N, 01°39′W) on 1 December 1930 (original cat. no. 455.18).

Description.—See Fig. 2. Colour descriptions here and elsewhere in this paper are based on Munsell Color (1977), with Smithe (1975) used for iridescent colours not coded in Munsell. Head dark bluish grey (Gley 2, 4/5B). Narrow, contiguous nuchal collar and breast-band glittering lilac (Color 76, Lilac) above with glittering bluish green (5BG 5/6) below. Mantle and wing-coverts pale grey (Gley 1, 6/N). Two black (Gley 1, 2/N) wingbars, on median and greater coverts, and alula. Flight feathers dark grey anteriorly (Gley 1, 4/N) more dusky distally (Gley 1, 3/N). Upper rump white (uncoded), lower rump dark grey (Gley 1, 4/N but darker) becoming paler (Gley 1, 4/N) towards upper tail. Lower tail black (Gley 1, 2.5/N). Breast grey (Gley 1, 5/N), darker towards undertail-coverts (Gley 1, 4/N) and undertail (Gley 1, 3/N). Underwing-coverts white (uncoded). Bare parts probably pale brownish horn (not coded given age of specimen).

Rationale for selection.—The specimen is a wild Rock Dove phenotype. The ancestral character of two black wingbars is notable, as this was the only morphological feature referred to by Gmelin (1789) in his description of *C. livia*. Plumage is also consistent (Art.

Figure 2. Ventral, dorsal and lateral views of: (i) a typical Stock Dove *Columba oenas* (left-hand individual in each image: NHMUK 1905.6.28.935, female, Rome, Italy, February 1876; Cavendish Taylor bequest; close to topotypical given the Bologna type locality proposed herein); (ii) the neotype designated here for Rock Dove *C. livia* (middle: NHMUK 1934.1.1.1804); and (iii) a melanistic chequered Feral Pigeon *C. livia* ('*domestica*') (right: NHMUK 1897.12.19.1; female, coll. J. Turnbull, Beechwood, Co. Dublin, Ireland, received 9 December 1897) (B. Huertas, © Natural History Museum, London)

75.3.5) with Brisson's (1760) specimen description and in most features with the 'Biset' of Buffon (1771) and Martinet *et al*. (1772), which were cited in Gmelin's (1789) description. Based on its locality and date, the specimen can be considered, beyond all reasonable doubt, to be of wild ancestry, i.e. a naturally occurring Rock Dove. It was collected on a remote island off northern Scotland, which is one of the few regions of Western Europe where pure wild phenotype *C. livia* are still observed today. Fair Isle still harbours a breeding population of pure-looking '*livia*', although small flocks of feral, homing or racing pigeons occasionally visit (D. Shaw *in litt*. 2009).

A British Isles specimen can be considered to have been collected as close as possible to the original type locality (Art. 75.3.6) given the now restricted range in Europe of birds exhibiting the wild phenotype. By reference to Albin (1738), Gmelin (1789) sought to include British Isles populations within his *livia*. Several indirect sources for the description, e.g. Jonston (1657), Willughby (1676, 1678), Ray (1713) and Dale (1732), are also based on British birds (although not all of the relevant passages refer to Rock Doves). It is unlikely that any of the authors mentioned by Gmelin (1789), or Gmelin, principally had British pigeons in mind. For example, Brisson, Buffon and Martinet probably knew the species mostly from France. However, today, the wild *livia* phenotype has been over-run by domestic and Feral Pigeon plumage states, even in more remote parts of the Mediterranean region.

Nominate *C. l. livia* occurs throughout Western Europe, southern Europe, the Mediterranean, and Scottish islands including Fair Isle, where natural populations still occur (Goodwin 1970, Gibbs *et al*. 2001, Dickinson & Remsen 2013), meaning that the neotype is of the same subspecies as wild birds used for this name by authors cited in the original description and of birds in the Hartert *et al*. (1912) restricted type locality. Notably, Scottish specimens were also used by Stringham *et al*. (2012) as examples of wild *livia* to study the phylogeny and origin of domestic and Feral Pigeons.

Description of *Columba domestica*

Detailed analysis of publications referred to in the description of *Columba domestica* Linnaeus, 1758, and potential type specimens appears as Part 3, Supplementary Materials. The discernible syntypes are: (i) a female specimen described by Willughby (1676) under *domestica seu vulgaris*; (ii) Willughby's (1676, pl. 33) runt, which is based on Aldrovandi's (1600) *Columba domestica* (Figs. 2A–C, Supplementary Materials); and (iii) other individuals studied by Ray (1713), Willughby (1676), Aldrovandi (1600), Linnaeus (1758) and other authors referred to in Part 3, Supplementary Materials, which are presumed to be domestic feral pigeons (potentially including the two birds illustrated in Figs. 2D–F, Supplementary Materials). All of these specimens are domestic breeds. The status of the type series as mixed at subspecies level can be evaluated via phylogenetic studies. Stringham *et al*. (2012) found wild Rock Dove samples from Scotland (ancestral *livia*), together with the 'modena' breed (a former racing breed developed in Italy up to 2,000 years ago) to be sister to other domestic breeds. The 'scandaroon' breed (which is closely related to the 'runt') occupied a relatively more recent terminus within the phylogeny of the domestic group. These specimens do not relate to the same name under all 1700s taxonomic arrangements for domestic breeds. However, all of the individuals in the *domestica* type series are of the same subspecies under taxonomy where the name *domestica* is used as a trinomial to indicate a domestic origin, which is the only more or less widespread taxonomic usage for the name today. As a result, the type series cannot be considered mixed and a lectotype designation is not required to resolve current priority issues.

Description of *Columba oenas* and designation of a lectotype

Detailed analysis of publications referred to in the description of *Columba oenas* Linnaeus, 1758, and potential type specimens appears as Part 4, Supplementary Materials. The type series comprises: (i) Stock Doves studied by Aldrovandi (1600) and copied by subsequent authors (Fig. 1), probably near Bologna in Italy; (ii) an indeterminate dove probably intended to be a Stock Dove and probably studied in England by Albin (1738: Fig. 3G, Supplementary Materials); (iii) a Feral Pigeon depicted by Albin (1738: Fig. 3H,

Supplementary Materials); and (iv) unillustrated Stock Doves studied by Linnaeus (1758), Aristotle and other authors referred to in Part 4, Supplementary Materials.

Art. 74.1 permits a lectotype to be selected from among syntypes as the unique name bearer of a species. Recommendation 74G states that any lectotypification should 'be done as part of a revisionary or other taxonomic work to enhance the stability of nomenclature, and not for mere curatorial convenience'. Stable nomenclature is furthered by establishing a lectotype for *oenas* because the name's type series includes both Stock Dove and Feral Pigeon specimens. There is clear taxonomic benefit from fixing the name *oenas* to a Stock Dove specimen to stabilise nomenclature, especially with respect to *livia*. An ICZN case concerning priority between *domestica* vs. *livia* will be simplified once possible synonymy of *oenas* with *livia* or *domestica* is eliminated.

The individual illustrated by Aldrovandi (1600: 499: Fig. 1) 'Oenas mas cum vicia' is designated (for purposes of Art. 74.7) from among the various specimens referenced in the original description as the lectotype of *oenas* Linnaeus, 1758. Under Art. 76.2, the origin of the lectotype, which is presumed to be the region of Bologna, Italy, becomes the type locality of *oenas*. The type specimen appears to be an adult. Other data for inclusion under Recommendation 73C of the Code (via Recommendation 74C) cannot be elucidated because the specimen is no longer extant.

The illustrated bird is consistent with previously accepted taxonomic applications of the name *oenas*, per Recommendation 74A. Hartert *et al*. (1912) restricted the type locality of *C. oenas* to 'Sweden'. Although no rationale was provided, Hartert *et al*. (1912) presumably sought to refer to individuals probably studied by Linnaeus (1746, 1758). My designation results in a new type locality but one taken from a region in which the same wild subspecies occurs (Dickinson & Remsen 2013), causing no change to subspecies or species taxonomy.

Other birds illustrated or referred to in the original description of *oenas* discussed above become paralectotypes as a result of this lectotypification (although at least one and possibly both of Albin's (1738) plates are not Stock Doves). Under Art. 74.4, the lectotype is the bird depicted in Aldrovandi's (1600) illustration, not the illustration itself.

Supplementary Materials

These include complete analysis of the three descriptions referred to above, together with plates of all relevant illustrations. The document is available at https://www.researchgate.net/profile/Thomas_Donegan or by e-mail from the author, and has not been published here principally due to its length.

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species, mounted specimens) for *Columba*. Nomenclature in this paper was reviewed by the Working Group on Avian Nomenclature of the International Ornithologists' Union.

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Appendix: status of other names

Many other names for pigeon breeds were published in 18th-century works, several of which give rise to nomenclatural issues with respect to the names *domestica* and *livia*. The status of such names is summarised below.

Name	Authority	Status with respect to *domestica* Linnaeus, 1758	Status with respect to *livia* J. F. Gmelin, 1789
gutturosa	Linnaeus, 1758	These names have precedence under Art 24.1 as a result of being described at higher rank (*domestica* as a form; *gutturosa* and *cucullata* as species); reversal of precedence does not apply because both names have recent usage in trinomials. See note 1.	These names are senior synonyms for purposes of Art. 23.1; reversal of precedence does not apply because the names have modern usage as a trinomial. See notes 1–2.
cucullata	Linnaeus, 1758		
turbita	Linnaeus, 1758	These names have precedence under Art 24.1 as a result of being described at higher rank (*domestica* as a form; the others as species), but reversal of precedence applies because *domestica* is a *nomen protectum* under Art 23.9.1. See note 1.	These names are senior synonyms for purposes of Art. 23.1, reversal of precedence applies because the name *livia* is considered here a *nomen protectum* under Art 23.9.1. See note 2.
tremula	Linnaeus, 1758		
tabellaria	Linnaeus, 1758		
hispanica	Linnaeus, 1758		
hispida	Linnaeus, 1758		
campana	Pontoppidan, 1763	Subjective junior synonyms	
galeata	Pontoppidan, 1763		
tympanista	Pontoppidan, 1763		
fulicaria	Pontoppidan, 1763		
mercurialis	Pontoppidan, 1763		
atricapilla	Pontoppidan, 1763		
melanura	Pontoppidan, 1763		
gyratrix	Pontoppidan, 1763		
percussor	Pontoppidan, 1763		
turca	Pontoppidan, 1763.		
vertaga	Brünnich, 1764		
melanocephala	Brünnich, 1764		
prolifera	Brünnich, 1764		
dasypus	Linnaeus, 1766		
laticauda	Linnaeus, 1766		
turcica	Linnaeus, 1766. For validity, see note 9 in Part 1, Supplementary Materials.		
testaceoincarnata	Forskål, 1775. This and *incarnata* are objective synonyms: see note 6 in Part 1, Supplementary Materials.		
incarnata	Forskål, 1775.		
vulgaris	Forskål, 1775. For basis, see note 6 in Part 1, Supplementary Materials.		
saxatilis	J. F. Gmelin, 1789		All were described at the same taxonomic level as *livia*, under different Greek letters in the *domestica* account; *livia* chosen pursuant to implicit first reviser action by Temminck (1813). See note 3 in Part 1, Supplementary Materials.
norwegica	J. F. Gmelin, 1789		
barbarica	J. F. Gmelin, 1789		
eques	J. F. Gmelin, 1789		
jubata	J. F. Gmelin, 1789		

cristata	J. F. Gmelin, 1789	Invalid junior homonym: see note 4 in Part 1, Supplementary Materials.
maculata (p. 772)	J. F. Gmelin, 1789	Invalid primary homonym of lower rank: see note 5 in Part 1, Supplementary Materials.

Note 1. Some of Linnaeus' (1758) names for domestic pigeon breeds (*gutturosa*, *cucullata*, *turbita*, *tremula*, *tabellaria*, *hispanica* and *hispida*) were contemporaneously described in the same genus and relate to the same taxonomic species. Under Art. 24.1, where synonyms are established simultaneously, but proposed at different ranks, the name proposed at higher rank has precedence. The name *domestica* Linnaeus, 1758, was introduced as a variety of *oenas* (when description of a variety was as valid as a subspecies today, see Art. 45.6.4). The names *turbita*, *tremula*, *tabellaria*, *hispanica* and *hispida* were all introduced in the same work as species. These names all have priority over *domestica* under Art. 24.1. Under Art. 23.9, application of the Principle of Priority is reversed where 'the senior synonym or homonym has not been used as a valid name after 1899, and ... the junior synonym or homonym has been used for a particular taxon, as its presumed valid name, in at least 25 works, published by at least 10 authors in the immediately preceding 50 years and encompassing a span of not less than 10 years'. The terms 'junior synonym' and 'senior synonym' for these purposes include names contemporaneously described but given precedence among one another under Art. 24.1. The names *gutturosa*, *cucullata*, *turbita*, *tremula*, *tabellaria*, *hispanica* and *hispida* appear in various online databases, published discussions of described names and papers on historical collectors or early ornithologists (e.g. Casanova 2005, Navarro-Sigüenza *et al*. 2007, van Grouw 2014). However, to my knowledge, none has been used as a valid name for a species or subspecies in published works since 1899. Since these names were considered synonyms of *livia* by Temminck (1813) and of *domestica* by Latham (1823), they appear not to have been widely used subsequently. With reference to Art. 23.9.6, mention of those names herein should not be taken into account in determining usage. In contrast, *domestica* has been used, as a presumed valid name, in more than 25 works, published by more than ten authors in the immediately preceding 50 years and encompassing a span of not less than ten years. Searches in July 2014 revealed multiple usage of *C. domestica* as a species, e.g. 14 in PubMed since the 1950s and 535 on Google Scholar. Usage of *C. l. domestica* as a trinomial is even commoner: 78 on PubMed, 1,840 on Google Scholar. Five publications that have used the name *Columba domestica* specifically are Oberholser (1974), Kirst & Prokop (1985), Tazawa *et al*. (1994), Traxler *et al*. (2000) and Nematollahi *et al*. (2012), while 20 examples of use the unmodified trinomial *C. l. domestica* (not including 'forma', 'f.' 'var.' or similar to indicate infrasubspecific rank) can be found in: Galton & Bredbury (1966), Bhattacharya & Datta (1971), Epstein *et al*. (1980), Péczely & Antoni (1984), Lumeij & de Bruijne (1985), Farah (1988), Mayr *et al*. (1990), Westerhof *et al*. (1992), Mushi *et al*. (2000), Dutton & Tieber (2001), Marshall *et al*. (2003), Scullion & Scullion (2007), Stenzel & Koncicki (2007), Lumeij *et al*. (2008), Beernaert *et al*. (2010), Duchatel *et al*. (2010), Radfar *et al*. (2012), van Zeeland *et al*. (2012), Biswal *et al*. (2014) and Xie *et al*. (2014). As a result, each of the names *turbita*, *tremula*, *tabellaria*, *hispanica* and *hispida* should be considered a *nomen oblitum* with respect to *domestica* as a *nomen protectum* for purposes of Art. 23.9.1. The name *gutturosa* Linnaeus 1758 has, however, been used by researchers into cardiac parameters in veterinary science in trinomial form (*C. l. gutturosa*, e.g., Lopez Murcia *et al*. 2005, Hassanpour *et al*. 2011). Separately, Seng (1913, 1915) and Sievers (1938), in relation to the study of egg yolks, used the trinomial *C. l. cucullata*.

The original description of *gutturosa* Linnaeus, 1758, referred only to Willughby (1676: 121, pl. 34: Fig. 4I, Supplementary Materials) and Ray (1713: 60). The original description of *cucullata* Linnaeus, 1758, is based on the *cucullata s. jacobea* of Ray (1713: 60), Albin's (1738, t. 43) Jacobine Pigeon and Columba anglica f. russica of Gessner (1555: 279; ill. on p. 267). The type series includes the birds illustrated by Albin (1738: Fig. 4R, Supplementary Materials), Gessner (1555: Fig. 4Q, Supplementary Materials) and that depicted as 'Columba cypria cucullata A Jacobine Pigeon' by Willughby (1678, pl. 33: Fig. 4G, Supplementary Materials), which was the basis for Ray's (1713) account. These are all domestic pigeons with ornate feathering. The names *gutturosa* and *cucullata* also require suppression by ICZN.

Note 2. All of the names listed above for domestic pigeons introduced before Gmelin (1789) have priority over *livia* and refer to the same species. The same principles established in Note 1 apply equally for usage since Temminck (1813) and Latham (1790) to the names to which Note 2 applies. The name *livia* has been used, as a presumed valid name, in more than 25 works, published by more than ten authors in the immediately preceding 50 years and encompassing a span of not less than ten years. For example, searches in July 2014 located 1,232 papers in PubMed and 42,300 references in Google Scholar. Satisfaction of Art. 23.9.1 for *livia* is considered self-evident. As a result, each of the pre-1789 names listed in the Appendix (except *gutturosa* and *cucullata*, see Note 1) should be considered a *nomen oblitum* with respect to *livia* as a *nomen protectum* for purposes of Art. 23.9.1. Prevailing usage of *livia* vs. these names must be maintained and does not require ICZN attention.

Note 3. The names *leucoptera* Linnaeus, 1758, and *sinica* Linnaeus, 1758, are not considered to be based on specimens from the genus *Columba* (under modern taxonomies). See note 7 in Part 1, Supplementary Materials.

The complicated early nomenclature of Yellow-tufted Honeyeater *Lichenostomus melanops*, and the watercolours examined by John Latham

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Summary.—Yellow-tufted Honeyeater *Lichenostomus melanops* was described under four different English names and three Latin binomials by Latham (1801a,b, 1822). Until now, these names were usually thought to be based solely on four watercolours produced during the early years of settlement in Australia, one of which was established by Sharpe (1906) as the 'type' of Latham's 'Black-eyed Thrush' and '*Turdus melanops*', the original binomial of *Lichenostomus melanops*. We review the history of the watercolours copied by Latham, and the complicated nomenclature of *L. melanops*. The first watercolour of *L. melanops* that Latham inscribed '*Turdus melanops*' was included in a different set of watercolours to the 'Watling' set reviewed by Sharpe (1906). A specimen of *L. melanops* >200 years old in the Paris museum acquired from Joseph Banks was also compared to the original descriptions. Conditions simulating those under which Latham may have examined the specimen or another could possibly explain the anomalous rusty-brown coloration Latham ascribed to his 'Black-eyed Thrush', rather than the olive-green typical of *L. melanops*.

Yellow-tufted Honeyeater *Lichenostomus melanops*, one of two species in the genus *Lichenostomus*, is a locally common resident of south-east Australia. Latham provided three different descriptions in English and three Latin binomials for this species in 1801, including 'Black-eyed Thrush' and *Turdus melanops* (Latham 1801a,b), the nomenclatorial progenitor of *L. melanops*, as well as a fourth English name and description (Latham 1822). These were based on four illustrations produced in Australia during the early years of the Port Jackson settlement at Sydney Cove, New South Wales. Sharpe (1906) incorrectly identified the original illustration examined by Latham on which he based his 'Black-eyed Thrush' and *Turdus melanops*. Sharpe's designation is doubly incorrect: not only did he use the wrong set of watercolours to designate the 'type', but designation of a 'type' from a watercolour is not now permitted by the *International code of zoological nomenclature* (ICZN 1999), although it was customary at the time.

In 1802, Vieillot described a specimen of *L. melanops* recently received by the Muséum d'Histoire Naturelle (now the Muséum National d'Histoire naturelle, Paris; MNHN). In 2013, while researching the Baudin expedition (1800–04), JJFJJ fortuitously located the specimen of *L. melanops* (mounted with the skull in situ) described by Vieillot.

To identify which illustrations Latham used for his four named species, we examined all of the watercolours annotated and copied by Latham. We tried to understand why Latham failed to recognise that all were of the same species, and we examined the coloration of the watercolours. The Paris specimen could have been seen by Latham while describing the species, and is discussed in this paper.

The different sets of watercolours

The Watling watercolours.—Four of the six first known depictions of *L. melanops* are included in a set of 488 watercolours produced during the early years of the Port Jackson settlement (established 1788) and today bound in a single volume held in the Natural History Museum (NHMUK), London. Known as the Watling collection (henceforth Watling), the paintings depict Australian birds (271 watercolours), mammals (16), reptiles (nine), fish (15), molluscs (17), arthropods (13) and plants (59), as well as landscapes, Aboriginal peoples and their implements (88). Originally, the collection comprised 513 watercolours, but 25 watercolours (all birds) are lost (Hindwood 1970). The collection was brought back to London in July 1795 by John White, Surgeon-General of the Port Jackson settlement (White, 1790, Nelson 1998).

The Watling volume is one of several collections of natural history artwork produced during the early years of the Port Jackson settlement (Hindwood 1964, Calaby 1999, Olsen 2001, Annemaat 2014). Other volumes, held in Sydney, Canberra and Wellington, were produced by First Fleet naval personnel John Hunter and George Raper (Calaby 1999, Hindwood 1964). The John Hunter volume in the Mitchell Library, State Library of New South Wales, Sydney, includes four paintings by John Lewin (a far more skilful bird artist than any other at Port Jackson: Neville 2012), one of which also depicts *L. melanops*.

The Watling volume includes the work of at least three artists, but only Thomas Watling signed his paintings (121); the identity of the others is unknown, although the most prolific, identified by several stylistic traits, is known as the 'Port Jackson Painter' (Calaby 1999). The Watling watercolours are variously annotated by White, Watling and others (Calaby 1999). *L. melanops* is depicted in four watercolours in Watling: nos. 121, 122, 133 and 156 in Latham's ms list (Sharpe 1906, Hindwood 1970). Only one of these, no. 122, is signed by Watling.

The Lambert watercolours.—In March 1797, White lent a substantial portion (*c*.80%) of his watercolours to Aylmer Bourke Lambert, a founder and Vice-President of the Linnaean Society. Lambert apparently still had White's watercolours in his possession in April 1805 (Nelson 1998). While in his possession, Lambert had the paintings copied (by unknown artists) and bound into three volumes (henceforth Lambert). According to Calaby (1999), Lambert was referring to these copies rather than the originals in 1805. Comprising 225 watercolours, all unsigned, of birds (214), mammals (ten) and a view of Norfolk Island, most were copies of those in Watling (Hindwood 1970). The Lambert volumes also include 22 watercolours of birds with no equivalent in Watling, which may be copies of the 25 watercolours now missing from Watling.

Following Lambert's death in April 1842, the volumes were acquired by Edward Stanley, the 13th Earl of Derby, who had the volumes rebound with the title 'New South Wales Drawings' on their spines. The volumes were held in the library of Stanley's Knowsley estate in Lancashire until June 2011, when they were sold to the Mitchell Library, where they remain (C. Fisher *in litt*. 2013). Three other volumes of watercolours depicting fish, birds and plants by Port Jackson artists purchased at the Lambert sale by Lord Derby also formed part of the 2011 sale; another noteworthy volume in the Mitchell Library, acquired in 1929, comprises 100 watercolours of Australian birds dating to *c*.1790 and attributed to the anonymous 'Sydney Bird Painter'. One also depicts *L. melanops*. Copies of the four Watling watercolours depicting *L. melanops* are in the second volume of Lambert, hereafter Lambert (2) nos. 10, 40, 60 and 65.

The Latham watercolours.—After Lambert had copies made of the original watercolours in Watling, Lambert lent the copies to John Latham. Latham received the Lambert

Figure 1. Yellow-tufted Honeyeater *Lichenostomus melanops*, Library, Natural History Museum, London, UK (© NHMUK, London). The 'Watling' watercolour used by 'Lambert'.

Figure 2. Yellow-tufted Honeyeater *Lichenostomus melanops*, Mitchell Library, State Library of New South Wales, Sydney (© Mitchell Library). The 'Lambert' watercolour copy of 'Watling' (= Lambert (2) no. 64, presumably).

Figure 3. Yellow-tufted Honeyeater *Lichenostomus melanops*, Library, Natural History Museum, London, UK (Justin J. F. J. Jansen, © NHMUK, London). The 'Latham' watercolour.

watercolours sometime before 12 October 1799, and returned them on 26 January 1800, as evidenced by a letter preserved with the volumes (Hindwood 1970): 'I hope you will receive back safe your valuable Books of Drawings, which I mean to forward by to-morrow's Coach, which is at the Bell Savage, Ludgate Hill. I have according to my promise given a Name to each Bird, altho' I have been at much loss in respect to the genus of many of them - indeed, even the sizes in some cases have not been noticed any more than the Manners, independent of many circumstances not possible to be ascertained by delineations, unless aided by accurate descriptions, and which, had the Painter been at all versed in ornithology, he could not have failed to have remarked in writing. I should therefore think it not unlikely

Figure 4. Yellow-tufted Honeyeater *Lichenostomus melanops*, Muséum National d'Histoire naturelle, Paris (Justin J. F. J. Jansen, © MNHN). Photographed with overhead fluorescent lighting for illumination. Note olive-green coloration of upperparts.

Figure 5. Yellow-tufted Honeyeater *Lichenostomus melanops*, Muséum National d'Histoire naturelle, Paris (Justin J. F. J. Jansen, © MNHN). Photographed with green backdrop, using small halogen lamps positioned either side of specimen. Note rusty-brown coloration of upperparts.

that in case the specimens themselves should hereafter come before You and Me, we might alter our previous opinion. I do not suppose that any other Notes in writing can be got at besides those already in My possession, but if so, I should advise you to take advantage of it. New subjects will no doubt from Time to Time arrive from New Holland, and in such cases you will do well to take the advantage of procuring Drawings, at least of them, and You cannot do Me a greater favour than in granting Me a View of them' (Mathews 1931).

Latham identified the birds in Lambert and inscribed their names in pencil near the lower margins of the pages (Mathews 1931, *contra* Hindwood 1970). As Lambert had done with Watling, Latham had copies made of the watercolours in Lambert (i.e. second-generation copies) for his own personal use (Latham 1781–1832, Hindwood 1970). Like Watling, Latham's collection of 888 watercolours (which also includes copies of paintings from other sources in addition to those in Lambert) are now housed at NHMUK and were seen by JJFJJ in January 2016 (Latham 1781–1832). Although Latham listed the birds depicted in the Watling watercolours (see below), he apparently never listed his own watercolours, or if he did, the list is now lost. The Latham watercolours (Latham 1781–1832) include two of *L. melanops*, one (Pl. 399) inscribed 'Black-eyed Thrush' (Fig. 3), the other (Pl. 482) as 'Black-eared Thrush'. The former is an exact copy of Lambert (2) no. 65 / Watling no. 121 (Fig. 1), but Latham's 'Black-eared Thrush' is not copied from any known First Fleet source, nor did Latham ever describe a 'Black-eared Thrush' in his publications, perhaps due to his annotation of 'Doubtful' under the illustration.

Latham evidently did not examine the original watercolours in Watling prior to publication of his second *Supplement.* On 12 October 1799, Latham wrote to Thomas Pennant: 'Mr. White, The Surgeon, brought over very many drawings as well as new Birds, but I am sorry to say that altho' I sent out to Him every instruction I could, as also a copy of my synopsis as a Present, he has never offered me yet inspection of his drawings... However, I think it may not be useless to inform you that I have since seen Copies of all

Mr White's Birds in Mr Lambert's Hands, ye drawings being lent to him by Mr White & I should think you might avail yourself of them by applying to Mr Lambert...' (Nelson 1998).

Although information included in Latham's second *Supplement* was taken from notes inscribed on Watling's watercolours, as Latham had not seen the original Watling watercolours before then, it appears that Lambert had at least some of the notes transcribed and sent them to Latham with the copied watercolours, as Latham's letter of 28 January 1800 quoted above suggests: 'indeed, even the sizes in some cases have not been noticed any more than the Manners', indicating that sizes and habits were transcribed for others, while 'I do not suppose any other Notes in writing can be got at besides those already in my possession' shows Latham copied the notes for his own use. Some of this information (known only from these watercolours according to Hindwood 1970) was not used by Latham until he published his *General history of birds* (1821–28). Moreover, despite his assertion to Pennant that he had seen copies of all of White's drawings, he failed to describe some taxa in the second *Supplement*, illustrations of which are missing from Lambert but present in Watling.

That Latham saw the original watercolours in Watling at some point post-1801, however, is proven by a list in his handwriting, identifying the birds in Watling, included with the Watling volume when sold to the NHMUK. The sequence of this list and the watercolours in Watling correspond to that in Latham's second *Supplement*, indicating that Latham re-arranged the original sequence of the Watling watercolours. Latham's list also noted the page numbers on which the birds are described in the second *Supplement*, with the watercolours in Watling being annotated by Latham with the names and same page numbers from the second *Supplement*.

Several birds in Watling and Lambert are unidentifiable, and Latham misidentified a number of birds in his ms list of Watling birds. For example, he identified Watling nos. 112–113 as the 'Yellow-winged Creeper'. But, while no. 112 corresponds (albeit imperfectly) with his description of the 'Yellow-winged Creeper' in Latham (1801a), identified in Sharpe (1906) and Hindwood (1970) as Crescent Honeyeater *Phylidonyris pyrrhopterus*, no. 113 depicts an unidentifiable bird with red-edged primaries. Similarly, Latham identified four watercolours, Watling nos. 115–118, as the 'Yellow-eared Creeper', but while no. 115 corresponds (again imperfectly) with his description of the 'Yellow-eared Creeper' in Latham (1801a), identified in Sharpe (1906) and Hindwood (1970) as Lewin's Honeyeater *Meliphaga lewinii*, nos. 117–118 (no. 116 is missing from Watling) are identified in Sharpe (1906) and Hindwood (1970) as Fuscous Honeyeater *Ptilotula fusca* and Yellow-faced Honeyeater *Caligavis chrysops*, respectively.

The depictions of Yellow-tufted Honeyeater

Latham's 'Bearded Thrush'.—On the first of the Lambert watercolours depicting *L. melanops*, Lambert (2), no. 10, copied from Watling no. 156, Latham inscribed: 'Muscic. australis, White Journ. A. p. 239' (i.e. 'Muscic[apa] australis, White Journ[al] A[ppendix] p[age] 239').

In the appendix to White's *Journal of a voyage to New South Wales* (1790), George Shaw, curator of the Leverian Museum, described and gave the Latin binomial 'Motacilla australis' to the bird depicted by Sarah Stone in Pl. 28, an Eastern Yellow Robin *Eopsaltria australis*. Latham evidently misidentified the *L. melanops* depicted in Lambert (2) no. 10 with the *E. australis* depicted by Stone, and moreover re-assigned it to *Muscicapa*. Latham later re-identified the original Watling watercolour, no. 156, on his ms list and on the watercolour itself, as the 'Bearded Thrush.' He did not include a description of 'Bearded Thrush' in

Latham (1801a,b), but it did appear in Latham (1822); however, it never received a Latin binomial.

Latham's 'Yellow-tufted Flycatcher'.—On the second of the Lambert watercolours depicting *L. melanops*, Lambert (2), no. 40, copied from Watling no. 122, Lambert inscribed: 'Muscic. novae Hollandiae La. Ind. orn. 2 p. 478. 43' (i.e. 'Muscic[apa] novae Hollandiae La[tham] Ind[ex] orn[ithologicus] [volume] 2, p[age] 478, [number] 43').

In his *Index ornithologicus* (1790), Latham identified his 'Muscicapa novae Hollandiae' with the 'Yellow Eared Fly Catcher' depicted in Pl. 10 in White (1790), and Latham also based his description in Latham (1801a: 215) on the same plate (again by Sarah Stone), which apparently depicts Yellow-faced Honeyeater *Lichenostomus chrysops*. The latter, however, received its specific epithet from Latham, who, based on Lambert (2), no. 46 / Watling no. 134, described the Black-cheeked Warbler in Latham (1801a: 248) and its Latin equivalent *Sylvia chrysops* in Latham (1801b: liv)! Because Latham's 'Muscicapa novaehollandiae' was deemed to be of indeterminate identification (despite general agreement that Pl. 10 in White 1790 depicts *L. chrysops*), ICZN suppressed the name *novaehollandiae* (Hemming 1956, Paynter 1967).

Latham subsequently re-identified the original Watling watercolour, no. 122, from which Lambert (2), no. 40 was copied, as the 'Black-eyed Thrush.' However, Watling no. 122 evidently served as the basis for Latham's description of the 'Yellow-tufted Flycatcher' (Latham 1801a: 215–216) and 'Muscicapa auricomis' (Latham 1801b: xlix). On the reverse of Watling no. 122 there is a note, the edges of which were lost when the drawing was cropped. The full transcription, written on a separate sheet of paper now mounted below the watercolour, reads:

'The Native name of this very common Bird in New South Wales is Darwang. It is a very lively Bird, and by us called the yellow eared Flycatcher. The Tongue is feathered at the tip for Sucking Honey, which it is very fond of. It builds its Nest on the pensile branch of some trees or low shrubs, as I suppose to avoid the opossum, flying Squirrel, Lizard, Guana, and Birds and Mice. The yellow at the Ears are Tufts of Feathers longer than those on the other part of the Head.'

Latham (1801a: 215–216) included these notes (apparently acquired, as noted above, through an intermediary) in his description of the 'Yellow-tufted Flycatcher':

'This is considerably larger than the Hedge Sparrow: bill and legs black: tongue bristly at the tip: the general colour of the plumage on the upperparts is olive green: the crown, and all beneath, from the chin, yellow: through the eyes, from the gape, a large patch of black; at the back part of which, on the ears, a tuft of yellow, which tuft consists of feathers longer than the others: the outer tail feathers yellow.'

'Inhabits New Holland, where it is called Darwang, and is a common species. The English named it, as well as the last, the Yellow-eared Flycatcher: is said to feed principally on honey, which it obtains from the flowers, by means of its feathery tongue: makes the nest on the extreme pendant branches of low trees or shrubs, and by this means escapes the plunder of various smaller quadrupeds, who are unable to reach the nest with safety. Whether this is allied to the last, I will not take upon me to ascertain.'

Latham's 'Mustachoe Flycatcher'.—On the third Lambert watercolour depicting *L. melanops*, Lambert (2), no. 60, copied from Watling no. 133, Latham inscribed 'Sylvia mystacea'. Unlike the previous two depictions, Latham did not associate this bird with one depicted in White (1790). Instead, Latham described it as a new taxon, 'Mustachoe Flycatcher' (Latham 1801a: 221) with the binomial 'Muscicapa mystacea' (Latham 1801b: li). Between examining the Lambert watercolour and publication of the *Supplementum*, Latham re-assigned the bird from the warblers (*Sylvia*) to flycatchers (*Muscicapa*). Latham

subsequently inscribed 'Mustachoe Flycatcher' on the original Watling watercolour, no. 133. Latham's description reads:

'Length from eight to nine inches: bill slender; black: legs black: tongue fringed at the tip: general colour of the plumage pale green; but the under parts from chin to vent greenish yellow; the last most conspicuous on the chin and breast: from the gape springs a black band, which grows broader, and passes under the eye to the hind neck, where it is fringed with yellow. Inhabits New South Wales; it is a pugnacious bird, attacking others, especially the smaller Parakeets.'

Latham's 'Black-eyed Thrush'.—The fourth Lambert watercolour depicting *L. melanops* (Figs. 1–2), Lambert (2), no. 65, copied from Watling no. 121, was annotated 'Turdus melanops' by Latham. Again, he considered this to be a new taxon, which Latham named 'Black-eyed Thrush' (Latham 1801a: 181) and *Turdus melanops* (Latham 1801b: xl). Latham's description reads: 'Length eight inches: bill stout, slightly curved; tongue bristly at the tip: the crown of the head and under parts of the body are yellow; the forehead mottled with dusky: nape, wings, and tail rusty brown, the two last margined with yellow: from the gape springs a black streak growing broader, surrounding the eye, and descending on each side below it, growing more narrow; just within at the bottom part is a small spot of yellow: tail moderately long; the wings reach only to the base of it: bills and legs brownish. Inhabits New South Wales.'

Latham added two annotations in pencil above the illustration on Watling no. 121: 'Black-eyed Thrush Sup. 2. 181' and 'Lambert Drawing II. 65.' A third annotation in ink in a different hand reads: 'Black-eyed Thrush - Latham / Syn - Suppt 2. p. 131. / Natural Size'. The same author also annotated Watling no. 122 'Black-eyed Thrush, Latham Syn - Suppt. 2, p. [number cropped]' and transcribed the note quoted above.

Vieillot's 'L'héorotaire a oreilles jaunes'.—In 1802, Vieillot described a specimen of *L. melanops* as 'L'héorotaire a oreilles jaunes' that had 'only recently' (*depuis peu*) reached MNHN (Vieillot 1802: 156). In 2013, while researching the Baudin expedition (1800–04), JJFJJ fortuitously found the specimen of *L. melanops*, mounted with its skull in situ, described by Vieillot. On the underside of the mount was the following inscription: 'Australie - Botany Bay. - Sir Banks - 10160 - Ptilotis auricornis [*sic*] - Lath.'

The specimen's provenance is confirmed by a set of five acquisition books in MNHN dating from *c*.1854. In book four, it is recorded that specimen MNHN A.C. 10160 (recently re-registered as MNHN-ZO-2013-174), identified as a male 'Ptilotis auricomis, Lath.' was acquired from 'Sir J. Banks.' Although both the base inscription and acquisition book entry were written after 1837 (when *Ptilotis,* now a junior synonym of *Lichenostomus*, was erected by Swainson), MNHN ZO-2013-174 was evidently acquired by MNHN *c*.1800, indicating that the data were taken from a subsequently discarded old label. But even that label would not have been original, present on MNHN-ZO-2013-74 when it arrived at the museum (i.e. it would have been prepared years later). JJFJJ is unaware of any pre-1810 bird specimen with original labels: no Cook, Baudin, Bullock, Temminck, Lichtenstein, Bonelli or Leverian Museum birds examined by him bear such. The precise origin, collector and date of collection of MNHN ZO-2013-174 are consequently unknown.

In addition to MNHN ZO-2013-174, Banks evidently donated other specimens to MNHN, including a Little Lorikeet *Glossopsitta pusilla* (Jansen 2015), mentioned by Levaillant (1801: 99), two Pied Currawongs *Strepera graculina*, also mentioned by Levaillant (1806: 67), and Short-beaked Echidna *Tachyglossus aculeatus* (de Beaufort 1966). The *G. pusilla* is still at MNHN, where it was recently found by JJFJJ. Banks apparently received these specimens, like those of other Australian taxa (including Superb Lyrebird *Menura novaehollandiae*, Spotted Quail-thrush *Cinclosoma punctatum* and Platypus *Ornithorhynchus*

anatinus), post-1792, when he divested himself of most, or perhaps all, of the specimens in his possession (Medway 1981, Jansen & Roe 2013).

MNHN ZO-2013-174 was identified with 'Muscicapa auricomis' (Latham 1801b: xlix), rather than 'Turdus melanops' (Latham 1801b: xl), presumably due to the agreement between Latham's description of the olive-green coloration of the 'Yellow-tufted Flycatcher' and the similar coloration of MNHN ZO-2013-174.

Discussion

Although the four watercolours in the second volume of Lambert, nos. 10, 40, 60 and 65, all depict *L. melanops*, Latham ascribed them four different binomials and assigned them to three different genera, *Muscicapa*, *Sylvia* and *Turdus*; in Latham (1801b), he placed them all in *Muscicapa* and *Turdus*. Two of his identifications, of taxa described by Shaw and depicted in White (1790), were erroneous. Latham later inscribed three different English names to the four Watling watercolours of *L. melanops*: 'Black-eyed Thrush', 'Mustachoe Flycatcher' and 'Bearded Thrush', and used the note on the reverse of Watling no. 122 in his description of the 'Yellow-tufted Flycatcher' in Latham (1801a). He employed three binomials in Latham (1801b): *Turdus melanops*, *Muscicapa auricomis* and *Muscicapa mystacea*, with *melanops* appearing first (and thus having priority) in Latham (1801b), despite its appearing last in the Lambert series.

Despite the overall similarity in coloration of the four watercolours depicting *L. melanops* in Lambert, Latham was evidently persuaded by differences between them (due in part to the varying skill of the artists) into believing they represented species in different genera. For example, in Lambert (2), no. 60, identified by Latham as 'Sylvia mystacea', copied from Watling no. 133, the artist extended the black facial mask into a long, broad stripe tipped by an upswept yellow 'moustache', while in Lambert (2), no, 40, copied from Watling no. 122, identified by Latham as 'Muscicapa novae Hollandiae', the mask is truncated and the bird has a long yellow ear-tuft. In Lambert (2), no. 65, copied from Watling no. 121, identified by Latham as 'Turdus melanops', the mask extends like a teardrop on the neck-sides, with a spot of yellow at the tip.

Latham (1801a) described the nape, wings and tail of his 'Black-eyed Thrush' (= 'Turdus melanops' in Lambert) as 'rusty brown', while the upperparts of 'Yellow-tufted Flycatcher' (= 'Muscicapa novae Hollandiae' in Lambert) were 'olive green', as they are in life in *L. melanops.* Yet Latham later identified both Watling nos. 121–122 as the 'Black-eyed Thrush', rather than the seemingly more appropriate 'Yellow-tufted Flycatcher'.

How to explain this apparent anomaly? Two clues suggest an answer. As noted above, Latham had a copy made of Lambert (2) no. 65 for his own collection. Comparison of Watling no. 121, Lambert (2) no. 65 and Pl. 399 in Latham (1781–1832) shows a shift in coloration between the original and first- and second-generation copies. In Watling no. 121, the upperparts are dark greyish olive-green above and pale yellowish grey below; in Lambert (2) no. 65, the overall coloration is brighter and the upperparts olive-brown, while in Latham's copy, the upperparts are brown and underparts greenish yellow. In Watling no. 121 and Lambert (2) no. 65, the crown is greenish yellow and the chin bright yellow, but in Latham's copy, the crown and chin are the same greenish yellow as the rest of the underparts. This indicates that, instead of Lambert (2) no. 65, Latham used his own copy of the latter to describe the 'Black-eyed Thrush'.

The other clue was provided by Banks' specimen in Paris. In June 2012, JJFJJ photographed MNHN-ZO-2013-174 in MNHN's underground storage facility, the 'zoothèque', using a Panasonic DMC-TZ7 digital camera and the basement's overhead fluorescent lighting (Fig. 4). The greyish-green coloration of MNHN-ZO-2013-174 in these

photographs agrees both with Vieillot's description of the specimen and the olive-green plumage of *L. melanops* under natural light.

However, in April 2013, JJFJJ again photographed MNHN-ZO-2013-174, but with very different results. This time, he used an Olympus SP600UZ digital camera and photographed the specimen against a green backdrop, using small halogen lamps sited either side of the specimen. The mix of overhead fluorescent lighting and lateral halogen lamps (combined with the green backdrop) resulted in a dramatic difference, turning the background from green to beige and the specimen's upperparts from greenish grey to rusty brown (Fig. 5). The photographs (which are unaltered) match Latham's description of the 'Black-eyed Thrush' in having the nape, wings and tail rusty brown, crown and underparts yellow, rectrices fringed yellow, and bill and legs brownish.

Although fluorescent lighting would not be invented until >100 years after Latham's description (and halogen lighting >50 years later still), the remarkable congruence in the rusty-brown plumage described by Latham and photographed by JJFJJ suggest that Latham initially examined Banks' specimen of *L. melanops* under conditions in some way similar to those in JJFJJ's 2013 photographs, explaining his anomalous description of the 'Black-eyed Thrush'. The conditions concerned are, of course, unknown; although candlelight is a possibility, no photographs of MNHN-ZO-2013-174 were taken in such conditions, or other tests conducted. Irrespective of the above, the two sets of photographs provide a remarkable demonstration of the significance of lighting in assessing the accuracy of Latham's descriptions, as well as those by other authors in the 18th and 19th centuries.

Latham made extensive use of Banks' collection in describing new species and obtained many specimens for his own collection from Banks, as noted by Latham himself (1781), and included many descriptions of birds in Banks' collection in his *General synopsis* (1781–85) and subsequent supplements (Latham 1787, 1801a,b). While in Banks' possession, MNHN-ZO-2013-174 would have been available to Latham to examine. It is informative that Latham described the tail of 'Turdus melanops' as rusty brown; however, in Watling no. 121 and Lambert and Latham's copies, only the pale ventral side of the tail is visible. That Watling no. 121, the original watercolour, shows only the undertail, proves this was not a simple copying error in the copies examined by Latham. That Latham described the dorsal coloration suggests he had another reference to hand.

The Banks provenance of MNHN-ZO-2013-174 and the strikingly similar pose of this specimen to the birds depicted in Watling no. 121 and Lambert (2) no. 65 (head uptilted, bill open and tongue exposed) indicate it was posed to resemble these watercolours when mounted. As the Watling watercolours arrived in England in 1795 and Vieillot (1802) included a plate of MNHN-ZO-2013-174, it must have been mounted in England between 1795 and *c*.1800, when Latham was preparing his second *Supplement*, with MNHN-ZO-2013-174 arriving in Paris around the same time that the *Supplement* was published, in 1801. That MNHN-ZO-2013-174 was posed to resemble the watercolours that Latham inscribed 'Turdus melanops' and 'Black-eyed Thrush' indicates that MNHN-ZO-2013-174 was identified as a 'Turdus melanops'. As such, Latham could have used MNHN-ZO-2013-174 while it was in Banks's possession to describe 'Turdus melanops'.

Conclusion

Sharpe (1906) identified the Watling watercolours as the basis for, and hence 'types' of, Latham's descriptions in Latham (1801a,b). However, Latham examined the Lambert watercolours first, pre-1801, and subsequently annotated the Watling watercolours after the publication of Latham (1801a,b). Moreover, it is apparent that Latham used the copy of Lambert (2) no. 65 in his own collection (Latham 1781–1832, Pl. 399) to describe 'Turdus

melanops'. However, according to ICZN (1999) an illustration cannot be designated as the type specimen (Art. 72.5.6), only the specimen on which the description was based. Therefore, the Latham watercolour has no type status.

The evidence that MNHN-ZO-2013-174 might represent a syntype of *L. melanops* is highly circumstantial. Although there is no doubt that Latham examined the Lambert and Watling watercolours, it cannot be proven that he examined MNHN-ZO-2013-174, however, given that it came from Banks and is similar to the watercolours, it is quite possible that he did. Moreover, although the photographs of MNHN-ZO-2013-174 taken under halogen lighting suggest an explanation for Latham's anomalous description of rusty-brown plumage for 'Turdus melanops', they do not prove that lighting was responsible for the errors in his description. Further testing under various light conditions might be informative, but is unlikely to yield definitive answers. Although we do not advocate any type status for MNHN-ZO-2013-174, hopefully we have demonstrated its significance in the early taxonomic history of the species.

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Further records and updates of range expansion in House Crow *Corvus splendens*

by Colin Ryall

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Summary.—House Crow *Corvus splendens* continues its ship-assisted global invasion, reaching locations further from its native range in the Indian Subcontinent. This report reviews the species' recent spread as well as changes in the status of existing introduced populations where information is available. With the collapse of long-standing eradication programmes in Kenya and Tanzania, and a spread to inland sites in both countries, it is inevitable that House Crows will colonise the heart of Africa. In South and East Asia too, the species is spreading unobstructed through the region. Nevertheless, there is now a growing recognition of the threats of invasive alien species in general, including House Crow, and a willingness by some authorities and funding bodies to prevent the species' proliferation. As a result, control programmes are now in operation at several locations where House Crows have established, and increasingly proactive approaches involving risk assessments, surveillance and action plans are being developed where a risk of invasion exists.

Native to the Indian Subcontinent, southern Iran, Myanmar and western Yunnan (China), House Crow *Corvus splendens* has, over the past century or so, shown itself to be an invasive alien species (IAS) that is progressively spreading globally. Initially, the spread was mediated by deliberate releases in Aden (Yemen), Zanzibar and Klang (Malaysia) as of the late 1800s, for the purpose of dealing with refuse and crop pests. However, this was soon superseded by ship-assisted range expansion, at first within the Red Sea, Indian Ocean and its islands, probably via ships from Mumbai and Colombo, but also from ports including Aden and Suez, which possess large House Crow populations.

House Crow is now widely recognised as an invasive species, introduced populations of which have serious adverse impacts on native birds and other small fauna through intensive predation, harassment of raptors and other larger avifauna (Ryall 1992a), crop raiding, predation of smaller livestock and as potential vectors of human pathogens (Ryall 1992b). The pest status of House Crows and related information are provided in detail in the CABI Invasive Species Compendium (CABI undated).

This report is the fifth review of the species' global expansion (see Ryall 1994, 1995, 2003, 2010) and presents new locations and significant changes of status of existing introduced populations.

Europe

Republic of Ireland.—A House Crow, the second for the country, was reported in the busy port of Cork on 5 September 2010. It was suggested by S. Dymond of the Port of Cork Company that it may have originated from the Hoek of Holland population as 5–6 ships make the 30-hour voyage from Rotterdam to Cork each week. The bird remained in the area and scavenged mainly around the local burger joint, sometimes being fed by passersby (RM). It also associated with Jackdaws *C. monedula* and Rooks *C. frugilegus*, as do House

Crows in Hoek van Holland. It was last reported on 21 July 2012 (BGS) and, as it attracted considerable attention among the birdwatching fraternity, was widely photographed.

UK.—A suspected House Crow was recorded (heard and distant view) in Belfast, Co. Antrim, (Birdguides 2012) on 5 January 2012, but was not observed again. This is at least the fourth unconfirmed report of the species in the UK.

Netherlands.—The population in Hoek of Holland has grown steadily to *c*.35 birds since the arrival of a pair in 1994. In 2012, following a risk assessment of potential negative impacts if left to proliferate (Slaterus *et al*. 2009), the government decided to eradicate the population. As of April 2015, 26 had been killed with an estimated five, now very wary, birds remaining (GO). Since their establishment in the Hoek van Holland, there has been evidence of a small number of additional arrivals (Ottens & Ryall 2003), reinforced in May 2012 by the appearance of a very pale grey-hooded bird at Hoek of Holland (GO) resembling *C. s. zugmeyeri*, which race is native to Pakistan and south-east Iran, and is now widely established in parts of the Arabian Gulf. The founding pair and subsequent population there have all had the darker hood characteristic of nominate *splendens*. Two or three House Crows were seen in a residential part of The Hague in July 2012, but they were considered to be unrelated to the short-lived population present in the nearby Park Ockenburg in 2004 (WvY).

Cyprus.—One, the first for the island and the east Mediterranean region, was photographed on 19 September 2011 near the entrance to Zafer Burma Monastery, Apostolos Andreas, on the Karpas Peninsula (CR).

Middle East

The publication of *The atlas of breeding birds of Arabia* (Jennings 2010) provides an unrivalled account of the distribution of the species in the Arabian Peninsula, and reveals its continued spread through the coastal areas of the Gulf States, to most towns along the Yemeni coast, and along the Red Sea coast of Saudi Arabia. A control programme has been initiated in Jeddah, Saudi Arabia (Felemban 2011), and also at locations in the Arabian Gulf.

Turkey.—Four, the first record for the country, were seen in flight and giving characteristic calls near Çannakale, on the Dardanelles, which is a busy shipping route, on 23 June 2015 (JH). They may well have originated from the population at Suez, Egypt. As the majority of ship-assisted introductions involve only one or two birds, the presence of four together indicates that a breeding population may have established in the Çannakale area.

Africa

Benin.—A single was first seen on 6 February 2010 in the gardens of the Presidency of Cotonou, just 500 m from Cotonou harbour (Demey 2010, Portier & Plomp 2014), where it was chased by a pair of Pied Crows *C. albus*. It was seen repeatedly over the next ten months and photographed. The bird was seen again on 16 September 2010 and subsequently, when it was again photographed (Demey 2011a,b). This is the first record for West Africa and anywhere on the Atlantic coast of the continent.

Kenya.—For more than 40 years the sparsely populated and arid Tsavo region has served as a barrier to the House Crow's spread inland by the massive populations in Mombasa and other parts of the coastal strip (Ryall 1992b, 2010). House Crows have, until recent years, been restricted to the Kenyan coast, penetrating only *c*.60 km along the Nairobi road from Mombasa. However, in the past five years or so, House Crows have been seen at sites much further inland. In 2011 *c*.10 were observed at Voi, approximately 160 km from

Mombasa, and, by December 2013, TI reported that this breeding population had grown to > 100. The species was also seen at Mtito Andei in 2011 (FR), 50 km nearer Nairobi, and one at Makindu (BF), 50 km closer still, while a month later 11 were counted (TI). Their presence in Makindu makes the establishment of a breeding population in Nairobi just a matter of time. A long-standing eradication programme in Malindi, a large coastal town north of Mombasa, which had reduced the number of House Crows to 30–40, had to be discontinued in 2005/06 due to a lack of availability of Starlicide, the most effective avicide (CJ). By 2010 the population had recovered to 2,200 birds.

Tanzania.—The highly successful eradication programme operating in Dar-es-Salaam and environs, which had destroyed some 1.2 million House Crows since its inception, collapsed in 2013 due to problems over funding (TBA 2015). In the subsequent two breeding seasons, the House Crow population has bounced back to a level that is likely to drive their spread inland with renewed vigour.

Namibia.—One, undoubtedly ship-assisted, near the entrance to Walvis Bay on 3 June 2011, is the first record for Namibia. A lone individual was also reported in May 2014 at Walvis Bay waterfront and again in late November (Demey 2015). Despite a period of three years between these records, it is probable that they relate to a single bird remaining in the area, but that interested reporters were absent (TH). In view of the reduction of the Durban and Cape Town populations in recent years, the bird probably originated not from nearby South Africa but rather from East Africa, the Arabian Peninsula or even the Indian Subcontinent.

Mozambique.—According to CB, House Crows have continued to increase their range and now occupy six port cities (from north to south, Pemba, Nacala, Quelimane, Beira, Maputo and Matola). In Maputo, though first reported there in 1976 (Ryall 2002), they remain largely restricted to the Sommerschield area, close to the seashore, where the population density is high (GA). Distribution in the city is currently being mapped as an adjunct to a control programme, which will then serve as a model to be replicated in other affected cities in Mozambique (CB).

South Africa.—A control programme in Durban has significantly reduced the species and it may be extirpated (DA). The main centre of population is currently at Richard's Bay, 200 km north of Durban, where control measures have now been implemented. In Cape Town, where numbers have also been reduced significantly, House Crows are now centred in the area of Khayelitsha and the international airport (sabap2.adu.org.za), and the long-standing control programme continues. In addition, a lone House Crow was recorded at the port of East London in the Eastern Cape on 15 June 2010 (Demey 2010).

Madagascar.—On 1 January 2014, two House Crows, the first reported in the country, were found in the harbour of Toamasina (Linders & Langrand 2014). Further investigation revealed at least 15 roosting communally in trees near the seashore. Fortunately, the serious potential risk to the unique fauna and fragile economy of this impoverished country of allowing the species to establish, has been quickly recognised. Island Conservation and Asity, the BirdLife International partner, are working with a pest control company to eradicate the incipient population (BW).

Indian Ocean Islands

Chagos Islands (British Indian Ocean Territory).—Two have been present on Diego Garcia since the early 2000s (Ryall 2010) and were seen periodically until February 2011 (Carr 2011). On 19 September 2012, a further individual was seen at the populated western end of the island, while the other two remained in an uninhabited forested area in the east and, uncharacteristically for the species, have never visited the area where human inhabitants

are based (Carr 2014). No breeding seems to have occurred despite a pair on the island for more than a decade, but the arrival of the additional bird may change this situation.

East Asia and Australia

South Korea.—A single, the first record for the country, was seen on Mungab Island on 7 May 2010 (Birds Korea 2010). It was subsequently fed and photographed by multiple observers until at least 25 June, with photographs posted at Birds Korea. Given the proximity of the island to busy shipping lanes and Incheon Port, it is probable that this individual's arrival was ship-assisted.

Malaysia.—The population in Kota Kinabalu, Sabah, first reported in 1997 but which numbered only *c*.4 birds by 2006 (Ryall 2010), had increased to at least 15 by April 2013 (CRy), centred mainly around the fish market and adjacent seafront.

Vietnam.—Six were observed on 14 December 2013 by TC in the vicinity of beach restaurants at Vung Tau, *c*.60 km south-east of Ho Chi Minh (Robson 2014), and close to the main shipping route passing into this major port. This is the first report for this country and the number involved suggests breeding has occurred.

Indonesia.—Following the report of a single at Belawan, on Sumatra, in 1998 (Ryall 2002), three were seen on 28 September 2005, one on 1 October 2005 and another on 25 November 2012 (van Balen *et al*. 2013). Though a small population seems to have persisted for ten years, it is surprising that it has not grown significantly, especially in view of the burgeoning population across the narrow Straits of Malacca in Peninsular Malaysia.

Australia.—On 12 October 2010, a lone House Crow was seen at Flying Fish Point, Innisfail in far northern Queensland, which is *c*.30 km north of the international shipping docks at Mourilyan Harbour (Preston 2010). Following much public interest, the bird was killed in December 2011, in line with official policy on preventing the species' establishment in the country. Although House Crows have arrived regularly over the past century, this record from north-east Australia is unusual as the majority have been in the west and south-east, reflecting the main concentrations of ship traffic.

The Americas

USA.—As reported previously (Ryall 2010), a pair was seen in late 2001 at Nokomis Beach, Sarasota, south-central Florida, and they bred successfully in 2003 with up to four being reported periodically until 2008 and again in 2012 (Greenlaw *et al*. 2014). Additionally, a lone individual was seen in the area in 2006 with two Fish Crows *C. ossifragus*. From 2009, a group of up to six was photographed in Palmetto, just 16 km north of Sarasota, which apparently relocated and disappeared from the area (BPr). B. Pranty, who has periodically monitored the two groups, is of the opinion that, in view of the distance between them, they have arisen through two separate introductions. Greenlaw *et al*. (2014) were of the opinion that they were ship-assisted introductions emanating from the large port of Tampa, as no House Crows are kept in captivity in the region.

Cuba.—The lone bird on Cayo Guillermo was first seen on 25 November 2007 by R. Ford (Kirkconnell *et al*. in prep., and not in April 2008 as reported in Ryall 2010). It was still present in mid-August 2011 (BZ). Interestingly, CK observed it on 17 March 2010 associating and probably roosting with Great Antillean Grackles *Quiscalus niger*, as did other observers on other dates.

Brazil.—In early November 2014, a single was seen by JAJ close to Guanabara Bay, near Itaboraí *c*.20 km north-east of Rio de Janeiro. This is close to a busy shipping route with the nearest port *c*.20 km away. The bird, probably nominate *splendens*, was photographed

feeding on a dead rat. This is only the second record for South America, the first being in Punta Arenas, Chile, in 1993.

Discussion

The House Crow's invasion across the globe continues with breeding populations now found at ports and coastal locations in 28 countries outside their native range, and ship-assisted arrivals of lone birds or small groups in an additional 23 countries. The rate and distance of spread from their home range is extending with increased global trade, faster ships and large introduced populations at international ports, such as Aden (Yemen), Suez (Egypt), Mombasa (Kenya) and in the Arabian Gulf, which can act as secondary points of embarkation by House Crows. As a result, there have been further transatlantic arrivals in Florida, Cuba and Brazil.

In East and South-East Asia, however, the House Crow's spread is for the most part more stepwise, in the form of overland expansion through the Thai-Malay Peninsula (Wells 2007), and shorter-range ship-assisted spread to nearby islands and mainland sites. In the past two decades Phuket (Thailand), Sumatra and Borneo have been colonised, and more recently Vietnam. With House Crows breeding in Singapore and Hong Kong, lone birds arriving in South Korea and previously in Taiwan (Ryall 2010), surely the Philippines or other sites in Indonesia or China will be next in line.

The appearance of House Crows in Cyprus in 2011 and in western Turkey in 2015 represent the first reports for the eastern Mediterranean region although, in the west, singles were reported at Gibraltar in 1991 and Tangiers 2002 (Ryall 1994, 2010). Considering the proximity of the burgeoning population at Ismailiya and Suez, northern Egypt, it would not be surprising if colonies became established at other east Mediterranean coastal sites such as Port Said, Alexandria (Egypt), Haifa (Israel) and Beirut (Lebanon). If a breeding population is left to proliferate in western Turkey it will threaten further invasion into the Near East and Europe.

Madagascar has long been a high-risk location for invasion (Ryall 1994) due to its direct shipping connections to major House Crow populations in East Africa, the Arabian Peninsula and Indian Subcontinent. The arrival of House Crows onto this large, relatively poor island would have enormous socio-economic impacts due to crop-raiding and predation of livestock, including poultry, and young sheep and goats (Ryall 1992b), of the numerous subsistence farmers. The unique biodiversity too would be greatly impacted, exacerbated by the degree of habitat fragmentation allowing House Crows, colonising human settlements, access into all but the few large remaining tracts of forest. The rapid response of the authorities to prevent this dire scenario by expediting an eradication programme and surveillance system is most encouraging.

Less hopeful is the situation on the African mainland. The spread inland of House Crows in East Africa, assisted by the collapse of control programmes in Kenya and particularly Tanzania, into the fertile, heavily populated heartland of Rwanda, Uganda and beyond, presages massive socio-economic impacts and biodiversity loss.

At the same time as House Crows are proliferating, however, there is a growing recognition of the threats posed by Invasive Alien Species (IAS) to biodiversity and national economies. Thus, action to control House Crows within their introduced range is gaining impetus. This is less due to an increased desire in affected countries to take action, which has always existed, but more an increased willingness of funding bodies to support IAS eradication programmes, something they had no appetite for 10–20 years ago.

House Crow control programmes are now operating in the Netherlands, Israel, Jeddah (Saudi Arabia), Hong Kong, Singapore, Durban, Cape Town, Richards Bay and elsewhere—

and are planned in Madagascar and Mozambique—yet long-standing programmes in Kenya and Tanzania have collapsed. Given this rise in awareness it is all the more surprising that no action has apparently been taken to tackle those in Florida.

Another positive trend is the development of more proactive strategies involving risk assessments (e.g. Slaterus *et al*. 2009, Csurhes 2010), public information, and surveillance and response systems to provide early warning and action if House Crows arrive. This approach has operated successfully for decades in Australia and for more than two decades in the Seychelles. Although it has not arrived in New Zealand, Fraser *et al*. (2015) recently modelled the species' potential distribution if it became established in that country, which will act as an excellent basis for the development of contingency plans. In the UK too, a proactive strategy involves a risk assessment, identification leaflet and action plan (NNSS undated).

There now seems little to stop House Crows from invading the heart of Africa and much of coastal South and East Asia, with potentially severe impacts on both biodiversity and local economies. However, it is probable that islands and some other locations such as Europe, the USA and Australasia, where resources are available, may be maintained free of House Crows in the long term through surveillance and periodic control measures.

Request for information

All records of new locations around the world or which update information on existing House Crow populations, including numbers, activities, food sources and possible origins with dates, would be gratefully received and can be sent via House Crow Monitor (www.housecrow.com) or to colryall@btinternet.com.

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Nesting of Smoky-fronted Tody-Flycatcher *Poecilotriccus fumifrons* in French Guiana

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Summary.—Until now, the nests of only six of the 12 species of tody-flycatchers of the genus *Poecilotriccus* have been described. We present general information on the breeding biology of Smoky-fronted Tody-Flycatcher *Poecilotriccus fumifrons* in French Guiana. Nests we found were similar to those of other *Poecilotriccus* species for which the nest is known, i.e. closed/ovoid/pensile.

The genus *Poecilotriccus* comprises 12 species of small, stout-bodied flycatchers (Remsen *et al*. 2014). They generally occur in dense shrubbery at edges of primary forest and second growth, and in patches of low bushes in savanna, where they forage inconspicuously. The natural history of all *Poecilotriccus* is poorly known (Walther 2004, Kirwan 2010). To date, the nests of six species are described: Rufous-crowned *P. ruficeps* (Greeney *et al*. 2005), Black-and-white *P. capitalis* (Kirwan 2011), Ochre-faced *P. plumbeiceps* (de la Peña 1988), Rusty-fronted *P. latirostris* (Greeney 2014), Slate-headed *P. sylvia* (Skutch 1960, Walther 2004) and, most recently, Smoky-fronted Tody-Flycatcher *P. fumifrons* (Penard & Penard 1910, Bichinski 2015).

In French Guiana, Smoky-fronted Tody-Flycatcher is fairly common in appropriate habitats, mainly brushy vegetation or low second growth in man-altered habitats. However, its elusive behaviour and discreet movements in dense vegetation make it difficult to observe. Consequently, until recently, the species went unnoticed or misidentified by most French Guianan birders unfamiliar with its vocalisations, a situation exacerbated by its absence from popular field guides of the era, e.g. Meyer de Schauensee & Phelps (1978). The first record of nesting in French Guiana was mentioned by Tostain *et al*. (1992): on 11 April 1980, a pair was building a nest in an abandoned clearing near marshy forest at Saint-Georges-de-l'Oyapock (*c*.03°53'N, 51°48'W).

We present general information on the nesting of Smoky-fronted Tody-Flycatcher in French Guiana, describing ten nest sites and nests, and the structure of one nest in detail. We also report the observation of a pair accompanied by a fledgling.

Methods

The discovery of Smoky-fronted Tody-Flycatcher nests was entirely fortuitous, all being found during regular birdwatching trips or in the vicinity of observers' houses. Most observations were made after hearing the typical vocalisations and by following the birds. Nesting was revealed by the birds' behaviour: regular activity at one point, alarm calls, carrying of nest material or food. Nests were discovered by carefully watching the birds' movements through the vegetation. Active nests were monitored by frequent visits to sites. Observations were made from a distance through binoculars or a telescope, to minimise disturbance.

Results

From 1 February to 25 March 1998, VR regularly observed a pair of Smoky-fronted Tody-Flycatchers with a fledgling at the entrance to Air Force Base 367 next to Félix Eboué international airport at Rochambeau (*c*.04°49′N, 52°22′W). The area consisted of humid wasteland at the edge of swampy forest and covered by tall grasses, large stands of *Heliconia psittacorum* and bushes, close to buildings. The adults, and fledgling, which regularly begged for food, were always seen in the same small brushy part of this wasteland.

From 1999 to 2002, a pair of tody-flycatchers repeatedly nested in low vegetation in the backyard of MC's house at PK 10 along the Route de Saint-Jean (*c*.05°25′N, 54°03′W) near Saint-Laurent-du-Maroni. In early February 2002, a first nest was lost due to unknown reasons. A second nest, constructed *c*.50 m from the previous one, was probably destroyed by Smooth-billed Anis *Crotophaga ani*. A third nest was constructed in the same area of the garden and on 4 March one bird was incubating. All nests were pensile pouch-like structures of dry vegetation, e.g. grasses and rootlets, attached to a twig or vine *c*.1.5 m above ground and isolated from surrounding vegetation.

On 28 January 2010, MC found another nest under construction (Fig. 1), in the garden of Moutouchi ecolodge on the Plateau des Mines (*c*.05°20′N, 54°04′W) near Saint-Jean. The nest was attached to a thin twig also *c*.1.5 m above ground at the edge of low vegetation between the park-like garden and surrounding primary forest.

In 2013–14, MF found four nests of the species in an abandoned *c*.2 ha-clearing at Vevoni (*c*.04°13′N, 52°16′W), 19 km south-west of Régina, on the left bank of the Approuage River, between the rapids of Saut Tourépé and Saut Mapaou. The clearing was covered by shrubby regrowth mainly of vines, and Mimosaceae and Melastomataceae bushes, no taller than 1.5 m, and forming a near-impenetrable thicket under some palm and mango trees. All four nests were sited within a radius of *c*.40 m. In April 2013, MF found an active nest attached to the branch of a Mimosaceae bush, *c*.1.3 m above ground (Fig. 2). In early May 2014, a pair with a juvenile was observed in the clearing. Also in May 2014, MF found a nest under construction attached to a branch of a Mimosaceae, *c*.1.7 m above ground (Fig. 3). It was later found empty, the contents probably predated. On 20 July 2014, MF found another active nest *c*.2 m above ground attached to a branch of a *Bougainvillea* bush (Nyctaginaceae). It measured *c*.20 cm top to bottom with a dangling tail *c*.15 cm long. All four nests were constructed in rather open areas at the edge of shrubbery, used by the adults to discreetly approach the nest. The three nests in 2014 were probably successive breeding attemps by the same pair (MF pers. obs.).

In early 2014, VP followed a nesting attempt of this tody-flycatcher at Tour de l'Île (04°48′N, 52°22′W), a savanna at Matoury near Cayenne. When found on 1 January, the adults had only just started to attach nest material to the supporting twig. On 5 January, the rough structure of the nest was evident. An adult was occasionally seen near the nest until 26 January and thereafter the adults regularly visited the nest, probably to feed the nestlings. Finally on 9 February, the empty nest was found on the ground.

The nest was sited at the edge of a bushy area of *c*.40 × 30 m between a garden and swampy secondary forest. A small channel, 1 m wide, separated the garden from the bushy area. Vegetation in the garden mainly consisted of tall grasses and shrubs, 2–5 m tall. The pensile, pouch-like nest was attached *c*.50 cm from the end of a 3 mm-thick twig of a *Chromolaena odorata* bush (Asteraceae), and *c*.1 m above the small channel. The nest measured *c*.25 cm top to bottom with a dangling tail of material measuring *c*.15 cm (Fig. 4). At the level of the chamber, the nest measured *c*.11 × 8 cm. It clearly comprised two parts, a densely woven inner and a more loosely woven outer part. The inner part mainly

Figure 1. Nest of Smoky-fronted Tody-Flycatcher *Poecilotriccus fumifrons* under construction, Moutouchi ecolodge, Plateau des Mines, Saint-Jean, French Guiana, January 2010; note the still 'unroofed' and unfinished entrance (Michel Clément)

Figure 2. Nest of Smoky-fronted Tody-Flycatcher *Poecilotriccus fumifrons*, Vevoni, Approuage River, French Guiana, April 2013 (Mathias Fernandez)

Figure 3. Nest of Smoky-fronted Tody-Flycatcher *Poecilotriccus fumifrons*, Vevoni, Approuage River, French Guiana, May 2014 (Mathias Fernandez)

Figure 4. Nest of Smoky-fronted Tody-Flycatcher *Poecilotriccus fumifrons*, Tour de l'Île, Matoury, French Guiana, January 2014 (© Antoine Baglan)

Figure 5. Nest of Smoky-fronted Tody-Flycatcher *Poecilotriccus fumifrons*, Piste de Saut Bief near Cacao, French Guiana, March 2014 (Geneviève Gazel)

comprised *c*.5 mm-broad strips of monocotyledon leaves, i.e. true grasses (Poaceae) or sedges (Cyperaceae), and a few leaves of dycotyledons. No rhizomes, moss or spider's web were used. The inside of the nest chamber, measuring *c*.6 cm high by *c*.4 cm diameter, was lined with fine strips of grass leaves. The walls of the nest were 1.5–2.5 cm thick. The roofed side entrance comprised a short, rather loosely woven entrance, *c*.3 cm long and *c*.2.5 cm in diameter. The outer part of the nest was a looser structure constructed of broader strips of monocotyledon leaves.

On 20 March 2014, GG discovered a nest of the species along the Piste de Saut Bief (*c*.04°34′N, 52°27′W), a dirt road traversing fallow fields and active plantations to the rapids on the Comté River near Cacao (Fig. 5). The nest was *c*.80 cm above ground in vegetation between the dirt road and an abandoned clearing with low brushy vegetation and a few small trees. It was attached to a Solanaceae vine growing on a bush. The nest was constructed entirely of blades and strips of blades of herbaceous plants. On 31 March, O. Tostain (*in litt*. 2014) found one bird incubating two eggs. In the nearby vegetation, another agitated adult uttered the typical alarm call, a low rattling *kerrr* trill, quickly repeated 5–6 times. In the morning, at noon and in late afternoon, most passing vehicles along the dirt road disturbed the incubating bird, which would leave the nest briefly, returning after a few minutes. On 3 April between 08.31 and 09.27 h, the pair was seen arriving at the nest four times, with an interval of only 1–2 minutes between both birds. While one adult was in the nest, the second arrived, put its head inside for a moment and then flew off. The other adult followed later. We presumed that the eggs had hatched and that the adults were feeding small chicks. On 8 April, the nest was found on the ground, empty and destroyed.

Discussion

The nests of Smoky-fronted Tody-Flycatchers conformed to the closed/ovoid/pensile type in the system for describing nests of Neotropical birds proposed by Simon & Pacheco (2005), i.e. a pensile, pear-shaped, pouch-like nest with a tail of dangling material of variable length, usually up to *c*.15 cm, with a more or less roofed side entrance. They were similar to the nests of the species described by Penard & Penard (1910) and by Bichinski (2015) and to the known nests of other *Poecilotriccus*, although those of Slate-headed Tody-Flycatcher *P. sylvia* appear to lack a well-defined 'tail' (Skutch 1960) and the nests of Rufous-crowned Tody-Flycatcher *P. ruficeps* are 'tailless' or have a poorly defined 'tail' (Greeney *et al.* 2005).

Nests of the six *Poecilotriccus* species under discussion were all suspended less than *c*.3 m above ground, mostly from the tip of a twig, vine, slender branch or bamboo stem, in a site where the nest is not touching the surrounding vegetation, e.g. at the edge of or even within large patches of bamboo (*P. ruficeps*, Greeney *et al*. 2005), in an old treefall gap (*P. capitalis*, Kirwan 2011), in small openings in the understorey of second growth (*P. latirostris*, Greeney 2014), and at the edge of vegetation along a dirt road or a forest edge (*P. fumifrons* this study, Bichinski 2015), although dense vegetation used by the adults to discreetly approach the nest, was always nearby. Swampy forest nearby was found at four of eight nest sites studied by us.

Strips of grass, bamboo leaves and sedges are the main nest materials used by *Poecilotriccus* species, sometimes combined with other vegetation, e.g. *P. plumbeiceps*: fine grass stems with plant fibres and rootlets (de la Peña 1988); *P. sylvia*: grasses with moss and plant fibres (Walther 2004); *P. ruficeps*: bamboo leaves (*Chuquea* sp.) with moss (Greeney *et al*. 2005); *P. capitalis*: living and dead leaf parts with fine strips of bark, dark rootlets and rhizomorphs (Kirwan 2011); *P. latirostris*: strips of grass leaves (*Gynerium* sp.) and pale grass fibres with rootlets (Greeney 2014); and *P. fumifrons*: strips of dry grass (Poaceae) and sedge leaves (Cyperaceae), bamboo leaves, and other dry plant material (this study,

Bichinski 2015). However, the use of spider's web to bind the material as described for some *Todirostrum* tody-flycatchers (Walther 2004) has not been observed among *Poecilotriccus* species.

The dimensions of the *P. fumifrons* nest found by Bichinski (2015) agree very well with that measured by VP, with total length: 46 cm / 40 cm, dangling 'tail': 19 cm / 15 cm, nest diameter: 9 cm / 9.5 cm, diameter nest chamber: 3.5 cm / 4 cm, depth nest chamber: 7 cm / 6 cm and diameter of entrance: 2.4 cm / 2.5 cm.

For only two *Poecilotriccus* do we have any information concerning breeding season. In Napo province, north-east Ecuador, Rufous-crowned Tody-Flycatcher *P. ruficeps* is thought to breed from at least April until November, i.e. the second half of the wet and the onset of the dry season. However, the species may breed there year-round (Greeney *et al*. 2005). In Brazil, at Itagibá, Bahia (14°17′S, 39°51′W), V. P. Teixeira (www.wikiaves.com.br/565797 and www.wikiaves.com.br/581553) photographed a *P. fumifrons* nest in February. Nest building started around 5 February and the nest was complete on 17 February. The nest at Fortaleza do Tabocão, Tocantins (09°03′S, 48°31′W), studied by Bichinski (2015) was active in March. Thus, both nests were active in the second half of the wet and the early dry season in east-central Brazil (CRU 2015). In the Guianas, *P. fumifrons* breeds during the short dry and long wet seasons, i.e. from February to September (Penard & Penard 1910).

For *Poecilotriccus*, incubation periods are unknown, but a nestling period of 18–21 days is reported for Slate-headed Tody-Flycatcher *P. sylvia*. The similar-sized Common *Todirostrum cinereum* and Spotted Tody-Flycatchers *T. maculatum*, which also construct pensile, pouch-like nests, have incubation and nestling periods of *c*.18 days each. Assuming the same periods for *Poecilotriccus*, we calculated that construction of the eight nests of *P. fumifrons* in French Guiana started in December (n = 1), January (n = 1), February (n = 2), March (n = 2), April (n = 1) and June (n = 1). Therefore, we estimate breeding to occur from December through July, or throughout the wet season in French Guiana (Météo France 2014). When raining, the pear-shaped nest shape with broader strips of grass, sedge or bamboo leaves on the outside and the 'tail' of dangling nest material helps to shed rainwater, preventing the inside of the nest from becoming wet. Fig. 3 illustrates the raindrops on the nest material hanging below the nest.

Our observations also illustrate the high rate of nest failure for Neotropical passerines. At least three of five nests for which the outcome is known failed. Two were destroyed by predators. At one location, the same pair engaged in three successive breeding attempts within one month. Bichinski (2015) described predation of *P. fumifrons* nestlings by bullet ants *Paraponera clavata*. That bird nests in tropical environments suffer a high predation rate is well known (Skutch 1985). The pouch shape and suspended situation of nests of tody-flycatchers are presumed to reduce the risk of predation (Brosset 1974). Nests of *Todirostrum* tody-flycatchers are often constructed near active nests of paper wasps (Vespidae) (Walther 2004), probably as an anti-predator strategy. We did not notice an association with wasps at any of the nests of *P. fumifrons* we observed.

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Foraging behaviour and nest description of Rufous-breasted Piculet *Picumnus rufiventris*

by Tomaz Nascimento de Melo

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Summary.—Aspects of the foraging behaviour of Rufous-breasted Piculet *Picumnus rufiventris* are described for the first time, as well as a nest of the species. The observations were made in Rio Branco, Acre, in westernmost Brazil. The species used culms and branches of bamboo and vines as foraging substrates, and was observed consuming adult ants and their larvae. In early June 2013, an apparently recently fledged juvenile was observed accompanied by two adults near a hole in a dead tree, 1.14 m above ground. The characteristics of the presumed nest are described and compared to those of congenerics.

Rufous-breasted Piculet *Picumnus rufiventris* is a little-known species found in western Amazonia. It occurs from southern Colombia and eastern Ecuador south through eastern Peru and western Brazil to north-west and central Bolivia (Winkler & Christie 2002), and reaches up to 1,250 m in Peru (Schulenberg *et al*. 2007). It is considered a facultative specialist on bamboo (Kratter 1997), although it frequently occurs in other environments, such as understorey of *terra firme* and floodplain forest edges, second growth, river borders and typically in patches of *Gynerium* and bamboos (Winkler & Christie 2002, Schulenberg & Batcheller 2012). It is a relatively large *Picumnus* (Sick 1997, Schulenberg & Batcheller 2012). Despite its broad distribution in western Amazonia, the species appears uncommon, perhaps due to its inconspicuousness, it vocalises comparatively infrequently, and could be commoner than is known (Schulenberg & Batcheller 2012).

Little is known of the species' biology, ecology and behaviour, with no information on its diet (Winkler & Christie 2002, Schulenberg & Batcheller 2012). It is stated to forage alone or in pairs, 1–7 m above ground, sometimes with mixed-species flocks (Winkler & Christie 2002). *P. rufiventris* has strong feet that it uses to hang upside-down, pecking and investigating cracks in barks in live and dead wood, including thicker branches than other *Picumnus* (Winkler & Christie 2002, Schulenberg & Batcheller 2012). The only information concerning the species' breeding biology is that it nests in January–March in Peru and Bolivia, with juveniles collected in June and November. In Ecuador, the season is probably later (Short 1982, Winkler & Christie 2002).

Here I present new information on the foraging behaviour and breeding of *P. rufiventris* in Brazil, including the description of a presumed nest. Observations were made sporadically between March 2013 and September 2015, in the Zoobotanical Park, a 100-ha forest fragment west of the Federal University of Acre (UFAC) campus (09°57′S, 67°57′W; 250 m), municipality of Rio Branco, eastern Acre state. Vegetation in the park is secondary in several stages of regeneration, with *Guadua weberbaueri* (Poaceae) bamboo patches in many areas (Guilherme 2001). Fine-barred Piculet *P. subtilis* also occurs at the site, but only in open parts of the UFAC campus. Two additional Picidae occur in bamboo patches in the area: Little Woodpecker *Veniliornis passerinus* and Rufous-headed Woodpecker *Celeus spectabilis*.

Observations were made using binoculars, and behaviour was described in a field notebook. Playback was not used, with individuals being located by the sound of the bird's bill tapping on the substrate.

Figure 1. Rufous-breasted Piculet *Picumnus rufiventris* foraging on secondary bamboo branches (A), vines (B), a branch of the exotic bamboo of the genus *Phyllostachys* (C) and a hole made by the species in a bamboo culm (Tomaz Nascimento de Melo)

Figure 2. Nest hole of Rufous-breasted Piculet *Picumnus rufiventris*, Zoobotanical Park, Rio Branco, Acre, Brazil, June 2013 (Tomaz Nascimento de Melo)

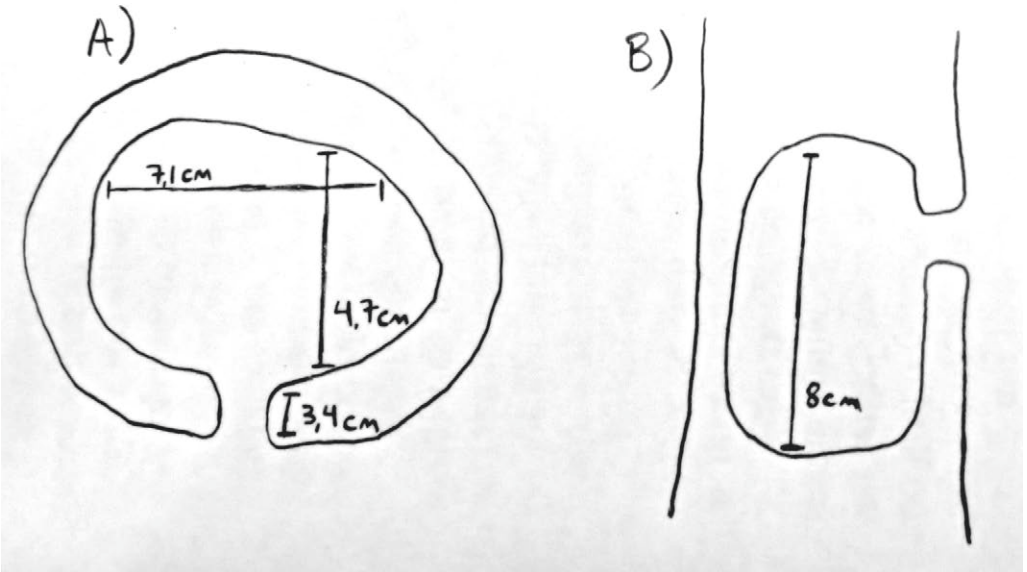

Figure 3. Schematic drawing of Rufous-breasted Piculet *Picumnus rufiventris* nest: (A) top view of internal cavity, and (B) side view of the internal cavity.

Foraging behaviour

Of 23 foraging events recorded, *P. rufiventris* was observed several times in mixed-species flocks led by Bluish-slate Antshrike *Thamnomanes schistogynus* (n = 3). During most observations, pairs were seen foraging close together (n = 18). Foraging height was 1–6 m. Substrates on which the species foraged involved bamboo culms (n = 10), secondary bamboo branches (n = 8; Fig. 1A), vines (n = 4; Fig. 1B), and, once, a bird was seen foraging on a branch of an exotic bamboo *Phyllostachys* sp. (Poaceae; Fig. 1C). When foraging on bamboo substrates, *P. rufiventris* preferred culms and live branches (n = 11), and focused its efforts on internodes, with an average of 2–3 holes per internode. The species assumed many acrobatic postures when foraging; usually it climbs the bamboo, occasionally tapping the substrate and, subsequently, focuses efforts on one spot. Twice, individuals were observed taking adult and larvae ants, extracted from bamboo branches. The mean dimensions of holes made by *P. rufiventris* were 3 × 8 mm (n = 8; Fig. 1D).

Nest

In 3 June 2013, a pair of *P. rufiventris* was observed with a juvenile, perched beside a cavity in a dead tree. The juvenile called frequently, while the adults gave short sharp calls and appeared alarmed, often changing perches, possibly due to my presence. The juvenile had rufous underparts, but was overall paler, lacking the typical white-spotted black crown of adults. After a few minutes, the birds flew away and it was not possible to follow them. Given the behaviour I witnessed, and the proximity of the birds, the cavity was assumed to be the nest site, although they were never observed entering or leaving the hole. It is possible the chick had just fledged, immediately prior to my observation. The nest (Fig. 2) was sited in a dead tree, dbh 41 cm, 1.14 m above ground. The external entrance hole was oval-shaped, 3.5 × 2.6 cm wide, with a diameter of 3.4 cm. The interior of the cavity was 8 cm

deep and had a diameter of 7.1 × 4.7 cm (Fig. 3), and within there were ant and beetle elytra remains. Cavity measurements were taken after the birds left the site and the data were collected by cutting the trunk horizontally above the nest hole. The surrounding vegetation was characterised by a dense understorey, with abundant bamboos and vines.

Discussion

Following mixed-species flocks and foraging height correspond to the information presented by Winkler & Christie (2002) and Schulenberg & Batcheller (2012). My observations reinforce the fact that this *Picumnus* has, due to its large feet, the capacity to explore thicker substrates, not being restricted to thin branches like congenerics, as mentioned by Schulenberg & Batcheller (2012), although the species does not utilise bamboo culms as heavy as those exploited by *Veniliornis passerinus* and *Celeus spectabilis*, thereby diminishing potential competition between them and *P. rufiventris*.

The species' foraging behaviour is not well documented (Winkler & Christie 2002, Schulenberg & Batcheller 2012). It did not use a broad variety of substrates, possibly because, at my study site, bamboo culms and vines are the most abundant substrates in the understorey. The observation of foraging in an exotic bamboo, which is structurally similar to native bamboos of the genus *Guadua*, indicates that it is presumably vegetation structure that is fundamental to the species' foraging behaviour, like that of other species associated with bamboo forests, as demonstrated by Socolar *et al*. (2013). Consumption of ants and their larvae has also been documented for two other woodpecker species dependent on bamboos: *Celeus spectabilis* (Kratter 1998) and Kaempfer's Woodpecker *C. obrieni* (Leite 2013).

The breeding season coincides with that reported for Peru and Bolivia, with juveniles previously collected in June (Short 1982). According to Winkler & Christie (2002), this is the first description of the species' nest. Few data on breeding are available for species of *Picumnus*, compared to larger woodpeckers. For only six of the 27 species in the genus is detailed information on nests available, with a few data for several more (Winkler & Christie 2002). The nest of *P. rufiventris* shares features with nests of other *Picumnus*. The entrance hole is 2 × 3.7 cm in White-barred Piculet *P. cirratus* (Kirwan 2009), 3 cm in White-wedged Piculet *P. albosquamatus*, 2.2 × 2.5 cm in Olivaceous Piculet *P. olivaceus* (Winkler & Christie 2002) and 2.5 cm in Ochraceous Piculet *P. limae* (Silva *et al*. 2012). Although *P. rufiventris* is considered a large species of *Picumnus*, the interior of the nest cavity is shallower than that documented for *P. cirratus* (10–20 cm: Kirwan 2009), but similar to *P. olivaceus* (9 cm: Winkler & Christie 2002). The cavity's internal diameter is similar to that reported for *P. cirratus* (5 × 6.3 cm: Kirwan 2009) and *P. olivaceus* (5–6 cm: Winkler & Christie 2002). Nests sited less than 2 m above ground are common in the genus, like that described here (Winkler & Christie 2002, Silva *et al*. 2012).

My observations contribute to knowledge of diet and foraging behaviour for *P. rufiventris*, as well as involving the first description of a nest for this poorly known species. In Acre, the species occurs in floodplain forests and open forests with bamboo, and can be common, especially where bamboos abound in the understory. The few data on its biology and ecology partially reflect the species' inconspicuous behaviour and the dense understorey environment it inhabits, hampering data collection.

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Reappraisal of plumage and morphometric diversity in Thick-billed Grasswren *Amytornis modestus* (North, 1902), with description of a new subspecies

by Andrew Black

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Summary.—Morphological, distributional, ecological and genetic studies distinguish seven subspecies within Thick-billed Grasswren *Amytornis modestus*. One, newly described here from the Sturt Stony Desert in north-eastern South Australia, is the palest and least streaked, and has a relatively short bill and wings. It is estimated to be Vulnerable under IUCN criteria with a known Extent of Occurrence of <1,500 km². Two subspecies are extinct and one is Critically Endangered. Parapatry has been recognised recently between two genetically divergent subspecies but all of the others are presently inferred to be allopatric.

Thick-billed Grasswren *Amytornis modestus* is one of 11 presently recognised species within the purely continental Australian genus *Amytornis* (Black *et al*. 2010, Christidis *et al*. 2010). The species once ranged across arid central and semi-arid south-eastern Australia in up to eight largely allopatric populations (Black *et al*. 2010, 2011, Black 2011a) (Fig. 1). Grasswrens are very specific in their habitat requirements (Rowley & Russell 1997, 2007) and, while most are dependent upon 'spinifex' tussock grasslands, Thick-billed Grasswren is almost entirely restricted to chenopod low shrublands, generally in depressions and drainage lines on stony plains. Two of five subspecies of its sister species Western Grasswren *Amytornis textilis* also occupy (or occupied) chenopod low shrublands (Black 2011b).

Among the eight populations of *A. modestus* there are six named subspecies and one population that is not formally named. A phylogenetic study, sequencing mitochondrial DNA (ND2) (Austin *et al*. 2013), found a clade of western distribution comprising the first two subspecies named below, each constituting an almost monophyletic haplogroup. Net DNA divergence between that clade and another (eastern) clade was 1.7%. The second clade contained four allopatric populations (3–6 below), none monophyletic but each with unique haplotypes, the pattern indicating incomplete sorting between more recently diverged lineages. Estimated time to most recent common ancestor was *c*.0.11 MYA, i.e. towards the end of the last interglacial (Fig. 1). Morphological and plumage distinctions among the eight populations, presented below, are taken from Black (2011a) with habitat data from Black *et al*. (2011) unless otherwise qualified. Their known or inferred historical distributions are shown in Fig. 2.

(1) *Amytornis m. modestus* (North, 1902). The unique and atypical habitat of the long-tailed, relatively dark but lightly streaked nominate subspecies, now extinct, was Sandhill Canegrass *Zygochloa paradoxa* along the sandy beds of watercourses within the mountains of central Australia, in Northern Territory (NT) (Whitlock 1924, Black 2012).

(2) *A. m. indulkanna* (Mathews, 1916). The closely related (Austin *et al*. 2013) but paler and much shorter tailed subspecies of the western Lake Eyre basin in South Australia (SA) occurs chiefly in low shrublands of Oodnadatta Saltbush *Atriplex nummularia omissa* or Cottonbush *Maireana aphylla*.

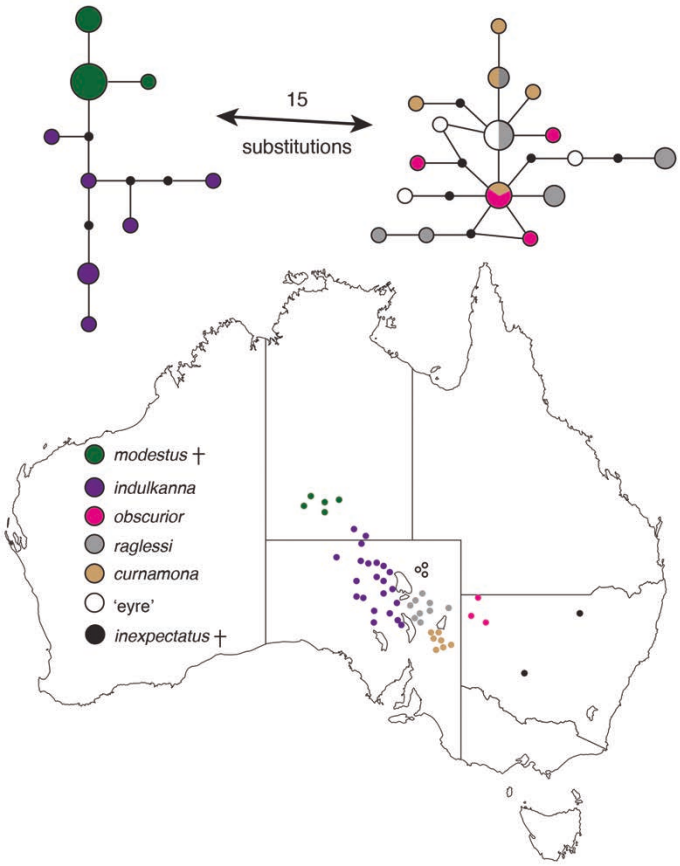

Figure 1. Map of Australia, showing occurrence of Thick-billed Grasswren *Amytornis modestus* subspecies with the unrooted mitochondrial DNA (ND2) network, after Austin *et al*. (2013).

(3) *A. m. raglessi* Black, 2011, of the North Flinders Ranges (SA) periphery belongs to a separate (eastern) clade, but is phenotypically very similar to *A. m. indulkanna* other than, on average, having a longer tail. Its habitats are low shrublands of Blackbush *Maireana pyramidata* and less frequently Low Bluebush *Maireana astrotricha*. Genetic divergence between the two clades (Austin *et al.* 2013) suggests their vicariance across the Eyrean Barrier (Ford 1987, Schodde & Mason 1999) during the late Pleistocene (*c*.0.36 MYA).

(4) *A. m. curnamona* Black, 2011, of the southern Lake Frome basin (SA) is darker and longer tailed than *A. m. raglessi* and is largely restricted to Blackbush low shrubland but occurs infrequently in low shrublands of Spiny Saltbush *Rhagodia spinescens* and Australian Boxthorn *Lycium australe*.

(5) *A. m. obscurior* (Mathews, 1923) of the Grey Range periphery in north-western New South Wales (NSW), long considered extinct, was rediscovered in 2008 in a tiny and highly endangered population (Parker *et al*. 2010) that occurs in Blackbush and Cottonbush low shrublands (AB pers. obs.).

(6) *A. m.* 'eyre'. The fourth population within the eastern clade occupies a limited range in the stony plains east of Lake Eyre (SA), within a partially resolved drainage into

the Warburton River below Goyder Lagoon in the Diamantina River system (Fig. 7). Its habitats are Old-man Saltbush *Atriplex nummularia nummularia* shrubland and low shrublands of Cottonbush, Oodnadatta Saltbush and Spiny Saltbush. It has not been formally described.

(7–8) *A. m. inexpectatus* (Mathews, 1912). Only one specimen representing this subspecies is held in an Australian museum and it proved uninformative in the DNA sequencing study of Austin *et al*. (2013). It was described from two separate populations >400 km apart in eastern NSW. Habitats occupied by these long-extinct populations have not been confidently determined but were probably chenopod or Nitrebush *Nitraria billardierei* shrublands or low shrublands (Parker 1972, McAllan 1987).

An earlier morphological review of the species (Black 2011a) examined four of the above subspecies (epithets used hereafter for simplicity), *modestus*, *indulkanna*, *raglessi* and *curnamona*, while the phylogenetic study (Austin *et al.* 2013) included the same four plus *obscurior* and 'eyre'. Subsequent examination of specimens of *inexpectatus* in North American and European museums (Black *et al*. 2014) now provides an opportunity to reappraise plumage and morphological diversity within the species as a whole.

This review will include the unnamed 'eyre' population, represented by a small number of museum specimens, and will provide its formal description and name. Only two specimens are available of the now Critically Endangered population of *obscurior* and the only adult male (in the Mathews collection, American Museum of Natural History, New York) was included within the review.

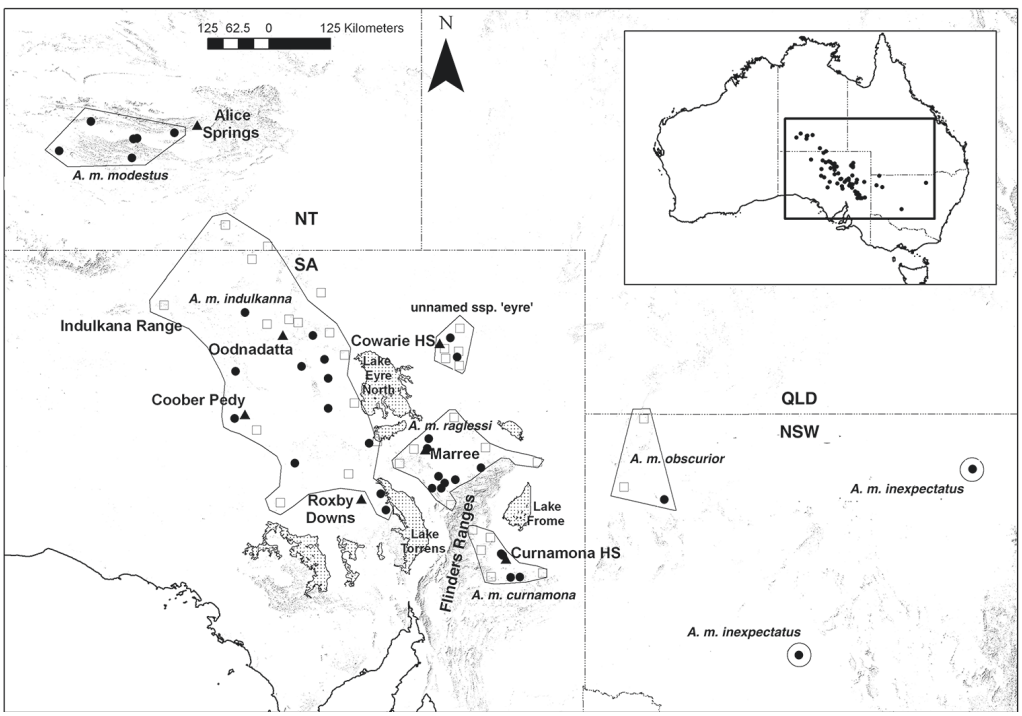

Figure 2. Map of central and inland south-eastern Australia, showing the distribution of Thick-billed Grasswren *Amytornis modestus* subspecies. Specimens included in this study are represented as closed circles, other distributional records as open squares, after Black (2011a).

Methods

Methods follow those employed in the earlier review (Black 2011a) of morphometry and plumages of *A. modestus* material in Australian museum collections. Sampled in that review were 51 specimens: six male and six female *modestus*, nine male and four female *indulkanna*, 11 male and ten female *raglessi*, and three male and two female *curnamona*. Four morphological parameters assessed were bill length (from the junction of skull and culmen to tip), bill depth (at the point of frontal feathering), wing length (max. flattened chord) and tail length (the central rectrix from its point of emergence to tip). Statistically significant differences were found in the tail length of males. Female sample sizes were small and comparisons proved statistically uninformative. The same four subspecies were tested further using factor analysis after quantifying two plumage characteristics—depth of dorsal tone and strength of ventral streaking—and each was found to be reciprocally diagnosable.

The present study involved a comparative analysis of 42 male specimens of all seven subspecies, including the unnamed 'eyre'. Sample sizes of specimens with complete data were: *modestus* (n = 7), *indulkanna* (n = 9), *raglessi* (n = 11), *curnamona* (n = 3), 'eyre' (n = 4), *obscurior* (n = 1) and *inexpectatus* (n = 8).

In distinguishing all subspecies, the measured parameters (as above) were first compared between subspecies within each of the two established genetic clades, using univariate parametric statistics. Within the eastern clade, the largest sample (*raglessi*, n = 11) was used primarily as the statistically most applicable comparator. The moderately well collected but genetically unsampled *inexpectatus* (n = 8) was compared to subspecies with the closest values. Subsequently, the combined morphometric data were tested using factor analysis. In the present study, the qualitative plumage variables—depth of tone and strength of ventral streaking—were considered independently.

Results

Measurements of wing and tail length plus bill length and depth of males of seven subspecies are presented in Table 1. The results of factor analysis of all seven subspecies are shown in Fig. 3. Factor 1 largely reflects bill depth and relative bill 'thickness', and factor 2

TABLE 1
Morphometrics of seven subspecies of Thick-billed Grasswren *Amytornis modestus*. Asterisks indicate statistically significant parameters referred to in the text.

Subspecies	***n***	**wing**	**tail**	**bill length (L)**	**bill depth (D)**	**L/D**
modestus mean ± SD	7	62.1 ± 1.7	80.8 ± 2.5 *	12.6 ± 0.7	6.2 ± 0.3	2.0 ± 0.1
range		59–64	76.1–83.6	11.3–13.5	5.9–6.9	1.8–2.2
indulkanna mean ± SD	9	60.0 ± 3.0	69.5 ± 2.9	13.3 ± 0.7	6.1 ± 0.3	2.2 ± 0.1
range		57–66	65.1–73.8	12.2–14.4	5.8–6.6	2.1–2.3
raglessi mean ± SD	11	61.3 ± 1.8	74.5 ± 2.8	13.1 ± 0.6	6.3 ± 0.2	2.1 ± 0.1
range		59–64	69.3–77.8	11.9–13.7	5.9–6.6	1.9–2.3
curnamona mean ± SD	3	61.0 ± 2.6	78.1 ± 0.6 *	13.2 ± 1.4	6.2 ± 0.4	2.1 ± 0.1
range		58–63	77.6–78.8	12.2–14.8	5.8–6.5	2.0–2.3
'eyre' mean ± SD	4	58.3 ± 1.0 *	72.9 ± 2,5	12.0 ± 0.3 *	6.1 ± 0.4	1.9 ± 0.1
range		57–59	70.6–76.5	11.7–12.2	5.6–6.6	1.8–2.1
obscurior mean ± SD	1	61	80	12.9	6.1	2.1
range		61	80	12.9	6.1	2.1
inexpectatus mean ± SD	8	62.1 ± 3.4	82.7 ± 4.2 *	12.6 ± 0.9	5.4 ± 0.3 *	2.3 ± 0.2
range		57–68	79.5–91.2	11.3–13.6	5.0–5.9	2.0–2.5

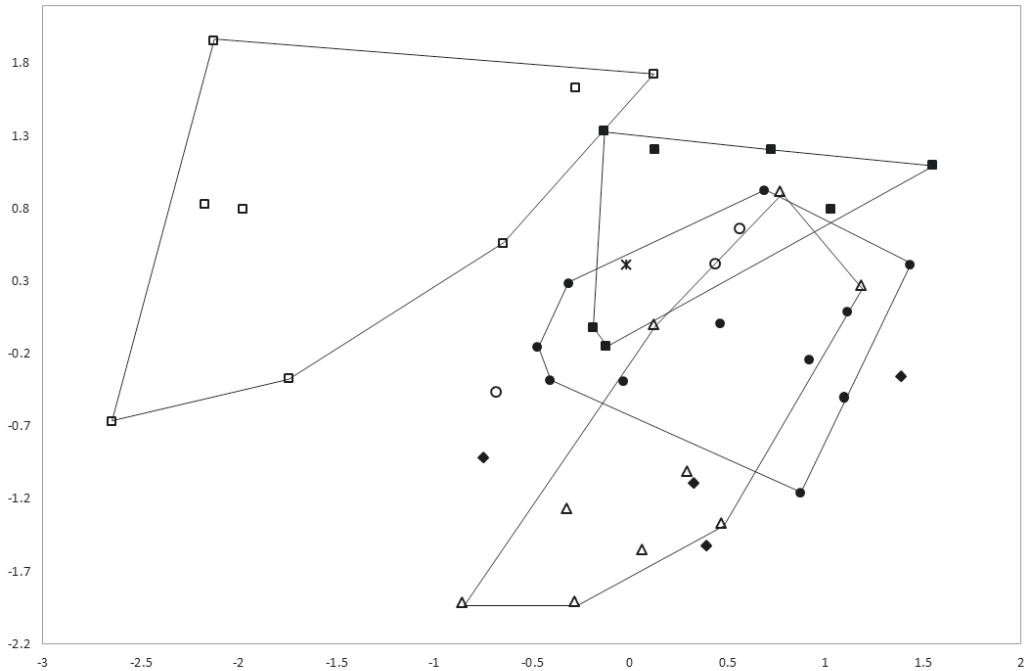

Figure 3. Factor analysis of the seven subspecies of Thick-billed Grasswren *Amytornis modestus*: *A. m. modestus* = closed squares, *A. m. inexpectatus* = open squares, *A. m. indulkanna* = open triangles, *A. m. raglessi* = closed circles, *A. m. curnamona* = open circles, *A. m. obscurior* = star and 'eyre' = closed diamonds. Loadings for factor 1 (horizontal axis) are bill depth 0.584 and length /depth ratio -0.434; for factor 2 (vertical axis) wing 0.626 and tail 0.563.

reflects wing and tail lengths. The non-metric variables dorsal tone and strength of ventral streaking are illustrated in Figs. 4–6 and discussed further below.

Discussion

Black (2011a) described distinguishing character states of plumage variables for subspecies *modestus* (darker above, very lightly streaked below), *indulkanna* and *raglessi* (pale and lightly streaked) and *curnamona* (darker and more heavily streaked). The 'eyre' population is paler than all of the named subspecies (Figs. 4–5), except perhaps *obscurior* which, from observations of live birds in the hand, may be almost as pale, but appears relatively darker on the head (Fig. 6). Because subspecies *obscurior* is unrepresented in Australian collections and *inexpectatus* by only a single historical example, direct comparison between those two and other subspecies has not been practicable. Nevertheless, specimens in overseas collections of the latter extinct subspecies appear, while taking into account dulling and browning with age, darker and more heavily streaked than most other subspecies (Black *et al*. 2014) and perhaps most closely resemble the *curnamona* phenotype in these respects.

Univariate analysis revealed that, within the western clade, its two subspecies *modestus* and *indulkanna* are reliably separated by tail length, with no overlap (p = 0.0001), the first-named being the second longest-tailed within the species and the latter among the shortest. In the eastern clade of four subspecies, tails of *curnamona* are longer than both *raglessi* (p = 0.046) and 'eyre' (p = 0.018), and the tail of the single *obscurior* specimen is longer than any of the specimens of the other three. Compared with others in the same clade, 'eyre' is short-

Figure 4. Dorsal view of four subspecies of Thick-billed Grasswren *Amytornis modestus*, from left to right: SAMA B55670 *A. m. indulkanna*; SAMA B55666, the similar but genetically divergent *A. m. raglessi*; SAMA B55710, the dark-plumaged *A. m. curnamoma*; and SAMA B56067, holotype of the pale newly described *A. m. cowarie* (© P. Gower)

Figure 5. Ventral view of the same specimens as in Fig. 3, showing variation in the strength of ventral streaking (© P. Gower)

winged and short-billed (*cf. raglessi* $p = 0.008$ and $p = 0.004$, respectively). Outside the two recognised clades, the genetically unsampled subspecies *inexpectatus* is even longer tailed than nomino-typical *modestus* ($p = 0.0001$) and is relatively slender billed (*cf.* 'eyre' $p = 0.007$).

Factor analysis (Fig. 3) revealed that the easternmost subspecies *inexpectatus* separates from all others, principally on account of its being the longest tailed and least 'thick-billed'.

Figure 6. Male of the Critically Endangered subspecies of Thick-billed Grasswren *Amytornis modestus obscurior* (© L. P. Pedler)

In the western clade, *modestus* and *indulkanna* are almost mutually exclusive. Individual subspecies of the eastern clade are separated incompletely, the larger *raglessi* sample partly overlapping *curnamona* and the single *obscurior* sample, both of those being longer tailed, but largely excluding 'eyre,' which is shorter winged and shorter billed.

Black *et al*. (2011) examined the distribution of four Thick-billed Grasswren subspecies in South Australia and suggested that all were allopatric, with most separated by distances of *c*.100–200 km. The smallest inferred separation was between the most genetically divergent subspecies *indulkanna* and *raglessi*, where the closest known records were just *c*.60 km apart. Those subspecies have now been shown to be parapatric and intergradient (A. Slender pers. comm.), indicating population expansion, most likely of the first-named subspecies, subsequent to their postulated late Pleistocene vicariance. With this exception, the closest subspecies are now 'eyre' and *raglessi*, with known outlying records *c*.110 km apart and separated by dune fields of the Simpson-Strzelecki Desert complex and the Lower Cooper Creek floodplain. The former region is occupied by another member of the genus, Eyrean Grasswren *A. goyderi* (Fig. 7). Extinct *A. m. modestus* of central Australia (NT) appears also to have been allopatric, separated from *A. m. indulkanna* by 100–200 km (Black 2012). The two eastern subspecies, *obscurior* and *inexpectatus*, are even more isolated, the former >200 km east of both *raglessi* and *curnamona*, with the Strzelecki Desert intervening, and the latter on the opposite side of the Murray-Darling basin, another 500 km further east.

Relatively slight but statistically significant differences in morphology, plumage and mitochondrial DNA permit the identification of seven subspecies within Thick-billed Grasswren. One, the population given an informal epithet 'eyre', was previously undescribed and unnamed.

Amytornis modestus cowarie subsp. nov.

Holotype.—Adult male, SAMA B56067, collected and prepared by L. P. Pedler, near Karakaranthina Creek, *c*.12 km east of Cowarie Homestead, north-eastern South Australia (27°42.0′S, 138°25.85′E), on 24 September 2008. Mass 20 g, wing (max. flattened chord) 58 mm, tail (central rectrix from emergence to tip) 72.3 mm, bill length (from skull to tip) 11.7 mm, bill depth (at level of frontal feathering) 6.1 mm.

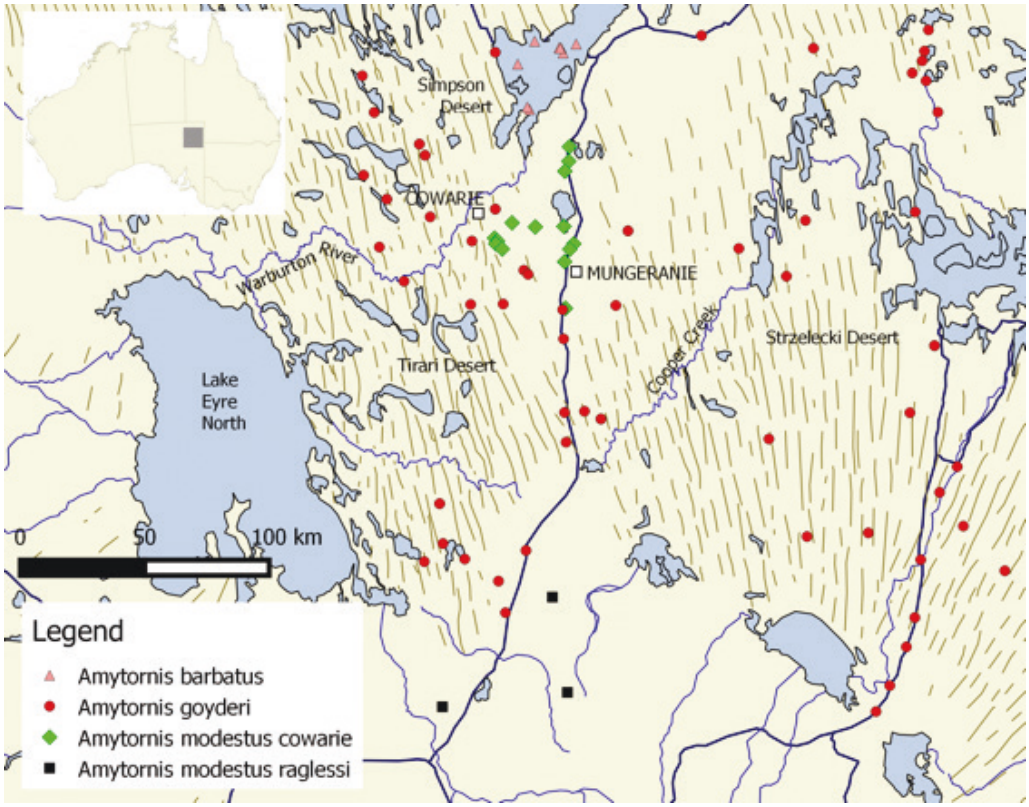

Figure 7. Map of north-eastern South Australia east of Lake Eyre, showing localities of all known records of the newly described *Amytornis modestus cowarie*. Also shown are immediately surrounding records of Eyrean Grasswren *A. goyderi* and Grey Grasswren *A. barbatus*, as well as the three northernmost records of *A. modestus raglessi*.

Paratype.—Adult female, SAMA B56235, collected and prepared by L. P. Pedler, near Birdsville Track, Cowarie Station, *c*.25 km north of Mungeranie Homestead, north-eastern South Australia (27°48.0′S, 138°43.6′E), on 26 October 2009. Mass 17 g (nematode infestation), wing 60 mm, tail 67.8 mm, bill length 11.7 mm, bill depth 5.6 mm.

Plumage description of holotype.—Colour assessment is based on Smithe (1975), following D. I. Rogers and K. Bartram (*in* Higgins *et al*. 2001: 442–443) for their descriptions of *A. m. indulkanna* and *A. m. raglessi* (given as *A. textilis modestus*). Centre of frons and crown dark (hair) brown (119A), each feather becoming paler towards the edge, with off-white shaft-streaks (paler than drab grey / pale horn 119D/92). Rest of crown, nape and back and sides of neck much paler (light drab / drab grey 119C/D) with similarly paler feather edges and off white shaft-streaks. Small area of side of frons and upper lores forms subtly tinted fore-supercilium (Yellow ochre 123C). Lower lores, face, ear-coverts dark to light drab (119B/C) with feather edges and shaft-streaks (as above) prominent, producing a distinctly streaked effect. Chin and throat nearly as pale as the off-white shaft-streaks (pale 119D/92) rendering the latter almost imperceptible. Mantle and scapulars grading between pale back of neck (119C/D) and slightly darker back, rump and uppertail-coverts (119B/C). Upper breast as throat, lower breast, belly and vent similar (pale 119D/92) but unstreaked. Tibial feathers and flanks pale buff (119C/D / tawny olive 223D). Uppertail dark drab (119B) with pale fringes (119D / 223D). Undertail light drab (119C) with similarly pale fringes.

Upperwing-coverts light drab (119C), remiges darker (119B/C) with similar pale edges. Bases to outer webs of inner primaries subtly tinted (Yellow ochre (123C) forming patch at base of primaries on folded wing.

Variation.—Of five specimens, there is slight variation in the depth of tone and in the extent of pale buff coloration on the flanks. The paratype bears the hallmark of females of the species, an irregular bright tawny (38) patch on the lower breast-sides / flanks.

Diagnosis.—This restricted-range subspecies is (with *A. m. obscurior*) the palest and is the least streaked ventrally of all, and is included in a phylogroup of four that is genetically divergent from *A. m. modestus* and from *A. m. indulkanna*. It is readily distinguished from the dark, heavily streaked and long-tailed, far eastern *A. m. inexpectatus* that is unsampled molecularly. Within its own phylogroup, it has a shorter tail (mean 72.9 mm, range 70.6–76.5 mm) than *A. m. obscurior* (80 mm for the only male specimen) and *A. m. curnamona* (mean 78.1 mm, range 77.6–78.8 mm), but only relatively shorter than *A. m. raglessi* (mean 74.5 mm, range 69.3–77.8 mm), from which it is distinguished by shorter bill and wing measurements, more lightly streaked underparts and paler plumage.

Etymology.—Named for the pastoral property Cowarie Station, which harbours almost its entire known population and which itself is named after a small locally occurring carnivorous marsupial, the Kowari *Dasyuroides byrnei*. The name is that of the Dieri people of the region, in earlier orthography rendered Kau-ri by the Lutheran missionaries, Homann and Koch in their 1870 'primer' (H. Kneebone pers. comm.) and as Cowirrie by Gason (1879).

Distribution.—Known only from stony rangelands of the southern (and major portion) of the Sturt Stony Desert, to which it is confined by the surrounding sand dunes of the Simpson, Tirari and Strzelecki Deserts in the west, south and east, respectively, and by the Warburton River floodplain in the north. The sand dune deserts named above provide the particular habitat requirements of Eyrean Grasswrens *A. goyderi* and the Warburton floodplain likewise supports Grey Grasswrens *A. barbatus diamantina*. The nearest conspecific population, *A. m. raglessi*, is present in similar stony rangelands to the south, beyond the Tirari Desert and Cooper Creek floodplain, its closest known locality being *c*.110 km from the southernmost record of *A. m. cowarie* near Mungeranie (Fig. 7).

Conservation status.—The known Extent of Occurrence (EOO) of this subspecies is <1,500 km². Among other subspecies, the Area of Occupation (AOO) has been estimated to be no greater than 4% of the EOO (Garnett *et al*. 2011), which would translate into <60 km² AOO for the new subspecies. Population density is probably similar to that of *A. m. indulkanna*, which is estimated at four adults/km² (AB pers. data) and the total population of *A. m. cowarie* therefore probably numbers fewer than 1,000 mature individuals. The above data indicate a conservation status of Vulnerable (IUCN 2012).

Summary of subspecific divisions in *Amytornis modestus*

Conservation status is provided, as assessed by Garnett *et al*. (2011), applying contemporary IUCN criteria.

A. m. modestus
Extinct. Long-tailed, darker dorsally but very lightly streaked below. Unique habitat.

A. m. indulkanna
Least Concern. Pale and lightly streaked, very short-tailed. Genetically distinct from *A. m. modestus*, but in the same western clade.

A. m. raglessi
Vulnerable. Similar to the previous subspecies but slightly longer tailed and genetically divergent, within a separate eastern clade.

A. m. cowarie
Not assessed by Garnett *et al*. (2011) but Vulnerable if same criteria applied. The palest subspecies of all, relatively short-billed and short-winged.

A. m. curnamona
Near Threatened. The darkest and most heavily streaked within the eastern clade, longer tailed than *A. m. raglessi* and *A. m. cowarie*.

A. m. obscurior
Critically Endangered. Perhaps the longest-tailed within the eastern clade and paler than all but *A. m. cowarie*.

A. m. inexpectatus
Extinct. The longest-tailed subspecies, relatively slender billed, dark and heavily streaked.

Acknowledgements
I am deeply indebted to Graham Carpenter and Lynn Pedler for their exceptional field skills in finding grasswrens and doubly to Lynn for his perseverance and labour in obtaining and preparing the fine study skins that underpin this analysis of diversity within the species. Philippa Horton, Leo Joseph and Les Christidis have encouraged my interest in the genus over many years, and I am grateful to Nate Rice, Academy of Natural Sciences Philadelphia, Paul Sweet and Mary LeCroy, American Museum of Natural History, New York, and Steven van der Mije, Naturalis Biodiversity Center, Leiden, for access to their collections. I also acknowledge the support and interest of Sharon Oldfield and her family, owners and managers of Cowarie Station. Heidi Kneebone advised me on Dieri names, Terry Reardon produced the statistical analysis and Jeremy Austin and Brian Blaylock prepared the maps, one modified from Margaret Cawsey. I thank them all. Eleanor Russell and Dick Schodde, as well as the editor and an anonymous reviewer, suggested helpful amendments to the submitted manuscript. Nomenclature in this paper was reviewed by the Working Group on Avian Nomenclature of the International Ornithologists' Union.

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Rediscovery of a long misattributed and misidentified Darwin Beagle bird specimen

by Zoë Varley, Joanne Cooper & Robert Prŷs-Jones

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Steinheimer (2004) provided a most useful appendix that lists all bird specimens that Charles Darwin is known to have collected during the second voyage of *HMS Beagle* (1831–36), together with information on their then current status. As a result of their complicated post-Beagle history, this list reveals that the whereabouts of the majority of Darwin's specimens were unknown. Since then only two additional Darwin's Beagle birds have come to light: a mounted Cinereous Harrier *Circus cinereus* in Naturalis, Leiden, the Netherlands (van Grouw & Steinheimer 2008), and an egg of Spotted Nothura *Nothura maculosa* in the University Museum of Zoology, Cambridge, UK (Lowe *et al*. 2010).

During research into the bird specimens of Captain (later Vice-Admiral) Robert FitzRoy[1] from the same voyage, held at the Natural History Museum (NHM) (Sharpe 1906), we noted that an owl specimen (Fig. 1a) stored among specimens of Short-eared Owl *Asio*

A

B

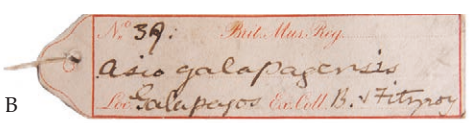

Figure 1(a). Specimen supposedly of Short-eared Owl *Asio flammeus galapagoensis* and collected by Captain Robert FitzRoy during the 1831–36 voyage of *HMS Beagle*, but actually an *A. f. suinda* collected by Charles Darwin on the same voyage; (b) NHM label on specimen; (c) metal tag, with appended mm scale, on specimen (Lucie Goodayle / © Natural History Museum, London)

C

[1] We follow Sulloway (1982) and McConnell (2004) in adopting this spelling of FitzRoy's name, except in direct quotes.

flammeus galapagoensis with an NHM label[2] stating '*Asio galapagensis* [*sic*] Galapagos B. & Fitzroy' (Fig. 1b—NB: no registration no. is given) also had a tiny metal tag attached, *c*.1 cm in diameter, concealed in the tarsal feathering and bearing the inscription '41.1.18.15' (Fig. 1c). The NHM register details for this 1841 registration number are '*Otus brachyotus* Maldonado (1270) Pres. by C. Darwin, Esq.'[3]. Steinheimer (2004, appendix p. 15) had noted the latter specimen, with a Darwin specimen number of 1270, as 'missing since 1875', based on the fact that Sharpe (1875) failed to mention it in his catalogue of owl specimens then present at NHM.

Going back even further, Darwin's specimen was also not mentioned in either of the first or second editions of the first published catalogue of owls present in NHM (Gray 1844, 1848), despite these being produced just a few years after the arrival of Darwin's specimen in 1841. In this context, Darwin had in early 1837 presented the great majority of his Beagle bird skins to the Zoological Society Museum of London (ZSM) for its curator, John Gould, to research. A substantial proportion of these subsequently ended up at NHM in 1855, when ZSM was disbanded. However, Darwin had previously donated 13 bird skins (reg. numbers: 1839.8.4.1 and 1841.1.18.15–26) to NHM, seemingly because he had requested G. R. Gray, then NHM bird curator, for his assistance in completing the bird sections of the zoology of the Beagle's voyage (Steinheimer 2004). The owl '41.1.18.15' formed part of the 1841 donation.

Unlike Darwin's Beagle specimens, those bird skins collected by or on behalf of FitzRoy were presented directly to NHM in 1837 by 'Sir W. Burnett and Captain Fitzroy R.N.' and registered in the series 1837.2.21.231–417, with a single egg registered as 1837.3.15.16 (*sic*—not 37.3.15.1 as given by Sharpe 1906: 323)[4]. Among FitzRoy's 187 bird skins, the register lists a minimum of two owls as donated by him; only a minimum figure can be given as some specimens are both unidentified in the register and have yet to be located during ongoing research. The first of these is listed as 1837.2.21.235 '*Strix* - ♂. 247 Falkland Islands', where 247 is FitzRoy's specimen number. Specimen 1837.2.21.235 is still at NHM and is an example of *Asio flammeus sanfordi* (modern taxonomy follows Dickinson 2003), endemic to the Falkland Islands.

The other specimen is listed in the register as 1837.2.21.244 '*Strix galapagoensis* ♀ 437 Galapagos. James Island', where the word '*galapagoensis*' is clearly a later insert, written in a different hand. Specimen 1837.2.21.244 is in fact FitzRoy's holotype of *Tyto alba punctatissima* from James Island, Galápagos (Warren 1966), the only specimen of this taxon collected during the Beagle's voyage (Darwin *in* Gould 1839). Indeed, Gray (1844: 54, 1848: 110) listed this specimen of Burnett & FitzRoy from the Galápagos as his sole entry under *Strix punctatissima*; furthermore, in Gray's personal copy of the latter publication, '37.2.21.244' has been pencilled in alongside the entry[5].

[2] The NHM was still part of the British Museum when the label was attached, but is referred to as NHM throughout this paper. A synopsis of relevant name changes is given by Prŷs-Jones *et al*. (2014).

[3] The first volume of the NHM Aves Register (1837–53) is a copy made in the 1900s of the sections relating to birds in the original Zoology Register, which covers a wider array of animal groups (Wheeler 1996). Because the copy suffers from omissions and obscures evidence obtainable from handwriting style, all register references here are from the original Zoology Register.

[4] Although Sharpe (1906: 323) commented that 'Sir Wm. Burnett was the King's physician and what he had to do with the presentation of a collection made by the Admiral, I have never been able to discover', Kinnear (*in* Swarth 1931: 12) subsequently pointed out that 'Sir William Burnett was Physician-General to the Navy'. As such, he was the Royal Navy's senior scientist and empowered to disburse specimens collected by serving officers in the course of their duty (Sulloway 1982).

[5] NHM published specimen catalogues from the 1800s unfortunately do not include specimen registration numbers.

By contrast, under *Otus galapagoensis* Gould, 1837, Gray (1844: 48; 1848: 108) listed a Burnett & FitzRoy specimen from each of the Galápagos and Falklands. Gould's (1837) name *Otus* (*Brachyotus*) *galapagoensis* had been based solely on the single specimen that Darwin brought back from the Galápagos and deposited at ZSM, but Gray (1844, 1848) reinterpreted this name to subsume Falklands specimens. It further seems clear that Gray incorrectly interpreted the two Burnett & FitzRoy register entries for '*Strix*', from the Falklands and Galápagos respectively, to imply that they had donated two specimens of what he viewed as *Otus galapagoensis*, mistakenly assuming that Darwin's Maldonado specimen 1841.1.18.15 was the Galápagos one. In fact Darwin's type specimen of *Otus galapagoensis* (*sensu* Gould 1837) from James Island did not reach NHM until 1855, when the ZSM collection was dispersed; its NHM reg. no. is 1855.12.19.153 (Warren 1966). Although not explicitly stated by either Gould (1837) or Gould (1839), this was almost certainly the only Galápagos example of this taxon collected on the Beagle voyage.

Policies then current on labelling and mounting would have facilitated such confusion. Most Burnett & FitzRoy skins were mounted after receipt, with any original labels being discarded and such data as considered worthy of note being added on a label on the stand of each mount[6]. Darwin's specimens, if not already mounted at ZSM, received similar treatment, with few remaining as study skins. All specimens discussed above were certainly mounted, as noted by Sharpe (1875), though pencil annotations in Sharpe's personal interleaved copy of this volume show that all were demounted shortly thereafter. It was only at this point that the NHM label that each specimen currently carries was attached. The tiny metal tags seem to have been used during the 1830s / 1840s to keep track of specimens' identities during the process of either preparation or mounting, but could become concealed on birds with heavy tarsal feathering.

As a result of this misassignment, Gray (1844, 1848) overlooked that Darwin had in 1841 donated a Maldonado specimen of what was then referred to as *Otus brachyotus* and is now classified as *Asio flammeus suinda*. Indeed, he listed no specimens at all from continental South America. Sharpe (1875: 238) merely perpetuated Gray's error when he referred this specimen to his *Asio* (*accipitrinus*) *galapagoensis* [*sic*].

Clearly the above argument depends on whether or not, on independent grounds of identification, the supposed Burnett & FitzRoy specimen of *A. f. galapagoensis* really is assignable to this taxon, which is confined to Galápagos. König *et al*. (2008) stated that individuals of *A. galapagoensis*, which they recognised as a separate species to *A. flammeus* on the grounds that 'it is genetically isolated on an archipelago … and has developed behaviour distinguishing it from its continental counterparts', tend to be darker and smaller than *A. flammeus*. Whereas considerable individual variation in coloration and pattern within this complex means assignment of a single individual on this basis is likely to be less than definitive, size is more helpful. König *et al*. (2008) gave a wing length range of 310–323 mm for *A. f. suinda*, but only 278–288 mm for *A. f. galapagoensis*, i.e. not remotely overlapping. This very short wing of *A. f. galapagoensis* was confirmed by Swarth (1931: 83), who for a sample of 25 specimens gave a range of 268–285 mm (mean 276.7 mm). The supposed Burnett & FitzRoy *galapagoensis* has a wing length of *c*.315 mm, clearly far too large for this taxon, but appropriate for *suinda*.

[6] No FitzRoy specimen that we have seen in NHM retains an original label. However, the eight Geospizinae specimens of Harry Fuller, FitzRoy's personal steward on the Beagle voyage, are now in the University Museum of Zoology, Cambridge, UK, and each bears a small numbered label that links it to FitzRoy's specimen list (DAR 29.3) (Sulloway 1982). It therefore seems probable that, like Darwin, FitzRoy merely appended a label with a number to each of his specimens, which he used to link the specimen to any additional data regarding it that he recorded elsewhere.

In conclusion, as a result of early confusion at NHM, what has for the past 170 years been considered to be a Burnett & FitzRoy specimen of *Asio flammeus galapagoensis* collected in October 1835 on James Island, Galápagos, is actually a Darwin specimen of *A. f. suinda* collected between April and July 1833 (Barlow 1963) from Maldonado, Uruguay, NHM registration number 1841.1.18.15.

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