

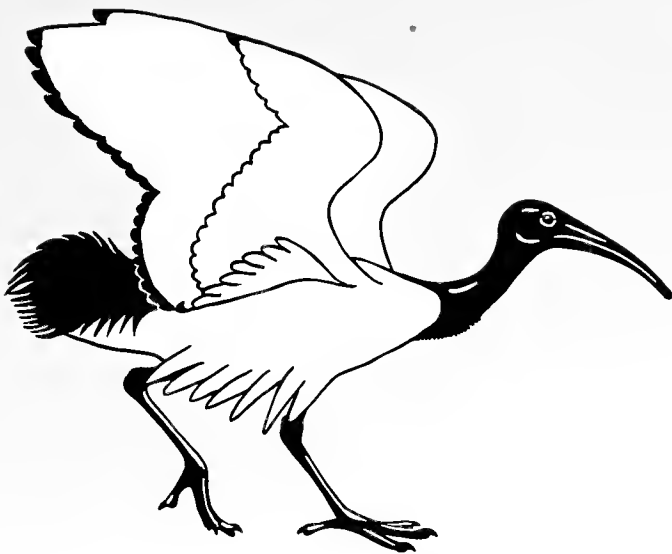
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Bulletin of the British Ornithologists' Club

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PRESENTED



Volume 133 No. 2
June 2013

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 held 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.marketaverns.co.uk/the_barley_mow.html or ask the Chairman for directions.

The cash bar will open 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 about one hour.

It would be very helpful if those who are intending to come would notify the Chairman no later than the day before the meeting and preferably earlier.

24 September 2013—6.30 pm—Dr Roger Safford—Recent advances in the knowledge of Malagasy region birds

Abstract: The Malagasy region comprises Madagascar, the archipelagos of Seychelles, the Comoros and the Mascarenes (Mauritius, Reunion and Rodrigues), six more isolated islands or small archipelagos, and the associated sea areas. It contains one of the most extraordinary and distinctive concentrations of biological diversity in the world. The last 20 years have seen a major increase in the level of knowledge of, and interest in, the birds of the region. This talk will draw on research carried out during the preparation of the first thorough handbook of the region's birds—numbering 487 species—to be compiled since the magnificent works of the late 19th century. The systematics of most taxa have been assessed using molecular techniques, revealing numerous surprises and a new family, the Bernieridae (tetrakas), although intriguing questions remain, not least the relationships of those two most baffling of groups, the Leptosomidae (cuckoo-roller) and Mesitornithidae (mesites). Current bird work is very patchy, with remarkably little study of 'natural history' despite the many gaps in our understanding; an interesting exception is the explosion of work of satellite tracking of seabirds. These and other aspects will be reviewed in a wide-ranging talk.

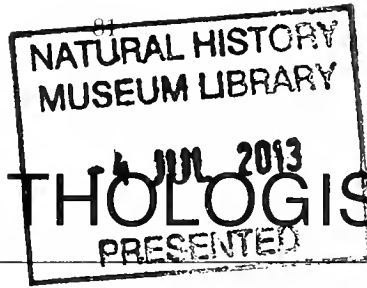
Biography: Roger Safford has been a frequent visitor to the Malagasy region since 1988, and in 1989–93 he completed a Ph.D. on the conservation of the endemic passerines of Mauritius, visiting all of the main islands in the region and developing an intimate knowledge of the region's birds. His subsequent work has always retained a link to the Malagasy region, with numerous visits and publications resulting, and since 2001 he has been responsible for supporting the work of the BirdLife International partnership in Madagascar.

19 November—*please check the BOC website where details will be posted as soon as they are finalised.*

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Bulletin of the BRITISH ORNITHOLOGISTS' CLUB



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CLUB ANNOUNCEMENTS

Chairman's message

The ninth Conference of the European Ornithologists' Union is being held in the UK at the Univ. of East Anglia in Norwich on 27–31 August 2013 (Tuesday–Saturday). The BOC will have a stand and I would very much like to meet any members of the Club who are attending, either at the stand or possibly at an informal get-together at a bar or other convenient location. I also hope that we will be able to recruit some new members during the event. If you are coming to the conference it would be very helpful if you could let me know in advance so that we can make arrangements. Contact me at helen.baker60@tiscali.co.uk.

At the time of writing, we have had our first evening meeting in the very comfortable upstairs room at the Barley Mow. Do join us on 24 September and 19 November.

We also had a very successful joint meeting with the African Bird Club (ABC) and Natural History Museum (see below). ABC arranged for Charlie Moores to produce a podcast containing interviews with the speakers. This is available on the BOC website <http://www.boc-online.org/meetings-past-2013.htm>. It lasts for c.1 hour and is well worth listening to.

The three supplements to the Bulletin *Avian Systematics and Taxonomy* (Vol. 112A), *Recent Avian Extinctions* (Vol. 126A) and *Why Museums Matter* (Vol. 123A) should by now be freely available on the Biodiversity Heritage Library website at www.biodiversitylibrary.org/bibliography/46639.

This is my last message as Chairman and by the time you read it we will have held our AGM and I will have handed over responsibility to my successor.

Helen Baker

The 972nd meeting of the Club was held on Tuesday 26 February 2013 in the upstairs room at the Barley Mow, 104 Horseferry Road, Westminster, London SW1P 2EE. Thirteen members and five non-members were present.

Members attending were: Miss HELEN BAKER (*Chairman*), Cdr. MICHAEL CASEMENT, RN, STEPHEN CHAPMAN, MARTIN GAUNTLETT, RICHARD LANGLEY, DAVID MONTIER, Dr ROBERT PRŶS-JONES, ROBIN PRYTHERCH, Dr PETER RUDGE, PAT SELLAR, TONY STATHAM, CHRIS STOREY and MIKE WALTON.

Non-members attending were: Mrs MARGARET GAUNTLETT, Mrs MARY MONTIER, JAMES REYNOLDS (*Speaker*), ROGER WOOLVEN-ALLEN and LINDA WOOLVEN-ALLEN.

Dr James Reynolds (Univ. of Birmingham Centre for Ornithology) spoke on *Ascension Island and Sooty Terns: an ecological disaster or a smorgasbord in the eyes of conservation biologists?* Ascension Island in many ways is an ornithological outpost of the UK. It is one of several UK Overseas Territories and is 'off the beaten track' because of its remote location midway between West Africa and Brazil in the tropical Atlantic Ocean. Jim began by explaining the island's historical, geographical and cultural contexts, before describing its ornithological treasures as a major breeding ground for seabirds within an otherwise landless seascape of one million square miles. He has worked there since 2008, when he accompanied the Army Ornithological Society (AOS) as their scientific advisor. The AOS has mounted expeditions to the island since 1990, since when many seabird species (including Masked Booby *Sula dactylatra*, Brown Noddy *Auou stolidus*, Black Noddy *A. minutus*, Ascension Frigatebird *Fregata aquila* and White Tern *Gygis alba*) have been censused.

However, the focus of Jim's talk was the mainstay of the AOS's and his ongoing research. Sooty Tern *Onychoprion fuscatus* breeds on the island and work over the last 23 years has unlocked many of the species' secrets. For example, he provided empirical evidence from ringing-recapture efforts for its subannual breeding cycle; he documented the precipitous decline in the population size from as many as 3,000,000 birds as recently as 100 years ago to the current population of 340,000 birds; he described the major predation pressure from a meso-predator (rat) release event as a result of the eradication of the apex predator (cat) in 2004; and he explored the role of food availability in the tern's population biology. He finished by explaining how current state-of-the-art tracking technology is revealing movements of the species for the first time, bridging a major gap in our knowledge about where birds go post-fledging for up to the first seven years of their lives, about where they forage in the South Atlantic and how they spend the 91% of their lives when they are not on land.

Joint BOC, African Bird Club, Natural History Museum meeting, at the Natural History Museum, London, 6 April 2013

This was the second of a series of joint meetings held by the BOC and the NHM in conjunction with various regional bird clubs. This time it was the turn of the African Bird Club. The day's programme comprised six talks, three each either side of lunch. The morning started with Paul Donald speaking on the Liben Lark *Heteromirafra sidamoensis*, possibly the most threatened bird species in Africa. Paul was standing in for Bruktawit Abdu, who unfortunately had been unable to travel from Ethiopia as originally planned. Paul reviewed the species' taxonomic history with respect to other forms in the genus elsewhere in the Horn of Africa, and described research being undertaken to understand the lark's requirements and to conserve its habitat on the Liben Plain. He also revealed that another population of Liben Larks has been found 600 km from the Liben Plains, and that *sidamoensis* is synonymous with the poorly known Archer's Lark *H. archeri*, which name has priority (see also Spottiswoode *et al.* 2013. Rediscovery of a long-lost lark reveals the conspecificity of endangered *Heteromirafra* populations in the Horn of Africa. *J. Orn.* DOI 10.1007/s10336-013-0948-1). He was followed by a presentation on Lesser Crested Tern *Sterna bengalensis* in Libya by Abdulmaula Hamza, who explained that there are now three breeding locations known in Libya and that at each of these there has been an increase in numbers in recent years. Abdulmaula has carried out detailed research on the species' feeding requirements and has carefully analysed the fish species taken. He has also ringed a large number of chicks, c.20 of which have been recovered in different parts of the Mediterranean and West Africa. The morning session concluded with a travelogue about birds and birdwatching in Rwanda, Africa's most densely populated country, given by Jason Anderson. Jason described the country's various habitats and the different species of birds in each. His talk was illustrated with many great photographs and also accompanied by sound-recordings.

The lunch break was followed by the African Bird Club's AGM and then the talks resumed with a fascinating account by palaeontologist and artist Julian Hume of his work reconstructing the lost world of the Dodo and the extinct birds of the Mascarenes, from the fossil record and the scant historical documentation of the early settlers. Dr Siobhan Cox then spoke about her genetic work reconstructing a phylogeny for the *Zosterops* white-eyes of the African mainland. Her results indicate that traditional taxonomy is incorrect in many respects and that there are more species than currently accepted, with Montane White-eye *Z. polioaster* being especially affected. Nigel Redman concluded the event with an account of his recent visit to the officially unrecognised Republic of Somaliland, a seldom visited self-governing country that is technically part of Somalia despite declaring independence in 1991. His talk focused on the endemic and near-endemic birds of the region, with particular attention paid to the taxonomic status and history of the larks, and was illustrated by numerous photographs of most species.

Attendance at the meeting was excellent, with well in excess of 100 people present, and there was enthusiastic support for the planning of future meetings with other regional bird clubs.

David Fisher

New and interesting records for the Obi archipelago (north Maluku, Indonesia), including field observations and first description of the vocalisation of Moluccan Woodcock *Scolopax rochussenii*

by Marc Thibault, Pierre Defos du Rau, Olivier Pineau & Wesley Pangimangen

Received 6 October 2012

SUMMARY.—The avifauna of the Obi archipelago is rather poorly studied and current understanding is essentially based on several historic collecting efforts and few recent visits by modern ornithologists, none of which reached the mountains above 750 m. Furthermore, the taxonomic position of many bird populations restricted to the archipelago or shared with nearby Bacan Island remains confused. We describe the results of a two-week avifaunal survey of Obi in March 2010. We provide first records since 1982 of the poorly known Moluccan Woodcock *Scolopax rochussenii* as well as the first description of its vocalisation and first information on its habitat, which, contrary to what was previously speculated, includes lowland forest. We also provide confirmed records of five taxa previously unknown on the island, including one that possibly represents a new subspecies (Sulawesi Myzomela *Myzomela chloroptera*). New elevational information is presented for 34 species. Comments on the taxonomy of several endemic taxa are made on the basis of new vocalisation or photographic material, suggesting that at least two deserve biological species status (Northern Golden Bulbul *Thapsinillas longirostris lucasi*, Dusky Myzomela *Myzomela obscura rubrotincta*) and offering further support to treat Cinnamon-breasted Whistler *Pachycephala johni* as a species. Finally, we emphasise the need for taxonomic reappraisal of several other endemic insular forms (Cinnamon-bellied Imperial Pigeon *Ducula basilica obiensis*, Violet-necked Lory *Eos squamata obiensis*, Red-cheeked Parrot *Geoffroyus geoffroyi obiensis*, Hair-crested Drongo *Dicrurus hottentotus guillemardi*, Northern Fantail *Rhipidura rufiventris obiensis*, Paradise Crow *Lycocorax pyrrhopterus obiensis* and Island Leaf Warbler *Phylloscopus poliocephalus waterstradti*). Although most of our observations await confirmation, they suggest that endemism on Obi at the species level is perhaps significantly under-estimated.

Obi and its satellite islands of Bisa, Tapat, Obilatu, Gomumu and Tobala form a remote oceanic archipelago in Maluku, 33 km south of Bacan, 100 km east of Mangole (Sula Islands) and 125 km north of Seram (Fig. 1). Total surface area is 3,040 km² with Obi (2,670 km²) the largest island, predominantly hilly and rising to at least 1,558 m. Together with the three large islands of Morotai, Halmahera and Bacan, and several smaller islands, the Obi archipelago forms part of the Northern Maluku Endemic Bird Area (EBA 171) distinguished by 32 species and 101 subspecies restricted to this region (following Gill & Donsker 2012).

To date, the resident avifauna of the Obi islands group is known to support 16 Northern Maluku endemic species shared with both Bacan and Halmahera. Only two endemics currently recognised at species level are confined to Obi (Carunculated Fruit Dove *Ptilinopus granulifrons* and Cinnamon-breasted Whistler *Pachycephala johni*), but the archipelago also hosts 19 recognised endemic subspecies, e.g. Paradise Crow *Lycocorax*

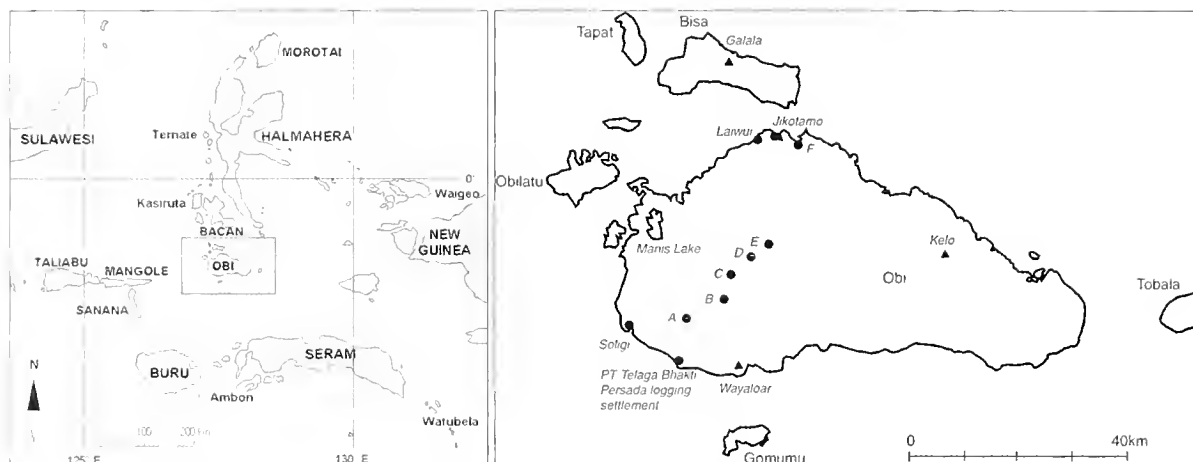


Figure 1. Location of Obi in eastern Indonesia and localities visited or mentioned in the text.

pyrrhopterus obiensis, while the enigmatic Moluccan Woodcock *Scolopax rochussenii* and two subspecies (Chattering Lory *Lorius garrulus flavopalliatu*s and Island Leaf Warbler *Phylloscopus poliocephalus waterstradti*) are shared only with Bacan and Kasiruta (White & Bruce 1986). Interestingly, the Obi islands also host endemic subspecies of several residents that, according to current knowledge, do not occur elsewhere in northern Maluku: Pale Cicadabird *Coracina ceramensis hoogerwerfi*, Northern Fantail *Rhipidura rufiventris obiensis*, Turquoise Flycatcher *Eumyias panayensis obiensis* and Hair-crested Drongo *Dicrurus hottentotus guillemardi*.

Despite its distinctive avifauna but as a result of its remote situation, Obi has received little attention from modern ornithologists. Bernstein was the first bird collector to visit the island in 1862 (Jansen 2008) followed by Guillemard in 1883, Doherty in 1897 (the latter also visiting Bisa), Lucas in 1898 and Waterstradt in 1902 (Hartert 1903a). Following a gap of 50 years, an expedition from the Museum Zoologicum Bogoriense was conducted under the leadership of Wegner in July–November 1953 (Mees 1982) and its results published by Jany (1954, 1955). Further specimens were collected in 1981–83 by Momou and Tatu, during expeditions organised by the Smithsonian Institution with the assistance of the Indonesian Nature Conservancy, as part of ethnobiological research conducted by Taylor (1990). These specimens were deposited at the National Museum for Natural History (NMNH), Washington DC. In December 1989 Linsley (1995) conducted a bird survey as part of a collaborative project between Manchester Metropolitan University, the Indonesian Institute of Sciences (LIPI) and the Directorate-General for Forest Protection and Nature Conservation (PHPA). He observed nine species not previously reported on Obi and provided the first ecological information for many taxa and descriptions of the vocalisations of several endemic forms. A brief exploration of Bisa was conducted on 11 June 1990 by Bishop (1992). Further ornithological observations were made in February 1992 by Lambert (1994) during a one-month survey of parrots under the auspices of IUCN; eight species were recorded on Obi for the first time. While maximum elevations reached by the earlier collectors are undocumented, Linsley (1995) and Lambert (1994) managed to reach c.500 m and 730 m, respectively. The basic ecology of a large suite of species remains poorly known and the rate of new island records hints that the avifauna is still poorly documented. This, together with the paucity of records for the enigmatic Moluccan Woodcock, encouraged us to undertake a short expedition to the island with the aim of improving knowledge of its avifauna.

Study area and Methods

On 7–21 March 2010, observations were made at ten sites on Obi. Details of these, survey dates and habitats are provided in Table 1 and Fig. 1. As many days as possible were spent above 800 m (10–16 March) and we eventually reached forest between 1,000 and 1,220 m on 13–16 March. Elevations and geographical coordinates were measured using a Garmin eTrex Vista HCx GPS. Subsequently, elevations and geographical data collected in the field were compared with satellite data available via Google Earth and some minor elevation corrections were made. It is of note that the highest elevation of 1,558 m given for Obi by Google Earth satellite data contradicts both the US Army map SA-52 1:1,000,000 (1968) and that in Coates & Bishop (1997), where 1,611 m is given as the highest elevation.

To support identifications and descriptions, MT took photographs using a Canon 40D digital camera with a 100–400-mm lens. Sound-recordings were made by MT using an Edirol R09-HR digital recorder with inbuilt microphone. Sonograms were prepared using Syrinx 2.6h by John Burt (available at www.syrinxpc.com). Recordings of Moluccan Woodcock have been uploaded to www.xeno-canto.org and further recordings will be uploaded to this online database.

Recent state of natural habitats on Obi

F. G. Rozendaal *in* Collar & Andrew (1988), Linsley (1995) and Vetter (2009) already reported that much of the lower lying forest on Obi was logged during the 1980s and early 1990s, while much of the remainder is under logging concession. According to Vetter (2009), Obi has suffered some of the largest reductions of lowland forest within north Maluku as a result of plantation development. In addition, illegal gold mining was reported to be destroying some areas of forest (F. G. Rozendaal *in* Collar & Andrew 1988).

Three logging companies, PT Poleko Yurbarson Trad., PT Telaga Bhakti Persada and PT Pusaka Agro Sejahtera, currently run six large logging licences covering two-thirds of Obi. These licences generally permit selective logging up to *c.*100 m³ / ha and for *c.*20–30 years (N. Brickle pers. comm.). Along the 70-km stretch of coast between Jikotamo and the

TABLE 1
Study site details, survey dates and habitat. See also Fig. 1.

Location (elevation)	Coordinates	Dates	Habitat
Soligi (sea level)	01°39'S, 127°25'E	7–8, 20 March 2010	Village; coconut plantation and other tree crops; mangrove
PT Telaga Bhakti Persada logging settlement (sea level)	01°42'S, 127°29'E	19 March 2010	Village; coconut plantation; grassland
Site A (200–300 m)	01°38'S, 127°30'E	19 March 2010	Logged forest
Site B (360–450 m)	01°36'S, 127°33'E	8, 17–19 March 2010	Logged forest
Site C (400–700 m)	01°33'S, 127°34'E	8, 9, 16–17 March 2010	Logged forest
Site D (700–850 m)	01°32'S, 127°35'E	9–13, 16 March 2010	Logged and primary forest
Site E (850–1,220 m)	01°32'S, 127°37'E	13–16 March 2010	Logged and primary forest including montane forest
Laiwui (sea level)	01°19'S, 127°38'E	20–21 March 2010	Village; coconut plantation; beach
Jikotamo (sea level)	01°20'S, 127°39'E	20–21 March 2010	Village
Site F (50–150 m)	01°21'S, 127°40'E	20–21 March 2010	Logged forest; regrowth forest; coconut plantation; grassland

PT Telaga Bhakti Persada logging settlement south of Soligi, hills were mainly covered by plantations (including cloves, coconut palm, nutmeg, ambarella and cacao) and fragmented secondary forest. Hills separating Manis Lake from the west coast were barren as a result of ongoing open-cast nickel mining. Remnant primary forest was mainly restricted to the most rugged and inaccessible terrain. Alluvial flats were extensively covered by coconut plantations, with the notable exception of a relatively large tract of coastal forest bordered by old-growth mangrove immediately north of Soligi.

Within the PT Telaga Bhakti Persada logging concession south and east of Soligi, forest was very degraded below 200 m, large areas had already been selectively logged up to 950 m and the lowest patch of primary forest was at 500–700 m, although some large trees there were marked for logging. At 700–950 m, forest was in better condition, with fragments of primary forest still covering some of the steeper, less accessible slopes, while the more accessible areas were mainly covered by selectively logged forest. A small area of tropical forest explored at 1,100–1,220 m showed no evidence of logging.

Soligi villagers reported that tree-plantation operations were planned by the logging company and a tree nursery was seen in the concession. Several drill holes excavated during recent mining exploration were found well inside the logging concession up to 600 m. According to some villagers, these have to date not resulted in any further mining. It is of note that in the north of the island, a large-scale drilling project was withdrawn in September 2011. It was initially set to target a large epithermal gold / silver / base metals system under a license covering 7,700 ha, which is already the subject of extensive artisanal gold mining (Ashburton Minerals Ltd. 2012).

To our knowledge, Obi lacks any protected area, although a nature reserve of 450 km² covering highlands in the centre of the island and further protection forests on steep terrain have been proposed (FAO 1981–82, BirdLife International 2013).

Species accounts

Overall we recorded 74 bird species, of which 66 are resident or presumed so and eight are Palearctic migrants. Three additional taxa are either unconfirmed or remain unidentified to species. The following details new island records, new elevational or noteworthy records from a distributional, ecological or taxonomic perspective. Other species encountered during our survey are listed in Table 2. Taxonomy and nomenclature follow Gill & Donsker (2012) except that we use Common Golden Whistler *Pachycephala pectoralis* instead of Black-chinned Whistler *P. mentalis*.

MOLUCCAN WOODCOCK *Scolopax rochussenii*

The following records were obtained at site B at c.420 m, from a logging track bisecting an extensive area of logged forest on flat and more graded sandstone soils: at c.19.00 h on 17 March 2010, calls reminiscent to those given in display-flight by Bukidnon Woodcock *S. bukidnensis* were briefly heard (OP, MT & PDR). Between 02.00 h and 04.00 h on 18 March 2010, similar calls were repeatedly heard by OP and subsequently at 05.55 h and 06.07 h by the three observers, when sound-recordings (www.xeno-canto.org/109282, www.xeno-canto.org/109283) and a glimpse of a fast-flying bird were eventually obtained at dawn by MT. At 07.00–07.15 h (before dusk) on the same day, what was presumably the same bird was observed three times by MT, when it called in roding (i.e. courtship) display-flight at the same location. It was flying rather straight, rapidly and low above the canopy, sometimes <100 m from the observer, and was briefly seen opening its bill when calling. Rock Dove *Columba livia*-like size, overall compact stocky shape, with a rounded bulky chest, short tail, broad pointed wings and a very long straight bill were noted. These characters, together

TABLE 2
Species encountered on Obi not mentioned in the main text.

Species name	Comments
Dusky Megapode <i>Megapodius freycinet</i>	1 at c.150 m
Pacific Reef Heron <i>Egretta sacra sacra</i>	1 on the coast
Striated Heron <i>Butorides striata</i>	1 on the coast
Eastern Cattle Egret <i>Bubulcus coromandus</i>	few seen on the coastal plain
Eastern Osprey <i>Pandion cristatus</i>	singles seen twice near sea level; presumably resident
Pacific Baza <i>Aviceda subcristata rufa</i>	1 near sea level
Brahminy Kite <i>Haliastur indus</i>	quite common from sea level to 200 m, with additional records to 1,200 m
White-bellied Sea Eagle <i>Haliaeetus leucogaster</i>	4 on coast
Oriental Hobby <i>Falco severus</i>	1 at Soligi
Spotted Kestrel <i>Falco moluccensis</i>	common in coastal plain
Common Sandpiper <i>Actitis hypoleucos</i>	3 near Soligi
Red-necked Phalarope <i>Phalaropus lobatus</i>	common in coastal seas, with 600–1,000 from boat between Soligi and Jikotamo
Greater Crested Tern <i>Sterna bergii</i>	c.10 seen inshore between Soligi and Jikotamo
Pied Imperial Pigeon <i>Ducula bicolor</i>	2 in coconut / coastal forest near Soligi
Great-billed Parrot <i>Tanygnathus megalorhynchos</i>	2 near sea level in degraded forest and coconut plantation near Soligi, 1 heard near Laiwui
Barking Owl <i>Ninox conuivens rufostriata</i>	1 photographed at site F at c.100 m
Large-tailed Nightjar <i>Caprimulgus macrurus schlegelii</i>	seen twice at 400–500 m
Glossy Swiftlet <i>Collocalia esculenta</i>	from sea level to 940 m
Moustached Treeswift <i>Hemiprocne mystacea confirmata</i>	three records at 300 m, 480 m and 600 m.
Common Paradise Kingfisher <i>Tanysiptera galatea obiensis</i>	1 seen at site F
Blue-and-white Kingfisher <i>Todiramphus diops</i>	-
Beach Kingfisher <i>Todiramphus saurophagus</i>	common on coast around Soligi with, e.g. 9 from a boat along 8 km of coast
Common Kingfisher <i>Alcedo atthis</i>	1 (<i>A. a. hispidoides</i>) at 480 m; 1 (possibly migrant <i>A. a. bengalensis</i>) on coast
White-bellied Cuckooshrike <i>Coracina papuensis</i>	6 records from sea level to 420 m
Willie Wagtail <i>Rhipidura leucoptrys</i>	-
Torresian Crow <i>Corvus orru</i>	1 near sea level near Jikotamo
Arctic / Kamchatka Leaf / Japanese Leaf Warbler <i>Phylloscopus borealis / examinandus / xanthodryas</i>	several encounters from sea level to 1,000 m
Gray's Grasshopper Warbler <i>Locustella fasciolata</i>	3 at 750–840 m
Moluccan Starling <i>Aplonis mysolensis</i>	fairly common to 450 m
Grey-streaked Flycatcher <i>Muscicapa griseistricta</i>	quite common migrant, from lowlands to 990 m
Black-faced Munia <i>Lonchura molucca</i>	flock of 30 at 220 m and 2 more at 360 m
Eastern Yellow Wagtail <i>Motacilla tschuscheensis</i> ssp.	1 at site F
Grey Wagtail <i>Motacilla cinerea</i>	5 records

with the flight behaviour, are typical of *Scolopax*. MT also noted that the bird appeared to be significantly larger than congeners with which he had previous experience (Eurasian Woodcock *S. rusticola* and *S. bukidnonensis*), but light conditions were too poor to observe any plumage characters. At 06.02–06.20 h on 19 March 2010, still in poor light conditions, a bird (probably the same) was seen again once and heard twice more (PDR & MT).

Further observations and sound-recordings (www.xeno-canto.org/109284) were made at site F, at c.100 m: at c.06.45 h on 20 March 2010, a woodcock was seen in flight and heard twice roding low over the canopy (MT & WP). The bird was seen in better light conditions and flew just overhead at a distance of >30 m. Typical *Scolopax* shape and large size were noted and WP also noticed yellowish, mainly unstreaked underparts. At 06.02 h the following morning, what was presumably the same roding bird was seen and heard again twice at the same location (MT & PDR). The observations were made in a coconut plantation at the edge of a patch of disturbed, fragmented primary forest, with evidence of ongoing small-scale logging. The undergrowth included a marshy gully with bare ground bisected by a low-flowing stream. It was adjacent to a wet grazed pasture and surrounded by steep hills covered by degraded forest interspersed by scattered clove and nutmeg plantations.

Our observations are the first documented records of Moluccan Woodcock since two females were collected in August–September 1982 at 'Galala', said to be on Obi (<http://collections.si.edu>). The latter locality is considered untraced by BirdLife International (2011b) and indeed we failed to find a locality of this name on Obi, although a remote village called Galala exists on the island of Bisa (Fig. 1). The species is known from only six other specimens, of which three were also collected on Obi (two in the 19th century and one in 1953, the latter at Wayaloar on the south coast), one on Bacan (in 1902) and two of unknown origin (Hartert 1903b, BirdLife International 2011b). During their field work on Obi in 1989 and on Obi and Bacan in 1992, respectively, Linsley (1995) and Lambert (1994) did not observe the species, but the latter obtained a convincing report from a guide at Kelo, Obi, who 'occasionally flushed this bird from ridgetops above ca. 500 m'.

Our sound-recordings permit the vocalisation of *S. rochussenii* to be described. In display, it gives a loud and distinctive call, comprising a hard, metallic, rattled or staccato phrase, with 8–11 motifs, each motif given at intervals of 0.04–0.05 seconds (Fig. 2). This rattle phrase can be transcribed *ti'ti'ti'ti'ti'ti'ti'ti*. Each motif has a similar structure, comprising a distinctive pulse (c.4 kHz rising to c.5–5.5 kHz) connecting with a concurrent, higher pitched and slightly variable curled syllable (c.6–6.8 kHz rising to 6.5–7.3 kHz and falling to 5.3–6 kHz). The rattle phrase is given at intervals of 1.8–3.3 seconds. Rattling calls of Moluccan Woodcock are strikingly similar in structure and frequency to those of *S. bukidnonensis*, but the latter have only five motifs and the pulse begins at a lower pitch (c.3 kHz) (Kennedy *et al.* 2001, www.xeno-canto.org/species/Scolopax-bukidnonensis). Rattles delivered by *S. bukidnonensis* are frequently interspersed by lower pitched, growling or grunting phrases, which were not heard from *S. rochussenii*, although this might just reflect the small sample of recordings. The calls of *S. rochussenii* are very different from those of New Guinea Woodcock *S. rosenbergii* (Kennedy *et al.* 2001; G. Wagner, www.xeno-canto.org/23274) and from those attributed to Javan Woodcock *S. saturata* (G. Wagner, www.xeno-canto.org/42307; F. Ducry & D. Marques, www.xeno-canto.org/56931), but we have been unable to locate sound-recordings of Sulawesi Woodcock *S. celebensis*, which are undescribed, the latter being closest to *S. bukidnonensis* by morphology. Our results suggest a close evolutionary relationship between *S. bukidnonensis* and *S. rochussenii*.

Based on the very scant information available, Moluccan Woodcock was previously assumed to be a bird of hill and montane forest (Hartert 1903b, White & Bruce 1986, Coates & Bishop 1997, Vetter 2009). However, the only traceable locality (Wayaloar, southern

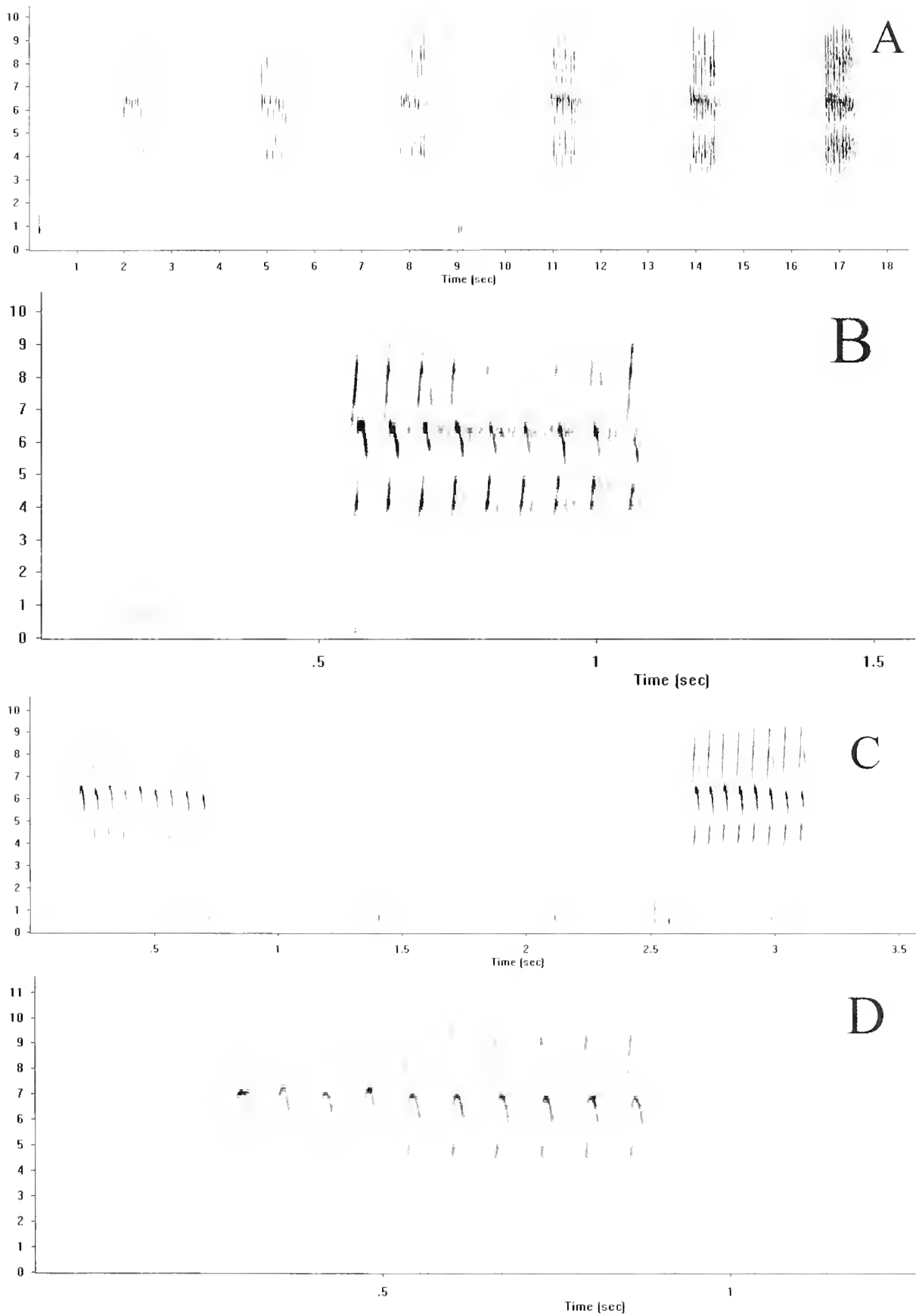


Figure 2. Sonograms of the roding display call of Moluccan Woodcock *Scolopax rochussenii* from (A–C) east of Soligi, Obi, 18 March 2010 and (D) near Jikotamo, Obi, 21 March 2010 (M. Thibault). X-axis = time (one second per tick, Fig. 2A; 0.5 seconds per tick, Figs. 2B–D), y-axis = frequency (1 kHz per tick).

Obi, August 1953) is on the coast, raising 'the possibility that its optimal (or seasonally optimal) habitat is to be found in lower-lying regions of islands where the largest, dampest substrates may perhaps occur' (BirdLife International 2011b). Our records were obtained at two of three localities visited below 500 m that we surveyed at suitable times, i.e. dusk and dawn. These records confirm that the species holds territory (and presumably breeds) in lowland forest, hence supporting the latter hypothesis and that it may not be uncommon in suitable habitat. Woodcocks were not recorded at the two localities we surveyed at 600–1,200 m despite dedicated searching. Thus, we provide evidence that the species is not only, if at all, associated with montane forest. Our records also suggest that, to some extent, Moluccan Woodcock tolerates habitat degradation and fragmentation, and that wet habitats in or close to forest (i.e. marshes or wet gullies around low-flowing streams) are perhaps important for the species. However, much remains to be learned concerning population size and ecological requirements. In the near future, direct habitat destruction resulting from mining, logging, plantations and agriculture are likely to be extended in lowland and montane areas on Obi and Bacan. Therefore, its status as Endangered (BirdLife International 2011b) should be maintained, at least until further data are collected.

METALLIC PIGEON *Columba vitiensis halmahera*

On 13–15 March 2010, a calling bird was seen and two more heard at site E at c.1,200 m in primary forest (MT, PDR & WP). On 14 March 2010 a bird was heard at the same site at 1,100 m (MT). Photographs and sound-recordings were made. No conclusive record was obtained at lower elevation. The species is widespread in Wallacea. White & Bruce (1986) and Coates & Bishop (1997) reported its presence on Gomumu, a small satellite island 9 km south of Obi, but they did not mention it from mainland Obi. These statements contradict Hartert (1903a), who mentioned that a specimen of '*Columba albigularis*' was sent by Lucas from 'Obi Major'. Furthermore, during a visit to Tring museum in 2011, MT & PDR were able to check five (three females and two males) *C. v. halmahera* collected by Waterstradt on Obi in January 1903. These specimens might have been collected too late for inclusion in Hartert's review of the birds of Obi. In any case our investigations clarify the status of this taxon on mainland Obi and also describe its altitudinal range on this island.

SLENDER-BILLED CUCKOO-DOVE *Macropygia aubouinensis albiceps*

Common in forest and forest edge from sea level to 1,210 m, with photographs made by MT at c.1,200 m. Our records considerably extend the altitudinal range on Obi as previous published records are below 500 m (Coates & Bishop 1997) and are in accordance with its altitudinal range from elsewhere in Wallacea (Coates & Bishop 1997).

SCARLET-BREASTED FRUIT DOVE *Ptilinopus bernsteinii micrus*

Regularly seen and commonly heard at 150–1,210 m in primary and logged forest. A nest attended by at least one adult, containing a single egg, was found on 13 March 2010 at 1,210 m in primary forest (WP, PDR & MT). The nest was a flimsy construction on a fern c.80 cm above the ground, comprising a small moss cup on a larger assemblage of small branches. *P. bernsteinii* is endemic to North Maluku, with the nominate subspecies found from Halmahera to Bacan and *micrus* restricted to Obi (Baptista *et al.* 1997). Previously known at 180–600 m on Obi (Lambert 1994). Our records include the first description of a nest on Obi, whose characteristics and situation are similar to those described from Halmahera (Lansley & Farnes 2006).

SUPERB FRUIT DOVE *Ptilinopus superbus*

Common at 150–1,000 m, with further records of two separate birds heard at 1,200 m in primary montane forest. Our records significantly extend the altitudinal range for the species on Obi, where it was previously unrecorded above 700 m (Lambert 1994, Coates & Bishop 1997).

CARUNCULATED FRUIT DOVE *Ptilinopus granulifrons*

Only recorded once, at site A on 19 March 2010, when at least eight were observed through a telescope in the upper canopy of a large fruiting *Ficus*, in logged forest at c.220 m (PDR & MT). This single record and the species' apparent absence at higher elevations appear to corroborate that this is an uncommon species closely associated with lowland forest (Coates & Bishop 1997, BirdLife International 2011a).

SPECTACLED IMPERIAL PIGEON *Ducula perspicillata*

Commonly heard and occasionally seen from sea level to 1,200 m in forest edge, logged forest and primary forest. Our records significantly extend the species' altitudinal range on Obi (Lambert 1994). They also significantly extend the altitudinal range for the species in the northern Maluku where it was previously recorded to 900 m on Halmahera (Poulsen & Lambert 2000).

CINNAMON-BELLIED IMPERIAL PIGEON *Ducula basilica obiensis*

This northern Maluku endemic was fairly commonly seen and heard in forest edge, logged forest and primary forest at 150–1,210 m (WP, PDR, MT) and it was photographed at c.1,100 m (MT). Our records significantly extend the species' altitudinal range on Obi, where it was previously unrecorded above 730 m (Lambert 1994) and match the upper limit of 1,230 m for the nominate subspecies on Halmahera (Poulsen & Lambert 2000).

Sound-recordings of *D. b. obiensis* were obtained by MT (Fig. 3), enabling comparisons with vocalisations of *D. b. basilica* from Halmahera (www.xeno-canto.org/species/Ducula-basilica). Both forms give similar vocalisations: songs usually comprise a series of 1–2 (less frequently three) very deep, throaty growls, *roow roooorw-ooow*, at 0.4–0.5 kHz. When the first call is a short note (lasting 0.2 seconds), the second call is often longer (2.0–2.5 seconds), whereas when a first, longer call (0.8–1.3 seconds) is given, there is no second call or it is frequently shorter (i.e. 1.3–1.7 seconds). Longer calls typically rise very slightly and end abruptly.

It was recently proposed to split *obiensis* (which is confined to Obi) from *basilica* (on Morotai to Bacan; www.birdlife.org/globally-threatened-bird-forums/2012/) following application of the Tobias *et al.* (2010) criteria. Although justification for this taxonomic

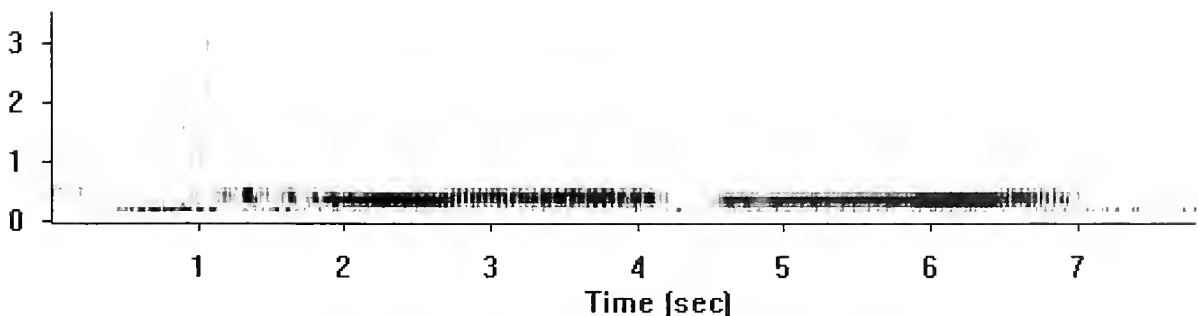


Figure 3. Sonogram of Cinnamon-bellied Imperial Pigeon *Ducula basilica obiensis*, Obi, 12 March 2010 (M. Thibault). X-axis = time (one second per tick), y-axis = frequency (1 kHz per tick).



Figure 4. Cinnamon-bellied Imperial Pigeon *Ducula basilica*, with (A) *basilica* (a pair), Halmahera, 3 October 2011 (© F. Steinhauser), (B) *obiensis* (a pair), Obi, 15 March 2010 (M. Thibault).

treatment is unpublished, Hartert (1903a) already emphasised plumage differences between these two taxa, stating that *D. b. obiensis* is 'very different' from *D. b. basilica*, 'the entire head, throat, foreneck, and breast being much deeper vinous, with a greyish wash; the hindneck darker grey, separated from the vinous head by a rusty patch; abdomen and under tail-coverts deep cinnamon, instead of pale cinnamon'. According to Hartert (1903a), the collector W. Doherty also noted that *obiensis* has 'iris dark crimson, eyelids vermilion; feet vermilion; bill nearly black', whereas *basilica* (from Ternate) has 'iris crimson; feet pale carmine; bill black'. Although the subtle differences in bare-parts coloration might be difficult to appreciate in the field, the plumage differences between these taxa are obvious (Fig. 4). However, given the lack of obvious vocal difference between *D. b. basilica* and *D. b. obiensis*, we suggest that splitting these two taxa might require more investigation.

VIOLET-NECKED LORY *Eos squamata obiensis*

Recorded regularly from sea level to 700 m in a wide range of habitats including coconut plantations, primary and logged forest. Less frequently encountered at higher elevations with two sightings at 850 m and single observations at 1,110 m and 1,210 m (PDR, WP, MT). Most frequently observed in pairs or trios, although a large flock of c.25 was seen on 11 March at 1,110 m. Previous published records on Obi range up to 730 m. The elevational range on Obi is therefore significantly wider than previously known, similar to Halmahera where *E. s. riciniata* has been found to 1,230 m (Poulsen & Lambert 2000).

No sign of trapping during our visit. *E. squamata* is widespread on Obi including in primary forest, logged forest and non-forest habitats. As there was no obvious indication of a status change compared to Lambert (1993), this species may require quantitative surveys to detect any, perhaps slight, change in density.

Morphologically, *obiensis* closely approaches the nominate race (as mentioned by Collar 1997), which is restricted to the West Papuan islands, but is strikingly different from *riciniata* on Morotai to Bacan, notably in having the entire head and neck uniform red and greater wing-coverts and scapulars black (pers. obs.). Based on these observations, we suggest that the taxonomic position of the taxa currently included in *E. squamata* should be reassessed and require a detailed study of morphology, acoustics and DNA.

CHATTERING LORY *Lorius garrulus flavopalliatu*s

Singles and groups of 2–4 recorded almost daily in logged and primary forest, with max. flock of at least ten foraging birds in selectively logged forest at 440 m on 19 March (WP, OP, PDR, MT). Regularly recorded to 1,000 m and seen twice at 1,100 m, extending the altitudinal range of 370 m given previously for Obi (Coates & Bishop 1997). Several captive *L. g. flavopalliatu*s seen in villages and at a logging settlement, apparently being kept as pets. As noted by Linsley (1995), this species is the commonest captive parrot on Obi, indicating that it still faces heavy trapping pressure. However, compared to Lambert (1993), our observations do not suggest a significant decline. It may require quantitative surveys to detect any, perhaps slight, change in density.

RED-FLANKED LORIKEET *Charmosyna placentis intensior*

Very common from sea level to 400 m and less common, albeit regular, to 1,210 m. These records provide the first data concerning the altitudinal range of *C. placentis* on Obi and extend the altitudinal range known elsewhere in northern Maluku, where it had previously been recorded up to max. 1,010 m on Halmahera (Poulsen & Lambert 2000). *C. placentis* is occasionally recorded to 1,600 m in New Guinea (Coates & Peckover 2001).

RED-CHEEKED PARROT *Geoffroyus geoffroyi obiensis*

Total of 21 records of 1–6 birds seen or heard at 200–1,000 m, with 18 records below 600 m, mostly in selectively logged forest. Few were encountered in primary forest, possibly because of lower density or near-absence at higher altitudes. Our records significantly extend the altitudinal range of this subspecies endemic to Obi and Bisa, where it had been reported to 800 m (Coates & Bishop 1997). *G. geoffroyi* comprises 16 widely recognised subspecies ranging from Wallacea to New Guinea and north-east Australia (Collar 1997, Gill & Donsker 2012), of which several differ markedly in plumage, size and vocalisations (Collar 1997). *G. g. obiensis* is closer to *G. g. cyanicollis* from northern Maluku, sharing with it a long blue collar, although on *obiensis* this is larger and it has a brownish back which is lacking on *cyanicollis* (Collar 1997). The piercing, high-pitched nasal calls of *obiensis* have been described by Lambert (1994) and Linsley (1995), who report that they are distinctive compared to *cyanicollis* from Bacan, *floresianus* from Sumba and *rhodops* from Buru. These observations suggest that a detailed taxonomic study of *G. geoffroyi* is required, including morphological, acoustic and DNA comparisons.

ECLECTUS PARROT *Eclectus roratus vosmaeri*

Wild birds recorded just twice, both in the lowlands, with three in coastal coconut plantations near Soligi on 8 March 2010 (all observers) and a female in degraded forest with cloves and coconut plantations at site F on 20 March (WP, MT). A captive bird apparently kept as a pet near Soligi. Reportedly very common, at least in the north of the island, in the 1950s (Lambert 1994), but then declined dramatically due to trapping, so that Linsley (1995) and Lambert (1994) only obtained one sighting each. Our observations indicate that *E. roratus* remains rare on Obi, where it is primarily confined to lowland and coastal areas. Despite being protected by Indonesian law, it probably is extensively traded in northern Maluku (ProFauna Indonesia 2008), although perhaps less so than both lorries (Lambert 1993). There is no indication that the species' conservation status on Obi has improved or even changed since the 1990s.

MOLUCCAN CUCKOO *Cacomantis aeruginosus* ssp.

Three calling *Cacomantis* were recorded: a vocalising bird on 11–12 March 2010 at site D at 750 m in primary forest (sound-recorded, MT), another calling bird photographed (Fig. 5) and sound-recorded (Fig. 6A–E) at site E on 13 March 2010 and heard again on 16 March at



Figure 5. Moluccan Cuckoo *Cacomantis aeruginosus* ssp. (same individual), Obi, 13 March 2010 (M. Thibault).

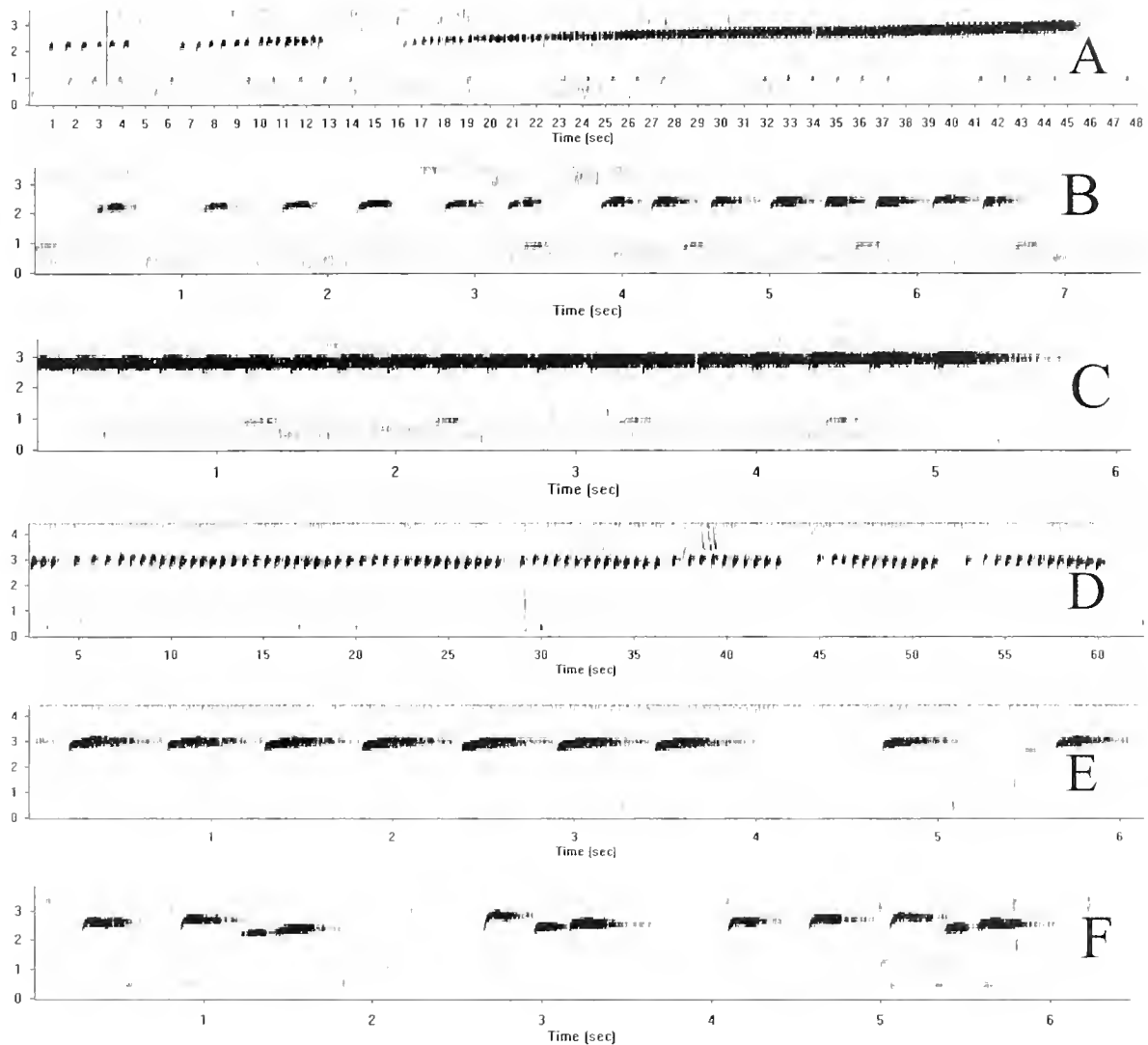


Figure 6. Sonograms of Moluccan Cuckoo *Cacomantis aeruginosus* ssp. by M. Thibault, with (A) long, rising and accelerating song, Obi, 13 March 2010, (B–C) details of A, (D) long level song, Obi, 13 March 2010 (same individual as in Figs. 6A–C), (E) detail of D, (F) three-note song, Obi, 21 March 2010. X-axis = time (one second per tick, y-axis = frequency (1 kHz per tick).

870 m in logged forest by MT, with a third briefly seen (WP, PDR, MT) and sound-recorded (Fig. 6F) on 20–21 March at c.100 m at site F (MT). In addition, a juvenile *Cacomantis* fed by a pair of *Phylloscopus poliocephalus waterstradti* was observed on 13 March 2010 at site E at 1,200 m in primary montane forest (WP, PDR, MT). The latter observation provides the first documented record of a *Cacomantis* breeding on Obi.

Taxonomy of resident *Cacomantis* cuckoos in Maluku is highly confused (Rheindt & Hutchinson 2007, Tebb *et al.* 2008, Rheindt 2010, Erritzøe *et al.* 2012) and the situation is exacerbated by the seasonal occurrence of migrant Brush Cuckoo *C. v. variolosus* from Australia. *C. variolosus* and *C. sepulcralis* are sometimes merged into one species (Payne 1997, 2005), but several works maintain the separation of *C. v. infaustus* and Rusty-breasted Cuckoo *C. sepulcralis aeruginosus* in southern Maluku (White & Bruce 1986, Coates & Bishop 1997, Erritzøe *et al.* 2012). Hartert (1925) separated northern Maluku birds as *oblitus*, which is reported to be paler below with longer wings than *infaustus*, which he considered to be restricted to southern Maluku. However, most recent works consider *oblitus* a synonym of *infaustus* (White & Bruce 1986, Coates & Bishop 1997, Payne 1997, Erritzøe *et al.* 2012).



Figure 7. From left to right: *Cacomantis sepulcraris virescens* (three from Manado, Sulawesi), *C. aeruginosus aeruginosus* (one from Buru and one from Ambon), *C. variolosus* (three from Bacan and two from Ternate) (M. Thibault / © The Natural History Museum, Tring).

Heinrichi is a poorly known taxon described from Bacan and Halmahera by Streseman (1931) who distinguished it from sympatric *C. v. oblitus* (= *infaustus*) on the basis of smaller size, with proportionately shorter wings and longer tail, more rufous underparts, darker olive-brown upperparts and yellow legs (instead of yellow-green or brownish). Other features not mentioned by Streseman (1931) include rufous notches in the outer edges of the rectrices (Coates & Bishop 1997, Erritzoe *et al.* 2012), dark grey throat (Payne 1997, Erritzoe *et al.* 2012) and eye-ring either undescribed (Coates & Bishop 1997) or greyish (Payne 1997). *Heinrichi* is variously treated as a synonym of resident *C. v. infaustus* (Payne 2005, Erritzoe *et al.* 2012) or recognised as an endemic species sympatric with *C. v. infaustus* and migrant *C. v. variolosus* (Heinrich 1956, Payne 1997, White & Bruce 1986, Coates & Bishop 1997). Alternatively, it was recently suggested, based mainly on vocalisations, that *aeruginosus* and *heinrichi* may belong to the same species (Tebb *et al.* 2008; J. A. Eaton pers. comm., F. Rheindt pers. comm.), a view supported by Gill & Donsker (2012), who afforded *aeruginosus* species status, including *C. a. aeruginosus* from southern Maluku and *C. a. heinrichi* on Halmahera and Bacan.

A distinct race, *C. v. obiensis*, was described from Obi by Jany (1955) on the basis of darker plumage and longer tail compared to resident *C. v. variolosus* from northern Maluku, but he did not compare it with *C. aeruginosus aeruginosus*. *C. v. obiensis* is generally treated as a synonym of *C. v. infaustus* (White & Bruce 1986, Payne 1997, Erritzoe *et al.* 2012). White & Bruce (1986) and Coates & Bishop (1997) mentioned the presence of two taxa on Obi, namely migrant *C. v. variolosus* and resident *C. v. infaustus*, but a calling bird observed and sound-recorded by F. R. Lambert possibly refers to *C. heinrichi* (www.xeno-canto.org/67791).

The bird photographed on 13 March 2010 (Fig. 5) was rather long-tailed with dark upperparts. It had a distinctive pattern on the underside of some rectrices, with whitish to

pale rufous bars extending the full width of the inner web. It also had rich rufous underparts with greyish feathers restricted to the upper throat and chin, merging with rufous feathers, yellow eye-ring, brownish tone to the base of the lower mandible and bright yellow legs. These features most recall *C. a. aeruginosus* (Fig. 7; http://orientalbirdimages.org/search.php?p=2&Bird_ID=448&Bird_Family_ID=&pagesize=1) and *C. a. heinrichi*, based on the description of Stresemann (1931). The bird photographed on Obi also strongly recalls a bird recently photographed on Halmahera and tentatively identified as Moluccan Cuckoo (Tebb *et al.* 2008). It noticeably differs from *C. s. virescens* from Sulawesi and the Sula Islands, the latter having greyish feathers extending lower on the breast and shorter whitish bars restricted to the inner web of the rectrices (Fig. 7). In addition, adults from northern Maluku referred to *C. variolosus* in Tring museum all possess paler rufous underparts with a predominantly greyish throat and breast (Fig. 7).

Most taxa in the *C. sepulcralis* / *variolosus* complex give two or more vocalisation types: (1) trisyllabic call notes repeated at rising frequencies and (2) a series of single calls usually repeated at level frequency (Coates & Bishop 1997, Rheindt 2010; pers. obs.), albeit with pronounced inter-racial differences (Coates & Bishop 1997, Payne 2005, Rheindt & Hutchinson 2007). In addition, distinctive variant vocalisations unambiguously given by *C. a. aeruginosus* on Seram, Buru and Ambon (Coates & Bishop 1997, Rheindt & Hutchinson 2007) and presumably by *C. a. heinrichi* on Halmahera (Tebb *et al.* 2008) include long series' of calls repeated very rapidly and delivered on either a level or rising frequency. These variant vocalisations are unknown in other forms of the *sepulcralis* / *variolosus* complex (Rheindt & Hutchinson 2007, Tebb *et al.* 2008, Rheindt 2010) and are also lacking in the many recordings of *C. variolosus* from the Lesser Sundas, New Guinea and Australia that we examined in online sound collections (i.e. xeno-canto.org; avocet.zoology.msu.edu/).

Variant calls described above and similar to calls previously recorded on Obi by F. R. Lambert were given by each of the three birds we recorded. These calls comprised rather flattened, hook-shaped individual call elements, which are frequently given by various races of *sepulcralis* and *C. a. aeruginosus*, but much less so by *C. variolosus*. Most interestingly, we failed to record the typical staple-shaped notes on Obi given by *C. variolosus* (see Tebb *et al.* 2008; F. R. Lambert, www.xeno-canto.org/38144).

Based on plumage and vocalisations, we conclude that our records refer to *C. aeruginosus* giving further support to the view that *heinrichi* and *aeruginosus* represent a single species (Tebb *et al.* 2008; F. Rheindt pers. comm., J. A. Eaton pers. comm.). Furthermore, given that we failed to record typical *variolosus* calls, we question the occurrence of a resident *variolosus* population (i.e. *C. v. infaustus*) on Obi and suggest that careful examination of *Cacomantis* specimens from Obi identified as *variolosus* might reveal, if they do not represent the *aeruginosus* / *heinrichii* group, that they are migrants of nominate *variolosus* from Australia. A thorough bio-acoustic, morphological and genetic study is required to clarify the taxonomy of *Cacomantis* in Australasia and Wallacea. Regarding the resident population on Obi, further study should clarify whether it belongs to *C. a. aeruginosus* or *C. a. heinrichi*, or to the endemic *obiensis* described by Jany (2005), which in our view should not be synonymised with *C. v. infaustus* until a thorough assessment is conducted.

MOLUCCAN SCOPS OWL *Otus magicus obira*

Seen three times and frequently heard at c.100–1,210 m, in forest edge, logged forest and primary forest. These are the first data on habitats, elevational range, status and vocalisations of this bird on Obi (White & Bruce 1986, Coates & Bishop 1997). Sound-recordings were obtained on 9 March 2010 (Fig. 8). The call is a short, harsh, rasping *kwok*, repeated at intervals of 5–7 seconds. Calls last 0.33–0.5 seconds, at 0.6–1.2 khz. When excited

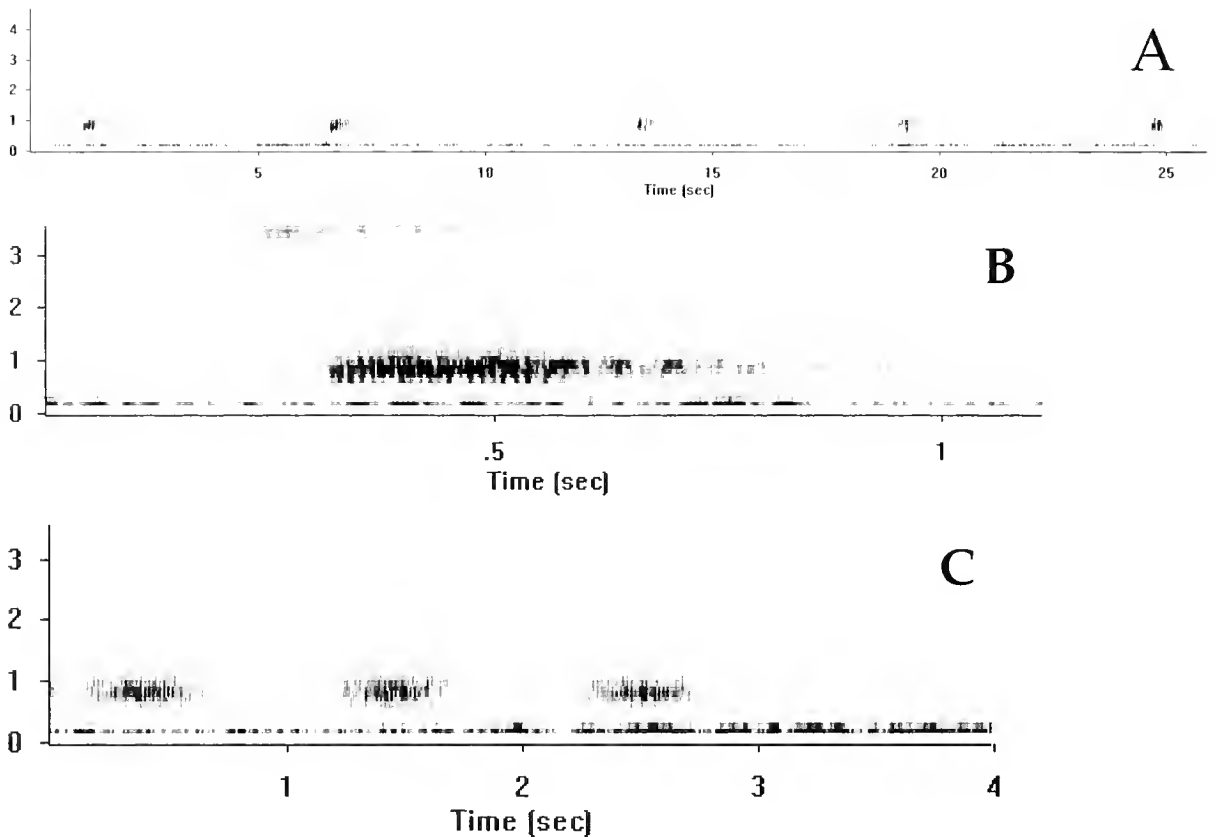


Figure 8. Sonograms of Moluccan Scops Owl *Otus magicus obira*, Obi, 8 March 2010 (M. Thibault): A: typical call. B: detail of A. C: excited *kwook* calls. X-axis = time (five seconds per tick, Fig. 8A; 0.5 seconds per tick, Fig. 8B; one second per tick, Fig. 8C), y-axis = frequency (1 kHz per tick).

by playback, one bird gave a series of *kwook* notes slightly longer and deeper than the usual call and repeated at shorter intervals. These vocalisations were found to be more restricted in frequency range, but otherwise similar to recordings of *O. m. magicus* from Buru (F. R. Lambert, www.xeno-canto.org/68940), *O. m. leucospilus* from Halmahera (D. Farrow, www.xeno-canto.org/19771) and *O. m. albiventris* from Flores (F. R. Lambert, www.xeno-canto.org/121829).

UNIFORM SWIFTLET *Aerodramus vanikorensis*

Identified on several occasions among mixed-species groups of *Aerodramus* and *Collocalia* spp. at 200–300 m on 19 March 2010 (MT & PDR). The birds were forced to fly low above ground by heavy rain, enabling reasonably good views against a forested background. Identification was based on the combination of larger size in direct comparison to Seram Swiftlet *A. ceramensis* and Glossy Swiftlet *C. esculenta*, and overall uniform brown plumage. At least 40 were present. Prior to our observations, only Lambert (1994) had reported this species on Obi.

SERAM SWIFTLET *Aerodramus ceramensis*

Also on 19 March 2010, MT & PDR observed at least 12 swiftlets intermediate in size between *A. vanikorensis* and *C. esculenta*, with glossy black upperparts, bold, clear-cut whitish rump band and paler underparts with dirty white belly and undertail-coverts. Following the split from Moluccan Swiftlet *Aerodramus infuscata* (Rheindt & Hutchinson 2007), we identified

these as Seram Swiftlets, which taxon had been tentatively identified on Obi by Lambert (1994) and our record suggests that it may be a regular visitor or resident.

WHITE-THROATED NEEDLETAIL *Hirundapus caudacutus*

On 18 March 2010, several small flocks totalling c.120 of this Palearctic migrant were recorded at site B at 400 m (OP, WP, PDR, MT). Most were low over the forest canopy, offering prolonged views in good early morning light. Key identification features including the extensive white throat were observed, eliminating Purple Needletail *H. celebensis* of Sulawesi and the Philippines and Silver-backed Needletail *H. cochinchinensis*, which breeds in mainland Asia and winters south-east to Java (Chantler 1999). All were flying west and might have been migrants. On 19 March 2010, small flocks totalling c.65 were seen at scattered locations between 320 m and 420 m (PDR, MT). Our records are the first for Obi and northern Maluku. Previous records from Sangihe, Sulawesi, Taliabu, Buru, Banda, Lombok, Timor (Coates & Bishop 1997), Atauro (Trainor & Leitao 2007), Tanimbar (J. A. Eaton pers. comm.) and Peleng (Rheindt *et al.* 2010) suggest that migrants can occur anywhere in Wallacea.

BLYTH'S HORNBILL *Rhyticeros plicatus*

Singles and pairs regularly recorded in logged forest and forest edge from sea level to 400 m, with a single on a forest ridge at 800 m (all observers). No previous information concerning elevational range on Obi (Coates & Bishop 1997, White & Bruce 1986).

RED-BELLIED PITTA *Erythropitta erythrogaster obiensis*

Seen twice and fairly commonly heard from c.100 m to 1,050 m. Most frequent in selectively logged forest and also found in second growth and scrub. Several sound-recordings of a singing bird obtained on 19 March (Fig. 9). The song comprised two slightly rising notes, the first note rising more markedly than the second, while the latter is flatter at the end. It was similar, but not identical, to the vocalisation on Halmahera (R. Drijvers *in*

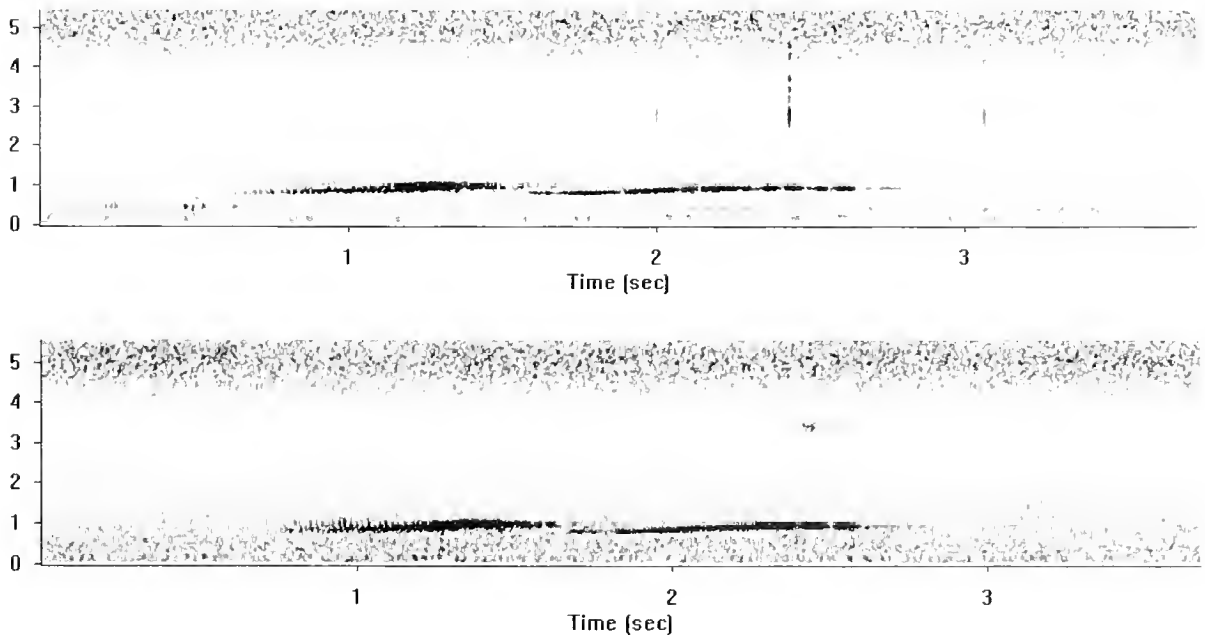


Figure 9. Sonograms of Red-bellied Pitta *Erythropitta erythrogaster rufiventris*, Obi, 19 March 2010 (M. Thibault). X-axis = time (one second per tick), y-axis = frequency (1 kHz per tick).

Sharringa 2005, www.xeno-canto.org/89488). However, given that *E. erythrogaster* presents considerable individual variation (Rheindt *et al.* 2010; pers. obs.), we are unable to comment further on the distinctiveness of the Obi vocalisation. While our records match previous statements that the species is common on Obi (Lambert 1994), they significantly extend the upper altitudinal range on the island. *E. e. obiensis* was described by Hachisuka (1935), who distinguished it from *rufiventris*, which occurs in most of northern Maluku, by an allegedly paler blue breast, despite earlier statement that specimens from Obi did not differ from *rufiventris* (Hartert 1903a). However most recent works treat *obiensis* as a synonym of *rufiventris* (White & Bruce 1986, Lambert & Woodcock 1996, Dickinson & Dekker 2000, Erritzoe 2003). A careful examination of specimens and thorough acoustic comparison are required to ascertain the taxonomic position of the Obi population.

DUSKY MYZOMELA *Myzomela obscura rubrotincta*

Common at 200–1,210 m with a single near sea level. Our records extend the altitudinal range on Obi, where it was previously unknown above 800 m (Coates & Bishop 1997). We had several opportunities to closely observe and photograph *rubrotincta*, which is restricted to Obi and Bisa. It has a bright reddish mantle, wings and tail, and a rosy red wash to the head-sides and most of the underparts, albeit brighter on the breast-sides and flanks (Fig. 10). MT found the appearance of *rubrotincta* to be strikingly different from the nominate race that he has observed in northern Australia, which is an overall greyish-brown bird. We also found *rubrotincta* to differ markedly from *simplex* that we saw on Halmahera immediately following our visit to Obi, which is a dark greyish bird, with reddish restricted to the outer edge of the remiges and rectrices, underparts pale greyish brown, with some pinkish-brown fringes on the breast feathers scarcely visible in the field (see http://orientalbirdimages.org/search.php?Bird_ID=1342).



Figure 10. Dusky Myzomela *Myzomela obscura rubrotincta*, Obi, 13 March 2010 (M. Thibault).

M. obscura comprises eight widely recognised races from northern Maluku to New Guinea and northern Australia (Higgins *et al.* 2008, Gill & Donsker 2012). Races are considered to comprise two groups, with *obscura* (northern Australia), *harterti* (islands of Torres Strait and north-east Australia), *fumata* (New Guinea), *rubrobrunnea* (Biak) and *ariensis* (Aru) comprising the 'nominate group', and *mortyana* (Morotai), *simplex* and *rubrotincta* the 'simplex group' (Higgins *et al.* 2008). However, in the nominate group, which mainly has overall dark grey-brown plumage, *rubrobrunnea* is remarkable as it has a brownish-red wash (see www.birdforum.net/opus/images/8/82/4370Dusky_Myzomela.jpg) and is also reported to have a reddish throat stripe (Higgins *et al.* 2008). These differences induced Hartert (1903a) to consider it intermediate between *simplex* and *rubrotincta*, and Mayr *et al.* (1939) to suggest that *rubrobrunnea* might constitute a species-level taxon. Based on important plumage differences, we consider that *rubrotincta* should be treated as a species and we suggest that molecular, morphological and perhaps acoustic analyses of the *M. obscura* complex should be conducted as they might reveal that non-clinal variation among island forms elsewhere in the northern Moluccas and on Biak include one or more additional species-level taxa.

SULAWESI MYZOMELA *Myzomela chloroptera* (undescribed subspecies?)

On 13 March, an adult male, an immature male and at least one female / juvenile were observed and photographed at 950 m at site E (MT). On 15 March, two females / juveniles in the same area (OP, MT). On both occasions, they fed in low trees and dense second growth bordering a logging track. These are the first confirmed records of *M. chloroptera* for Obi. It is of note that a 'mostly red' *Myzomela* sp. seen in 1992 in the lowlands of Obi could refer to this species, but the view was too brief for a description (F. R. Lambert pers. comm.).

M. chloroptera currently comprises four widely recognised subspecies: the nominate from north and central Sulawesi, *juga* from south Sulawesi, *eva* from Salayar and Tanahjampea, and *batjanensis* from Bacan (Coates & Bishop 1997, Higgins *et al.* 2008). Populations recently discovered on Taliabu, Sula Islands (Davidson *et al.* 1991, Rheindt 2010) and Peleng, Banggai Islands (Rheindt *et al.* 2010) closely resemble the nominate, although future research may reveal that they comprise one or two new subspecies.



Figure 11. Male Sulawesi Myzomela *Myzomela chloroptera* ssp. (presumably the same individual), Obi, 13 March 2010 (M. Thibault). Strongly patterned black-and-red upperparts, all-black scapulars, wing and tail feathers lacking brownish tinge and pure red on head, throat and breast clearly demarcated from pale greyish belly and whitish flanks strongly suggest it is a full adult. Underparts coloration strikingly differs from *batjanensis* and also shows subtle differences compared to typical adults of the nominate race.



Figure 12. From left to right: *Myzomela chloroptera batjanensis* (three from Bacan), *M. c. chloroptera* (two from Minahassa Peninsula, north Sulawesi), *M. c. juga* (one from south-west peninsula of Sulawesi), *M. c. eva* (two from Salayar and Tanahjampea, respectively) (M. Thibault / © The Natural History Museum, Tring).

The population we discovered on Obi fills a geographical gap between *batjanensis* and the populations on Taliabu and Peleng. One of the birds photographed (Fig. 11) was an adult male based on its strongly patterned black-and-red upperparts, pure red head, throat and breast lacking any greyish (immature) feathers and clearly demarcated pale greyish belly and whitish flanks. Preliminary comparisons can be made with other subspecies of *M. chloroptera*. Compared to *batjanensis* (geographically proximate), the adult male photographed on Obi was strikingly different, having a red (not greyish-olive) breast. The red below did not extend to the belly and appeared more restricted than on typical adults of the nominate (pers. obs.), although whether this pattern lies within individual variation of the latter cannot be fully excluded. It had a whitish abdomen, with no trace of the fawn grey-brown tinge supposedly distinctive of the nominate (Coates & Bishop 1997; Fig. 12). Compared to geographically distant *eva* and *juga*, no significant plumage difference could be detected. Compared to the (limited) photographic material available for populations on Taliabu (Rheindt 2010; F. Rheindt unpubl.) and Peleng (F. Verbelen unpubl.), red was lacking on the upper belly and flanks, suggesting that it possibly represents an undescribed taxon. Detailed morphological, acoustic and molecular analyses of the *M. chloroptera* group are required, as already suggested by Rheindt (2010) and Rheindt *et al.* (2011).

PALE CICADABIRD *Coracina ceramensis hoogerwerfi*

Recorded at 300–1,220 m in logged and primary forest and forest edge, seldom in the lowlands (three records below 700 m) and most commonly above 800 m (ten records). Endemic to Maluku, the subspecies *hoogerwerfi* is restricted to Obi. Our observations provide the first data on the elevational range of *hoogerwerfi* (Coates & Bishop 1997, White & Bruce 1986) and add new information concerning its habitat preferences (Linsley 1995).

RUFOUS-BELLIED TRILLER *Lalage aurea*

Common in logged forest and forest edge to 420 m. This monotypic species endemic to northern Maluku is a lowland specialist. Our records slightly extend the altitudinal range on Obi, where it was previously reported to 300 m (Coates & Bishop 1997).

COMMON GOLDEN WHISTLER *Pachycephala pectoralis obiensis*

Recorded at 300–1,220 m, most commonly above 700 m. *P. pectoralis* was reported from the lowlands of Obi (Linsley 1995), but there were no previous data on the upper elevational range of *P. p. obiensis* (White & Bruce 1986, Coates & Bishop 1997). The Common Golden / Mangrove Whistler *P. pectoralis / melanura* complex, with 66 named populations, is one of the most complex examples of avian geographic variation (Jonsson *et al.* 2008). The IOC currently treats Obi populations as part of Black-chinned Whistler *P. mentalis* (northern Maluku: Gill & Donsker 2012) but it seems preferable to await genetic and vocal analyses of the complex before accepting this split.

CINNAMON-BREASTED WHISTLER *Pachycephala johnei*

Common in logged forest, primary forest and forest edge, and also seen in regrowth and scrub, at 300–1,200 m, with a single record near sea level. Our observations significantly extend the altitudinal range given for this Obi endemic, which was previously recorded at 220–700 m (Lambert 1994).

Most authors (White & Bruce 1986, Coates & Bishop 1997, Boles 2007) placed *johne* within *P. griseonota*, along with five additional subspecies differing significantly in their plumage and potentially vocalisations (Coates & Bishop 1997, Rheindt *et al.* 2010), despite the initial assignment of *johne* to species level by Hartert (1903a), who argued that it 'has



Figure 13. Male Cinnamon-breasted Whistler *Pachycephala johnei*, Obi, 15 March 2010 (M. Thibault).

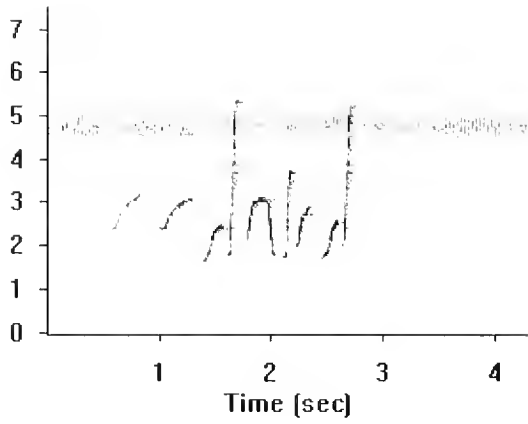
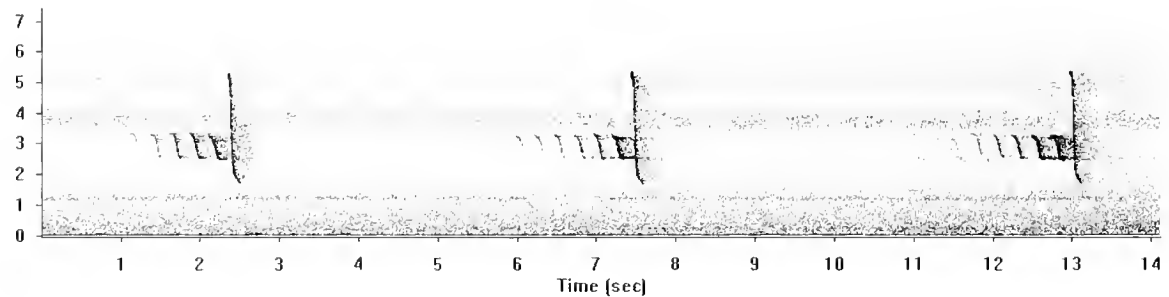
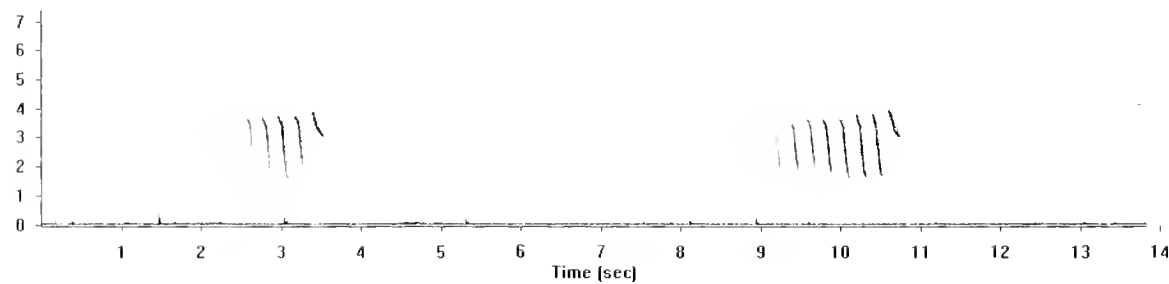
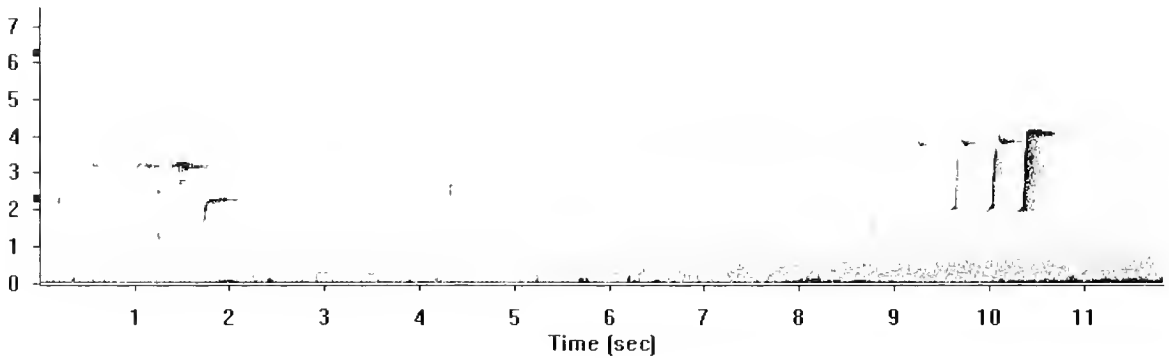
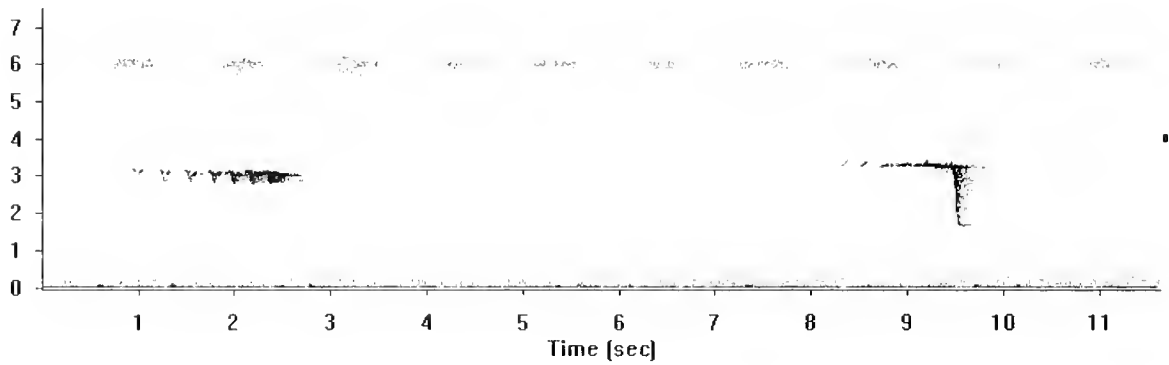


Figure 14. Sonograms of the songs of (A) Cinnamon-breasted Whistler *Pachycephala johni*, Obi highlands, 16 March 2010 (M. Thibault) and (B-E) Drab Whistler *P. griseonata*, with (B) *P. g. griseonata*, Kopiboto, Seram (R. O. Hutchinson), (C) *P. g. griseonata*, Sawai, Seram (J. A. Eaton), (D-E) *P. g. examinata*, Wamlana, Buru (J. A. Eaton). X-axis = time (one second per tick), y-axis = frequency (1 kHz per tick).



no very close ally' and that 'its bright rufous-cinnamon underside distinguishes it at once from all others [*Pachycephala*]'.

We were impressed by the wholly rich rufous-cinnamon underparts in male *johui* (Fig. 13), whereas male *P. griseonata* is described as having whitish (nominate, *examinata*, *lineolata*), greyish (*kuehni*) or ashy grey (*cinerascens*) throat, greyish breast (*examinata*, *lineolata*, *cinerascens*), tinged ochre (nominate) or brown (*kuehni*) and belly either rusty ochre (nominate), buffy ochre (*kuehni*, *examinata*), white (*lineolata*) or white with slight ochre tinge (*cinerascens*) (White & Bruce 1986, Boles 2007). Female *johui* is also distinctive, being similar to the male, albeit duller and with black streaks on the breast.

The song of *johui*, previously undescribed, was heard several times and sound-recorded once. It includes whistling strophes, of 0.5–2.0 seconds, comprising 3–10 varied notes delivered at 1.7–5.5 kHz, which produce a varied tuneful song (Fig. 14A). A preliminary comparison reveals that it differs markedly from *P. g. griseonata* on Seram (Fig. 14B–C), *P. g. examinata* on Buru (Fig. 14D–E) and *P. g. cinerascens* on Halmahera (G. Wagner, www.xeno-canto.org/23102), which mainly utter monotonous phrases. It also differs from the unique sample from Peleng, possibly attributable to *P. g. lineolata* (B. Demeulemester, avocet.zoology.msu.edu/recordings/12430), and to at least some of the vocalisations described for *kuehni* on the Kai Islands (Coates & Bishop 1997). Based on plumage and song, we support the view (Hartert 1903a, Gill & Donsker 2012) that *johui* should be regarded as a species and recommend comprehensive morphological and acoustic studies of the *P. griseonata* complex as it might reveal the presence of other species-level taxa.

HAIR-CRESTED DRONGO *Dicrurus hottentotus guillemardi*

Common in various habitats below 400 m including small patches of degraded forest mixed with coconut plantations. Much scarcer at higher elevations, with only four records at 800–1,220 m. Our records significantly extend the altitudinal range on Obi, where it was previously unrecorded above 800 m (Coates & Bishop 1997). *D. h. guillemardi* is endemic to Obi and Bisa (Coates & Bishop 1997). It is one of many allopatric forms of *Dicrurus* in the Philippines–Wallacea–New Guinea that are currently lumped in one of two polytypic species, Hair-crested and Spangled Drongos *D. bracteatus*. However, important morphological, behavioural or vocal variation among these numerous forms suggest that more detailed study might identify 'new' species (Rheindt & Hutchinson 2007, Rocamora & Yeatman-Berthelot 2009, Rheindt *et al.* 2010). Future visitors to Obi and Bisa should concentrate on obtaining good recordings of the vocalisation of *D. h. guillemardi* as these would be useful for a reappraisal of the taxonomy of the *D. hottentotus* / *bracteatus* complex

NORTHERN FANTAIL *Rhipidura rufiventris obiensis*

Commonly recorded from sea level to 1,210 m with most records in degraded forest and edge. Our records significantly extend the upper altitudinal range on Obi as it was not previously recorded above 550 m (Coates & Bishop 1997). *R. r. obiensis* is restricted to Obi and Bisa. *R. rufiventris* exhibits discrete variation between islands not following clinal trends; its taxonomy is complicated and unclear, and it has been suggested that DNA analysis might conclude that many races warrant species status (Rheindt & Hutchinson 2007). *R. r. obiensis* has a distinctive combination of plumage features not shared by any neighbouring populations of *R. rufiventris* in Wallacea, including broad white fringes to the secondaries and broadly white-tipped outer rectrices (Boles 2006).

RUFOUS FANTAIL *Rhipidura rufifrons torrida*

Only five singles and one record of a pair, all restricted to a narrow altitudinal zone at 760–1,000 m, at sites D and E (MT & WP). The range of *R. r. torrida* includes Halmahera,

Ternate, Bacan and Obi. Our observations apparently constitute the first records on Obi since one collected by Waterstradt in 1902 (Hartert 1903a) and there were no previous data on the elevational range on Obi (Coates & Bishop 1997, White & Bruce 1986).

MOLUCCAN MONARCH *Symposiachrus bimaculatus diadematus*

The *diadematus* subspecies of this northern Maluku endemic is restricted to Obi and Bisa. Observed at 260–1,030 m, with all but one record above 700 m. Widespread in second growth and forest edge, usually associating with mixed-species flocks. The occurrence of *M. trivirgatus* is already well known in the lowlands of Obi, where it was most recently reported by Linsley (1995). Our survey, however, extends the altitudinal range for the species, as it is reported to just 850 m on Halmahera (Poulsen & Lambert 2000).

MOLUCCAN FLYCATCHER *Myiagra galeata galeata*

Recorded in forest edge, secondary forest and scattered trees near coconut plantations, from sea level to 870 m. Moderately common in the lowlands of Obi, but no published data concerning its upper altitudinal limit (Lambert 1994, Linsley 1995, Coates & Bishop 1997).

SHINING FLYCATCHER *Myiagra alecto alecto*

Seen nine times and heard once. Most records were between sea level and 600 m, but also seen at 750 m and 850 m. Mostly observed near rivers and forest edge, but one in a dry gully in secondary forest at 750 m. Although *P. alecto* is mentioned from the lowlands of Obi (Linsley 1995), our records provide the first data on its upper elevational limit.

PARADISE CROW *Lycocorax pyrrhopterus obiensis*

Very common from sea level to 1,220 m in a wide range of habitats including small patches of degraded lowland forest mixed with coconut plantations and primary montane forest. Our records significantly extend the altitudinal range on Obi, where it was previously unknown above 800 m (Lambert 1994, Linsley 1995). *L. p. obiensis* is very distinct from both the nominate and *morotensis* in plumage and measurements (Frith & Beehler 2006) and has already been considered close to deserving species status (Cracraft 1992). It is also more manucode-like in appearance (Lambert 1994; pers. obs.) and its vocalisation includes several frequently delivered distinctive calls not given by the nominate, as previously described by Lambert (1994). Research on the degree of insular differentiation and on the evolution of local dialects was recommended by Frith & Beehler (2006).

NORTHERN GOLDEN BULBUL *Thapsinillas longirostris lucasi*

Commonly recorded in primary forest, logged forest and forest edge, at 260–1,210 m, significantly extending the altitudinal range on Obi, where it was previously unknown above 800 m (Coates & Bishop 1997). Golden Bulbul is a poorly studied group endemic to Wallacea, where it is represented by nine recognised taxa. Fishpool & Tobias (2005) recently split the group into two species, namely Northern Golden Bulbul *T. longirostris*, which includes six subspecies in northern Maluku, on Obi, Sangihe, Sula, Banggai and Togian islands, and Southern Golden Bulbul *T. affinis*, comprising three subspecies on Buru, Ambon and Seram. Rheindt & Hutchinson (2007) went further in proposing to split *T. affinis* into two species, Buru Golden Bulbul *T. mysticalis* and Seram Golden Bulbul *T. affinis*, which was adopted by Gill & Donsker (2012).

Compared with the subspecies *chloris* (from Morotai to Bacan), which is geographically its closest relative, *lucasi* has very distinctive bright yellowish plumage (whereas *chloris* is markedly greener overall) and an extensive bright yellow loreal spot (*chloris* has a dark loreal



Figure 15. Northern Golden Bulbul *Thapsinillas longirostris*, with (A) *T. l. lucasi*, Obi, 10 March 2010 (M. Thibault) and (B) *T. l. chloris*, Halmahera, 23 March 2010 (M. Thibault).

spot extending below the eye) (Fig. 15). The bright yellow loreal spot is a feature shared by no other form of the Northern Golden Bulbul group except *platenae*, which is restricted to the geographically distant island of Sangihe (Coates & Bishop 1997). *T. l. lucasi* is a fairly vocal taxon that frequently delivers three different call types, permitting many sound-recordings to be made. In addition to whistled *tweeeuip* notes (Fig. 16A) and raucous calls (Linsley 1995), it also gives a distinctive, piercing call comprising 2–3 notes that can be transcribed *pic pic piie* (Fig. 16B). A preliminary comparison was made with incomplete sets of recordings of the *T. affinis* / *longirostris* / *mysticalis* complex. These included recordings of *platenae* on Sangihe (F. Verbelen, avocet.zoology.msu.edu/recordings/3347), *aureus* on the Togian Islands (F. R. Lambert, www.xeno-canto.org/90082), *hartertii* on the Banggai Islands (F. R. Lambert, www.xeno-canto.org/95775, www.xeno-canto.org/95360, F. Verbelen, avocet.zoology.msu.edu/recordings/3344), *longirostris* on Taliabu (D. Verbelen, avocet.zoology.msu.edu/recordings/3344).

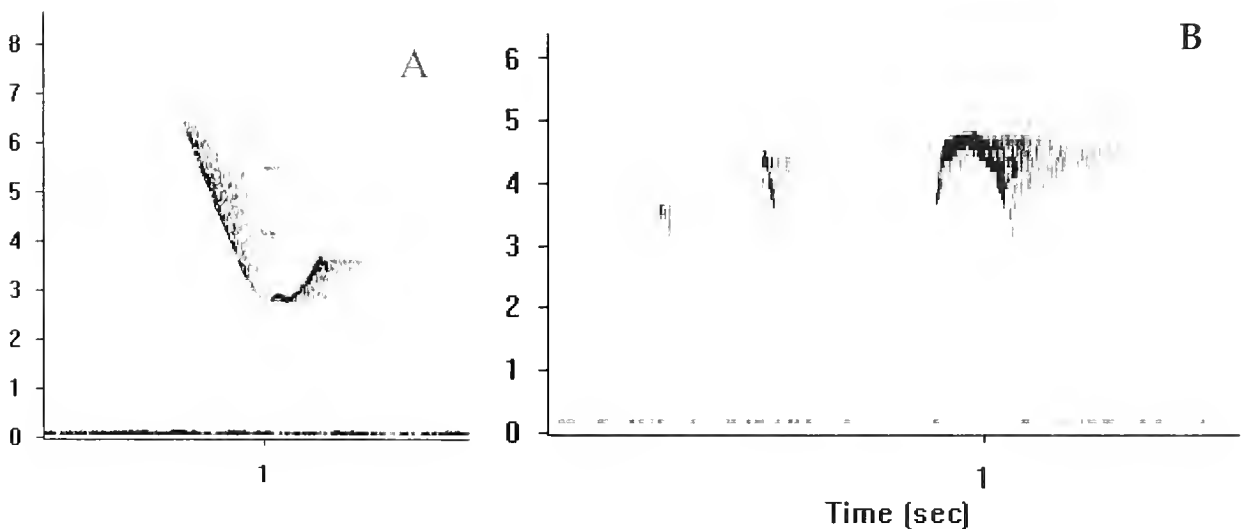


Figure 16. Sonograms of Northern Golden Bulbul *Thapsinillas longirostris lucasi*, with (A) whistled *tweeeuip* calls, (B) *pic pic piie* calls, Obi, March 2010 (M. Thibault). X-axis = time (one second per tick), y-axis = frequency (1 kHz per tick).

zoology.msu.edu/recordings/7821), *affinis* on Seram (F. R. Lambert, avocet.zoology.msu.edu/recordings/4805, avocet.zoology.msu.edu/recordings/4806) and *mysticalis* on Buru (G. Wagner, www.xeno-canto.org/42281, F. R. Lambert, <http://avocet.zoology.msu.edu/recordings/4147>). Recording of *chloris* (from Morotai to Bacan) were unavailable, but its vocalisation is described as ‘a rapid and repetitive chatter of semi-musical, moderately high pitched notes’ of 6–8 seconds duration (Coates & Bishop 1997). From these recordings and the description of *chloris*, no vocalisation comparable to those we recorded of *lucasi* could be found. Based on our preliminary comparisons, we suggest that *lucasi* is best regarded as a species. Further studies may evidence that *T. longirostris* comprises several other species-level taxa, as suggested by Rheindt *et al.* (2010).

UNIDENTIFIED MARTIN *Riparia riparia / diluta*

On 20 March 2010, a single *Riparia* sp. was seen at very close range in a flock of Barn Swallows *Hirundo rustica* in Laiwui town (PDR & OP). The bird perched for several minutes on an electric wire just above the observers. It was approximately one-fourth smaller than the Barn Swallows perched beside it and had dark sandy brown upperparts and top of the head, and a concolorous collar on its upper breast. The rest of the underparts, including throat and chin, were creamy white. Its tail appeared relatively short and slightly forked with the outer tail feathers having a rounded aspect. It took flight after a few minutes and was not seen again. Despite the prediction by Coates & Bishop (1997) that *R. riparia* might be recorded in Wallacea, we have failed to find any record in the literature, with the exception of a *R. riparia* on Karakelong, Talaud Islands, on 8 November 2011 (Robson 2012). Our record is apparently the first for Wallacea of the *R. riparia / diluta* species group. Based on several features, including (a) absence of pale grey tone to the upperparts and breast-band coloration, (b) solid, contrasting and complete dark beige-brown breast-band, (c) absence of any particular contrast, greyish tinge or paleness on the head, (d) whitish throat contrasting with dark beige-brown ear-coverts and lores, and (e) slight but clear tail fork, we believe it was possibly a Sand Martin *R. riparia* rather than a Pale Sand Martin *R. diluta*. Overall size and depth of the tail fork are of limited use on a lone vagrant (Loskot 2006, Schweizer & Ayé 2007). Identification in the field of eastern forms of both species is an unresolved issue in South-East Asia (<http://digdeep1962.wordpress.com/>), also because the winter range of Pale Martin is poorly known. Whereas Pale Martin is regularly recorded in winter only in Hong Kong (<http://digdeep1962.wordpress.com/>), eastern Myanmar and eastern Tonkin (Robson 2008), Sand Martin is more widespread in South-East Asia in the non-breeding season (Robson 2008) and is a rare but regular winter visitor to Borneo (MacKinnon & Phillips 1993, Myers 2009) and the Philippines (Kennedy *et al.* 2000, Allen *et al.* 2006). It is also a straggler to Papua New Guinea (Coates & Peckover 2001). In view of this pattern of occurrence in the Oriental and Australasian regions, Sand Martin is therefore more likely to be recorded in Wallacea. Elsewhere in Indonesia it has been recorded only in Kalimantan (<http://burung-nusantara.org/birding-indonesia/checklist-birds-of-indonesia/>).

BARN SWALLOW *Hirundo rustica*

Several seen at close range in Laiwui on 20–21 March 2010 (all observers). Easily separated from Pacific Swallow *H. tahitica* by the combination of long outer tail-streamers and dark chest contrasting with very pale creamy-white underparts. This northern migrant was previously unrecorded on Obi, although its presence is unsurprising given that it is ‘likely to occur anywhere in Wallacea’ (Coates & Bishop 1997).

ISLAND LEAF WARBLER *Phylloscopus poliocephalus waterstradti*

We recorded this taxon at 360–1,210 m, in primary and logged forest, most commonly above 800 m. *P. p. waterstradti* is endemic to Bacan and Obi and very little is known of its ecology except that it was previously recorded above 550 m on Obi (Lambert, 1994) and at 1,500–2,100 on Bacan (Coates & Bishop 1997). Our records significantly extend the altitudinal range on Obi and suggest more important range distinctions between Obi and Bacan.

The vocalisation of *P. p. waterstradti* has not been previously described. Several sound recordings were obtained (Figs. 17A–B). Songs comprise various trilling strophes lasting 1.1–2.2 seconds delivered every 1.4–3.6 seconds. Strophes are most frequently introduced by a single, lower pitched element at 3.0–6.5 kHz. Main trills are level or rising, at 3.5–9.0 kHz and include repeated inverted-V notes or inverted-V notes alternated with bell-shaped or more complex notes. These are somewhat reminiscent of the trilling song described for *P. p. ceramensis* on Seram (Rheindt & Hutchinson 2007; T. Mark, www.xeno-canto.org/122063), but the latter also gives more complex phrases alternating between rising and descending series (M. Catsis, www.xeno-canto.org/38412) that were not heard on Obi. The song of *P. p. waterstradti* is also close to *henrietta* of Halmahera (Fig. 17C), but distinctly faster and higher pitched. Our recordings of *waterstradti* differ markedly from those of all other *P. poliocephalus*

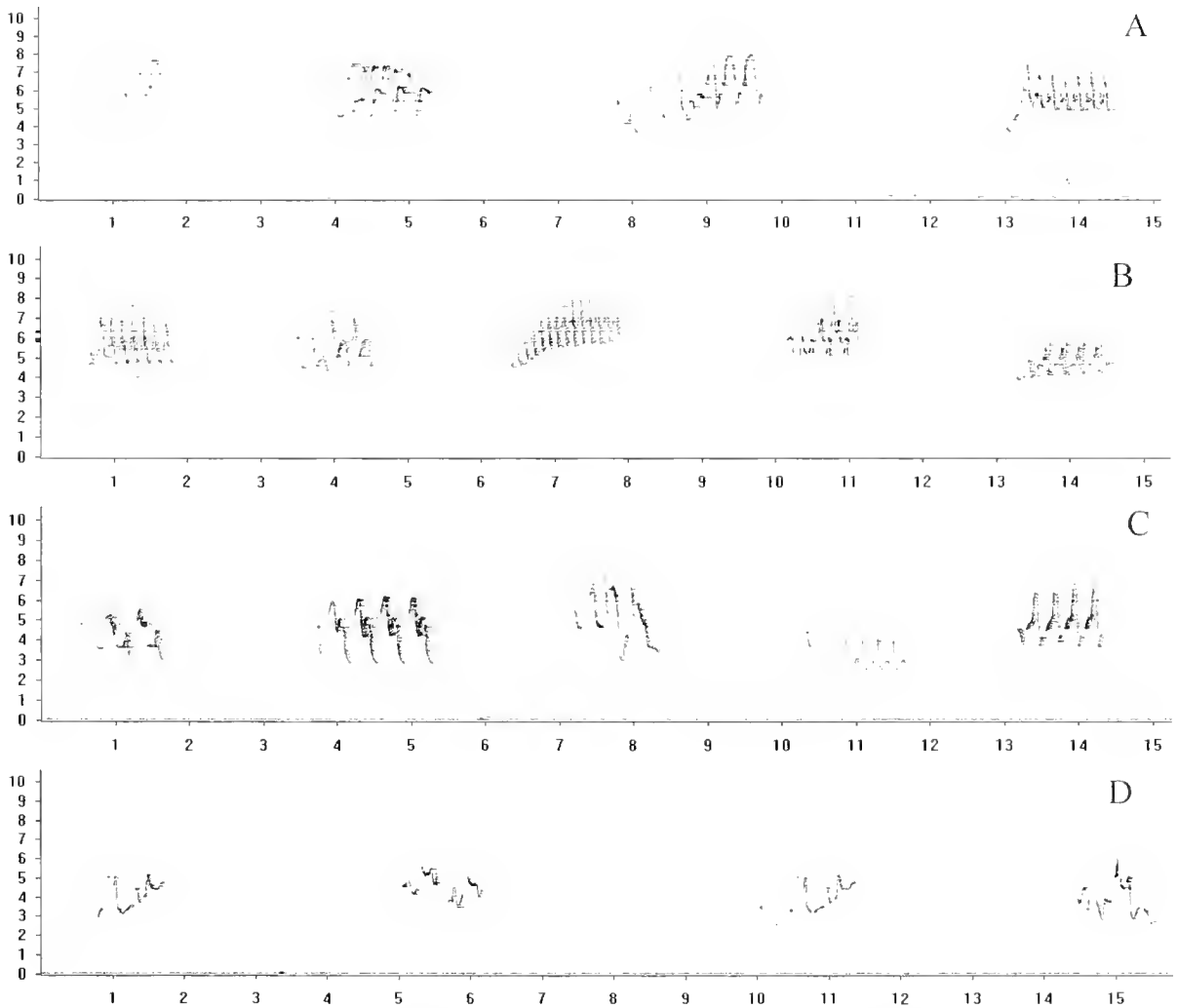


Figure 17. Sonograms of songs of (A–B) Island Leaf Warbler *Phylloscopus poliocephalus waterstradti*, Obi, March 2010 (M. Thibault), (C) *P. p. henrietta*, Halmahera, October 2011 (R. O. Hutchinson), (D) *P. (poliocephalus)* taxon novum, Taliabu, December 2012 (R. O. Hutchinson). X-axis = time (one second per tick), y-axis = frequency (1 kHz per tick).

subspecies for which recordings or sonograms are available, i.e. *cveretti* on Buru (Rheindt & Hutchinson 2007), *avicola* on Kai (F. R. Lambert, avocet.zoology.msu.edu/recordings/5420), *misoriensis* on Biak (B. van Balen, www.xeno-canto.org/75914), *giulianettii* from central and south-east New Guinea (I. Woxvold, www.xeno-canto.org/87539) and *becki* from the eastern Solomons (D. Gibbs, www.xeno-canto.org/70658). The song of *waterstradti* also differs notably from that of ‘Taliabu Leaf Warbler’ *Phylloscopus* taxon novum (Fig. 17D), recently discovered on Taliabu (Davidson *et al.* 1991, Rheindt 2010) and from ‘Peleng Leaf Warbler’ *Phylloscopus* taxon novum (F. Lambert, www.xeno-canto.org/95794), recently discovered on Peleng (Rheindt *et al.* 2010), but is reminiscent in structure to some variant trilling songs of *P. sarasinorum ucsophilus* from central Sulawesi, although the latter are at a markedly lower frequency (various recordists, www.xeno-canto.org/species/Phylloscopus-sarasinorum). This suggests that *P. poliocephalus waterstradti* might be best treated as a species. However, detailed taxonomic research into the *P. sarasinorum / poliocephalus* complex is needed as it might reveal a number of species-level taxa, as suggested by Rheindt & Hutchinson (2007) and Rheindt *et al.* (2010). Furthermore, a comprehensive study should include vocal comparisons between populations on Obi and Bacan.

CREAM-THROATED WHITE-EYE *Zosterops atriceps*

This inconspicuous but very vocal white-eye was occasionally seen and commonly heard at 700–1,200 m in primary and logged forest, forest edge and second growth, with records down to 400 m (all observers). Our observations significantly extend the altitudinal range on Obi, where it was previously unknown above 700 m (Coates & Bishop 1997). Surprisingly, it was first recorded on Obi in 1992 when Lambert (1994) found it uncommon and stated that ‘the birds most closely resemble the nominate subspecies of Bacan with greyish heads contrasting with the bright green upperparts’. From our field experience, white-eyes on Obi show striking variation that might be age-related, including in bill size and throat colour, the latter ranging from creamy white to grey. We failed to notice the greyish tone to the head mentioned by Lambert, but once obtained photographic evidence of the fuscous-olive tinge to the crown typical of nominate *atriceps* (Fig. 18). Vocalisations of birds on Obi have not been described. The song comprises moderately sweet whistles, strongly reminiscent of *fuscifrons* from Halmahera, although apparently more variable in duration (Coates & Bishop, 1997), with phrases ranging up to eight seconds (Fig. 19). A more detailed investigation including morphological, vocal and molecular analyses is required to confirm the taxonomic position of the Obi population.



Figure 18. Cream-throated White-eye *Zosterops atriceps* (*atriceps?*), two different individuals, Obi, 16 March 2010 (M. Thibault); note variation in throat coloration.

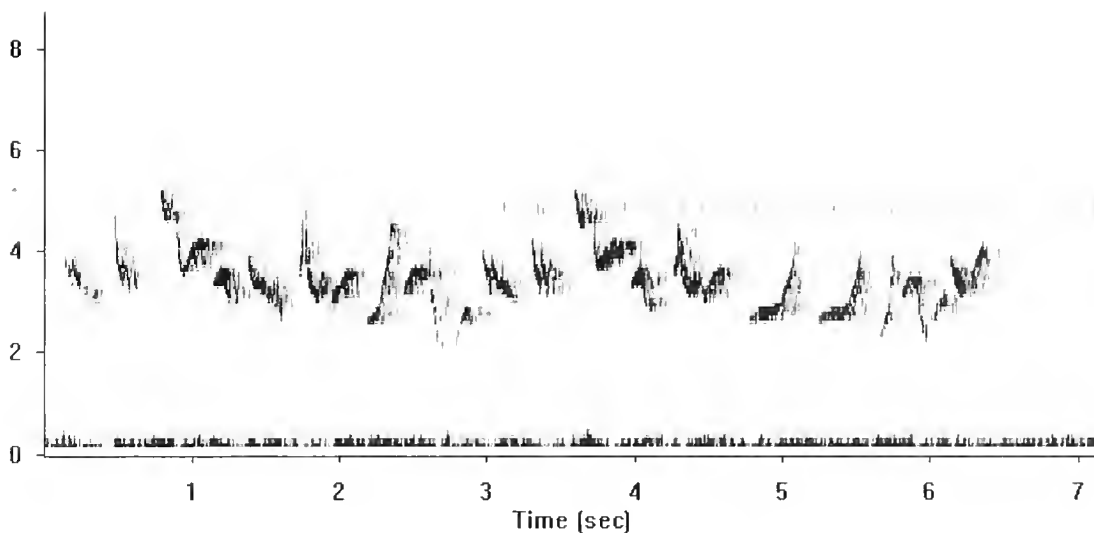


Figure 19. Sonogram of song of Cream-throated White-eye *Zosterops atriceps*, Obi, 14 March 2010 (M. Thibault). X-axis = time (one second per tick), Y-axis = frequency (1 kHz per tick).

TURQUOISE FLYCATCHER *Eumyias panayensis obiensis*

Recorded just twice in logged forest at 800 m at site D and 840 m at site E, with photographs taken by MT. *E. p. obiensis* is endemic to Obi (Coates & Bishop 1997). White & Bruce (1986) traced only two specimens, from 650 m, while Lambert (1994) found it uncommon at 250–700 m, and Linsley (1995) failed to record it. Our observations slightly extend the altitudinal range of this taxon and support the view that it is uncommon.

HALMAHERA FLOWERPECKER *Dicaeum schistaceiceps*

Recorded five times in primary forest, logged forest and edge at 300–1,210 m (all observers). *D. schistaceiceps* is a recent split from *D. erythrothorax* (Rheindt & Hutchinson 2007). Known elevation is 0–710 m on Halmahera (Poulsen & Lambert 2000), 0–950 m on Bacan (Lambert 1994) and 180–400 m on Obi (Lambert 1994). Our observations significantly extend the altitudinal range for this species, and suggest that it is fairly common and rather evenly distributed throughout its elevational range on Obi.

BLACK SUNBIRD *Leptocoma sericea*

Most commonly recorded from sea level to 500 m, less common at 500–1,000 m with one record of two birds at 1,200 m (MT). No previous data concerning elevational range on Obi (White & Bruce 1986, Coates & Bishop 1997).

OLIVE-BACKED SUNBIRD *Cinnyris jugularis*

We provide the first data concerning elevational range on Obi (Coates & Bishop 1997, White & Bruce 1986), with sight records from sea level to 420 m.

EURASIAN TREE SPARROW *Passer montanus*

Common at Laiwui and several at a logging settlement south of Soligi (all observers). Actively expanding its range in Wallacea (C. Trainor pers. comm.), in Maluku it was first recorded on Ambon (around 1900) and subsequently on Buru (1980), Ternate (1992) and Halmahera (1994) (Coates & Bishop 1997). Ours are the first records for Obi and were 40 km distant from each other, suggesting that the species may now be widespread and well established in the inhabited parts of the island.

Unconfirmed records

MOLUCCAN MEGAPODE *Eulipoa wallacei*

On 15 March 2010, two megapodes were flushed in dense, shrubby vegetation adjacent to a logging track at 940 m at site E (MT & PDR). Both gave only very brief views in taking-off but on the first bird, the whitish undertail and overall two-toned plumage with brown upperparts and dark greyish underparts were seen, suggesting *E. wallacei* and seemingly excluding all *Megapodius* including Dusky Scrubfowl *M. freycinet*, which is the only scrubfowl previously known from Obi and which is more uniform blackish grey without white or brown in the plumage. Moluccan Scrubfowl is near-endemic to Maluku where it is known from many islands including Halmahera, Meiti, Ternate, Bacan, Buru, Boano, Seram, Ambon and Haruku (Coates & Bishop 1997). Outside Maluku it occurs only on Misool Island (West Papua). The lack of previous records from Obi (Coates & Bishop 1997, White & Bruce 1986) seems remarkable given that the island is central to the species' range. The elevation of our observation matches information provided by Coates & Bishop (1997), who mentioned that the species 'inhabits hill and montane forest, generally above c. 750 m'. Lacking previous experience of *E. wallacei* and as we can only provide an incomplete description, we stress that our record should be considered provisional. Future observers should attempt to confirm or refute the species' presence on Obi.

Discussion

We provide the first records since 1982, first data on the vocalisations and basic information on habitat for a very poorly known species of global conservation concern (*Scolopax rochussenii*). These results will be potentially helpful for future research and conservation action. We also present details of five new bird records for Obi, including one (*Myzomela chloroptera*) that potentially involves an undescribed taxon. Three new records are migrants (including *Riparia riparia / diluta*, a species group new to Wallacea) and one is a new colonist whose presence is linked to anthropogenic habitat change (*Passer montanus*). In addition, another new bird record (*Eulipoa wallacei*) awaits confirmation.

The presence of a population of *M. chloroptera* in Obi fills a geographical gap between *M. c. batjanensis* on Bacan and those populations recently discovered on the Banggai (Rheindt *et al.* 2010) and Sula islands (Davidson *et al.* 1991). This record pertains to a generally montane species previously unnoticed possibly because most field workers have operated mainly in the lowlands, although recent colonisation is not fully excluded.

The occurrence of a species not mentioned in recent publications despite evidence of earlier collectors is confirmed (*Columba vitiensis*) and new material supportive of the presence of a resident population of *Cacomantis aeruginosus* in Obi is presented.

Our field work failed to reveal the presence on Obi of an unambiguous, distinct montane bird community, possibly as a result of genuinely limited and fragmented forest above 800–900 m, as outlined previously for Halmahera (Poulsen & Lambert 2000). While several resident species were only encountered above 700 m (*Columba vitiensis*, *Myzomela chloroptera*, *Rhipidura rufifrons*, *Eumyias panayensis*), they are not considered strictly montane elsewhere in their ranges. However further field work focusing on as yet uncovered elevations (1,200–1,500 m) is needed to confirm our preliminary assessment.

A number of resident landbirds, including two Obi endemics (*Accipiter hiogaster obiensis*, *Coraciina tenuirostris obiensis*), were not encountered by us, suggesting that they are rare or uncommon and / or that they are restricted to the lowlands, where little time was spent.

Our field work uncovered substantial new albeit incomplete data pertaining to the confusing taxonomic placement of several Obi birds. Novel acoustic data are suggestive of biological species status for *Thapsinillas longirostris lucasi* and further support calls to treat *Pachycephala johnei* as a species. Field observations and photographs highlight the distinctiveness of *Myzomela obscura rubrotincta*, which we consider deserves species status. Finally, we highlight the need for a taxonomic reappraisal of several other endemic forms, some of which were already mentioned by others. These include *Ducula basilica obiensis*, *Eos squamata obiensis*, *Geoffroyus geoffroyi obiensis*, *Dicrurus hottentotus guillemardi*, *Rhipidura rufiventris obiensis*, *Lycocorax pyrrhopterus obiensis* and *Phylloscopus poliocephalus waterstradti*. Although most of our observations await further taxonomic work, they suggest that the importance of the Obi avifauna at species level has probably been under-estimated.

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The taxonomic status of the Black-shouldered Nightjar *Caprimulgus nigriscapularis* Reichenow, 1893

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SUMMARY.—The current status of Black-shouldered Nightjar *Caprimulgus nigriscapularis* is based on relatively minor differences in voice and plumage from Fiery-necked Nightjar *C. pectoralis*. These differences are considered by some authorities to be no more than geographic or individual variation. Presented here are mensural data, previously largely overlooked, comparing *C. nigriscapularis* with the four races of *C. pectoralis*. The mean values of five key characters show clinal variation. Analyses of variance carried out on nine other key characters (in wing, tail, head and foot) reveal that, except for wing length, the null hypothesis, linking *C. nigriscapularis* with *C. p. shelleyi*, *C. p. feroidus*, *C. p. crepusculans* and *C. p. pectoralis*, cannot be rejected. Consequently, the conclusion is that the two current species are conspecific, Black-shouldered Nightjar being the northern race of Fiery-necked Nightjar.

Black-shouldered Nightjar *Caprimulgus nigriscapularis* was described as a new species by Reichenow (1893) and included in his *Die Vögel Afrikas* (Reichenow 1902–03), which also recognised South African Nightjar *C. pectoralis* Cuvier, 1816, and Fiery-necked Nightjar *C. feroidus* Sharpe, 1875, as species, while treating Shelley's Nightjar *C. shelleyi* Bocage, 1879, as a race of Fiery-necked Nightjar. Sclater (1924) retained *C. pectoralis*, *C. feroidus* and *C. nigriscapularis* as species in his standard work *Systema avium Aethiopicarum* but made no mention of *C. shelleyi*.

Chapin (1932) noted that 'Pairs of species distinct enough to be granted separate binomials by most systematists, and which are still mainly separated by the forest belt, at least in western Africa, include *C. nigriscapularis* and *C. feroidus*.' Grant & Mackworth-Praed (1937) decided that 'As *C. nigriscapularis* has the same general colour appearance and the same amount of white in the tail of males as *C. feroidus* it must be placed as a race of that species.' Chapin (1939) went further, treating *feroidus* and *nigriscapularis* as conspecific with *C. pectoralis*, on the basis of similarities in plumage and song. Mackworth-Praed & Grant (1957, under Addenda and Corrigenda) accepted this arrangement, as did White (1965).

Chappuis (1981) found that *nigriscapularis* and *feroidus* have very stereotyped song phrases throughout their distribution, with significant and constant differences separating them. He felt that, in the absence of sympatry, the status of superspecies should be preferred to that of race, since it is possible that the song differences may be insufficient to prevent hybridisation should they come together again. Fry (1988), in a major review of the skull morphology, song characteristics and systematics in general of African nightjars, concluded that *C. nigriscapularis* is a species, separable from *C. pectoralis*, based mainly on vocal differences.

In *The birds of Africa* Fry & Harwin (1988) distinguished *C. nigriscapularis* specifically from *C. pectoralis* on the basis of evidently constant song differences, but also provided a suite of plumage characters to separate them in the hand. Louette (1990) tested the colour criteria proposed in *The birds of Africa* on Zaïre (now Democratic Republic of the Congo = DRC) material in the Royal Museum for Central Africa (Tervuren, Belgium) and found that

none holds true. Dowsett & Dowsett-Lemaire (1993), contrary to Chappuis (1981) and Fry & Harwin (1988), believed that the voices of *C. nigriscapularis* and *C. pectoralis* are sufficiently alike to point to them being conspecific. They felt that Fry and Harwin had overlooked the natural geographic variation in voice *within* each form, which is at least as great as that *between* the two forms (italics mine). See also below under Discussion.

Clancey's (1994) review of the two austral races of *C. pectoralis* found that *fervidus* was composite, requiring that three subspecies be recognised, *fervidus*, *shelleyi* and a new form, which he named *crepusculans*. Cleere (1995) re-examined the entire Fiery-necked Nightjar group and recognised two species, separated mainly by vocal differences, namely *C. pectoralis*, with four subspecies (*pectoralis*, *fervidus*, *shelleyi* and *crepusculans*), and monotypic *C. nigriscapularis*. This arrangement was adopted in both major monographs of the Caprimulgiformes (Cleere 1998, Holyoak 2001). However, Cleere (1998) noted that some authorities consider the two species to be conspecific, and Holyoak (2001: 35) explained that he provisionally treated as species a few controversial forms, such as *C. nigriscapularis*, in order to present all relevant data separately from those pertaining to their close allies, rather than from any conviction that they deserve species rank.

Cleere (1995) suggested that the ranges of the two species may well overlap in parts of central and southern DRC. However, this was based on a misidentification by Chapin of a single female specimen from Matadi (Dowsett-Lemaire & Dowsett *in litt.* 2013). Both monographs (Cleere 1998, Holyoak 2001) treated their distributions as allopatric. There is a possible overlap in Rwanda, where Anderson (2012) found and photographed a *pectoralis* north-west of a probable *nigriscapularis*. The latter is a rufous morph and difficult to identify with certainty.

My examination of the relevant plumage descriptions and / or voice sonograms published by Fry (1988), Fry & Harwin (1988), Dowsett & Dowsett-Lemaire (1993), Cleere (1995, 1998) and Holyoak (2001) leads me to question whether the noted differences are sufficient to warrant specific status for *nigriscapularis*, or whether they merely represent geographic and / or individual variation within *C. pectoralis*. Presented here are mensural data that I believe help to resolve the problem.

Methods

Key characters (Jackson 2000) were measured on 145 specimens of the five forms involved: 43 *C. pectoralis pectoralis*, 42 *C. p. crepusculans*, six *C. p. fervidus*, 42 *C. p. shelleyi* and 12 *C. nigriscapularis*, listed south to north (for details of specimens see Appendix). Females, juveniles, feathers in moult and damaged characters were excluded. The data therefore refer to sound characters on full-grown males alone.

The lengths of the five outer primaries (pp10–6) were measured by sliding a stopped ruler under the closed wing until the stop met the bend of the wing, pressing the primaries flat against the ruler and then reading the five measurements. The position of the wingbar (an isolated white or buff patch about halfway along the feather) was measured on p9 by taking the distance from the tip of the primary to the centre of the patch on the inner web. The extent of the emargination on the leading edge of p9 was measured from the tip of the primary to the point of flexure in the reverse curve, i. e. the neutral point between the inner and outer curves (as illustrated in Jackson 1986).

The length of the inner rectrix (r1) was measured from the skin at the base of the calamus to the tip of the feather. The calamus was exposed by parting the uppertail-coverts so that the base was located visually, not by feel. The distance from the tip of r1 to the tip of r5 was measured with the tail in the closed position and the difference was then applied

to the length of r1 to derive the length of r5. All rectrix lengths are therefore relative to the base of r1. The pale apical patches on r4 and r5 were measured by taking the maximum dimension parallel to the rachis.

The length of the tomium was measured in a straight line from the tip of the bill to the inside angle of the gape and the width of the gape was measured across the bill from gape flange to gape flange. Tomium \times gape provided an approximate mouth size.

The length of the tarsometatarsus was measured posteriorly from the intertarsal joint to the base of the last complete scale before the divergence of the toes. The length of the middle toe (t3) was measured from the base of the last complete scale on the tarsus to the tip of the pectinated claw. Tarsometatarsus + t3 provided the overall length of the foot.

Characters showing clinal variation were set aside. The remaining characters were each subjected to an analysis of variance (ANOVA one-way classification) to test, with a probability of 0.05, the null hypothesis that the five forms represent either a single population or five populations with equal means.

Results

Clinal variation.—Four characters (one each on wing, tail, head and foot) show clinal variation, with mensural means decreasing from south to north (Table 1): the ratio of two primaries in the wing formula (p10 / p7); wing / tail ratio (p9 / r1); relative mouth size (tomium \times gape) and overall foot length (tarsometatarsus + middle toe). Song durations also appear to decrease clinally south to north (see below).

Analysis of variance.—An ANOVA was carried out on each of nine characters (Table 2); three on the wing, four on the tail, one on the head and one on the foot. The result for wing length (p9) ($F_{4,131} = 13.89$, $P = 1.79\text{E-}09$, Table 2a) was the only one requiring that the null hypothesis be rejected. It could not be rejected by the results for the other eight characters: percentage emargination on p9 ($F_{4,131} = 1.79$, $P = 0.135$, Table 2b); position of wingbar in relation to emargination ($F_{4,132} = 1.90$, $P = 0.115$, Table 2c); length of inner rectrix r1 ($F_{4,106} = 1.99$, $P = 0.102$, Table 2d); length of outer rectrix r5 ($F_{4,117} = 2.25$, $P = 0.068$, Table 2e); length of patch on outer rectrix ($F_{4,130} = 0.64$, $P = 0.634$, Table 2f); length of patch on r4 ($F_{4,129} = 0.33$, $P = 0.855$, Table 2g); length of tomium ($F_{4,132} = 2.06$, $P = 0.090$, Table 2h) and the ratio tarsometatarsus to middle toe (%) ($F_{4,140} = 0.63$, $P = 0.639$, Table 2i).

TABLE 1

Mensural characters showing latitudinal clinal variation in five Afrotropical nightjars, with measurement means decreasing from South African Nightjar *Caprimulgus pectoralis pectoralis* in the south, through Clancey's Nightjar *C. p. crepusculans*, Fiery-necked Nightjar *C. p. fervidus* and Shelley's Nightjar *C. p. shelleyi* to Black-shouldered Nightjar *C. nigriscapularis* in the north. P10 is the outer primary, r1 the inner rectrix. Mouth = tomium \times gape. Foot = tarsometatarsus + middle toe (t3). The sample sizes are shown in brackets after the means.

Taxon	p10 / p7	p9 / r1	Mouth (mm ²)	Foot (mm)
<i>pectoralis</i>	1.007 (40)	1.347 (30)	814 (35)	39.79 (43)
<i>crepusculans</i>	1.005 (40)	1.334 (33)	807 (41)	38.17 (42)
<i>fervidus</i>	0.994 (06)	1.329 (06)	756 (06)	37.67 (06)
<i>shelleyi</i>	0.991 (34)	1.328 (29)	753 (39)	37.64 (42)
<i>nigriscapularis</i>	0.954 (09)	1.246 (09)	740 (11)	35.67 (12)

TABLE 2

Results of ANOVA to test, with probability of 0.05, the null hypothesis that the five nightjars (as in Table 1) represent either a single population or five populations with equal means. Degrees of freedom (*df*) between groups (upper) and within groups (lower) are shown. *F* is the calculated *F* statistic, *F crit* the critical value that must be exceeded by *F* in order to reject the null hypothesis. *F* values less than *F crit* are marked with an asterisk (*).

Taxon (<i>n</i>)	Mean	<i>df</i>	<i>F</i>	<i>P</i> -value	<i>F crit</i>
(a) Length of p9 (mm):					
<i>pectoralis</i> (41)	163.1	4	13.894	1.79E-09	2.441
<i>crepusculans</i> (41)	160.2	131			
<i>fervidus</i> (6)	165.8				
<i>shelleyi</i> (36)	163.6				
<i>nigriscapularis</i> (12)	152.8				
(b) Emargination on p9 (%):					
<i>pectoralis</i> (41)	41.6	4	1.790*	0.135	2.441
<i>crepusculans</i> (41)	42.4	131			
<i>fervidus</i> (6)	42.1				
<i>shelleyi</i> (36)	42.2				
<i>nigriscapularis</i> (12)	42.0				
(c) Relationship of wingbar to emargination (E-WB) on inner web of p9 (mm):					
<i>pectoralis</i> (41)	4.7	4	1.898*	0.115	2.440
<i>crepusculans</i> (41)	5.4	132			
<i>fervidus</i> (6)	4.2				
<i>shelleyi</i> (37)	5.4				
<i>nigriscapularis</i> (12)	6.2				
(d) Length of inner rectrix r1 (mm):					
<i>pectoralis</i> (31)	121.6	4	1.987*	0.102	2.457
<i>crepusculans</i> (34)	120.0	106			
<i>fervidus</i> (6)	124.8				
<i>shelleyi</i> (31)	123.0				
<i>nigriscapularis</i> (9)	122.2				
(e) Length of outer rectrix r5 (mm):					
<i>pectoralis</i> (37)	120.7	4	2.249*	0.068	2.449
<i>crepusculans</i> (34)	117.4	117			
<i>fervidus</i> (6)	121.3				
<i>shelleyi</i> (35)	120.4				
<i>nigriscapularis</i> (10)	118.3				
(f) Length of apical patch on r5 (mm):					
<i>pectoralis</i> (40)	45.0	4	0.641*	0.634	2.441
<i>crepusculans</i> (39)	43.9	130			
<i>fervidus</i> (6)	45.8				
<i>shelleyi</i> (38)	44.5				
<i>nigriscapularis</i> (12)	45.1				
(g) Length of apical patch on r4 (mm):					
<i>pectoralis</i> (39)	44.7	4	0.333*	0.855	2.442
<i>crepusculans</i> (40)	44.0	129			
<i>fervidus</i> (6)	44.2				

Taxon (<i>n</i>)	Mean	<i>df</i>	<i>F</i>	<i>P</i> -value	<i>F</i> crit
<i>shelleyi</i> (38)	44.5				
<i>nigriscapularis</i> (11)	45.4				
(h) Length of tomium (mm):					
<i>pectoralis</i> (39)	30.7	4	2.055*	0.090	2.440
<i>crepuscularis</i> (41)	30.7	132			
<i>fervidus</i> (6)	30.5				
<i>shelleyi</i> (40)	30.1				
<i>nigriscapularis</i> (11)	29.5				
(i) Ratio of tarsometatarsus to middle toe (%):					
<i>pectoralis</i> (43)	69.5	4	0.634*	0.639	2.436
<i>crepuscularis</i> (42)	70.8	140			
<i>fervidus</i> (6)	75.3				
<i>shelleyi</i> (42)	70.0				
<i>nigriscapularis</i> (12)	68.3				

Discussion

In the absence of published relevant molecular studies, more traditional methods must be used to re-examine the taxonomic status of Black-shouldered Nightjar, to resolve whether it is the northern race of Fiery-necked Nightjar, or differs sufficiently to warrant species status. Its current status as a species is based on vocal and morphological differences (Fry 1988, Cleere 1995) that are relatively minor.

Plumage differences.—Coloration in nightjars is extremely variable within species, sometimes geographically and very often individually, and such intraspecific variation is often greater than differences between species (Jackson 2000). Consequently, most nightjars are confusingly similar in appearance. For example, Fry (1988: 124) noted that some specimens of Sombre Nightjar *C. fraenatus* are ‘*indistinguishable in the smallest quantitative detail*’ from some specimens of the nominate race of *C. pectoralis* (italics Fry’s).

Nightjar plumage patterns have evolved not as species-specific characters, but as camouflage for the bird at rest; as an adaptation to the general environment and the particular substrate upon which it roosts and nests. These plumage patterns, which may not accurately reflect historical relationships, are of minimal diagnostic value in devising identification keys; the pale patches in the wings and tails of some species do aid species identification, but are more useful in separating the sexes, males usually having larger, brighter patches than females (Jackson 2000).

Fry (1988: 105) commented that among African nightjars similarity of plumage is not a reliable criterion unless accompanied by a suite of derived characters and / or by more or less parapatric ranges. He noted (Fry 1988: 109) that *C. nigriscapularis* is darker than *C. pectoralis* and that in males the white spot on the inner web of p10 is vestigial in *C. nigriscapularis*. Fry & Harwin (1988) added that *C. nigriscapularis* differs from *C. pectoralis* in not having a small white mark near the corner of the mouth; in lacking a rufous morph, except perhaps in respect of crown colour (they apparently overlooked Benson & Colebrook-Robjent 1977—see below); in having darker underparts; and colour tones that differ to a greater or lesser degree over the rest of the plumage. However, as noted above, Louette (1990) found that none of the plumage criteria proposed by Fry & Harwin (1988) as diagnostic for *C. nigriscapularis* is true for DRC material that he examined.

Cleere (1995) noted that *C. nigriscapularis* tends to have less streaking on the crown than the four races of *C. pectoralis*, affording it a rather pale-headed appearance; that the white

spots on the four outer primaries of the male are generally smaller than on *C. pectoralis*; and that the blackish-brown lesser coverts always contrast markedly with the rest of the coverts, hence the name Black-shouldered Nightjar. Dowsett-Lemaire & Dowsett (*in litt.* 2013) noted that, in non-rufous forms, the uppertail colour is grey in *pectoralis*, brown in *nigriscapularis*.

The plumage differences noted above are relatively minor, no greater than those used by Clancey (1994) to separate the four austral races of *C. pectoralis*, indicative of their significance at subspecific level. They do not support specific status for Black-shouldered Nightjar.

Vocal variation.—Nocturnal and crepuscular birds, such as nightjars, depend less on plumage patterns and more on voice for conspecific and individual recognition. Nightjars in song can readily be identified, each species having a highly characteristic song, which makes it easy to distinguish between species occurring sympatrically in a given area, such as, for example, southern Africa (Jackson 1986). From the sound-recordings on Ranft & Cleere (1998) it is evident that neither a musical ear nor a sound spectrograph is necessary to distinguish the songs of most Afrotropical nightjars, the differences being relatively substantial.

However, the allopatric Freckled *C. tristigma* and Nubian Nightjars *C. nubicus* (*C. n. tamaricus* alone: see Jackson 2002a) have remarkably similar songs, as do the allopatric Abyssinian *C. poliocephalus* and Montane Nightjars *C. ruwenzorii*, and the allopatric Fiery-necked and Black-shouldered Nightjars. Should any of these species-pairs occur sympatrically, it would be difficult for field workers to distinguish between their songs, as the differences are relatively minor. A further complication arises because there is geographic and individual variation in voice, as in any other characteristic, of each species. The songs of some *C. pectoralis* males in my Ranelia Farm (Cashel, Zimbabwe) study area (Jackson 1985) were sufficiently different for me to recognise them individually.

The song durations of *C. p. pectoralis* (1.7–1.8 seconds), *C. p. fervidus* (1.4–1.6 seconds) and *C. nigriscapularis* (1.4 seconds) (Fry 1988, Fry & Harwin 1988) appear to decrease clinally south to north. Songs are repeated every five seconds (*pectoralis*), four seconds (*fervidus*) or 5–8 seconds (*nigriscapularis*), while the monotonous whooting calls (see Jackson 2002b) are repeated regularly, for at least 22 seconds, at a rate of 22 per ten seconds (*pectoralis*), or for at least 12.5 seconds, at a rate of 41 per ten seconds (*nigriscapularis*) (Fry 1988, Fry & Harwin 1988). Cleere (1995) noted that the song of *C. pectoralis* registers within a frequency band range of 0.8–2.2 kHz, compared to 1.2–2.2 kHz for *C. nigriscapularis*; he also noted that the whooting calls of the latter are shorter and faster than in *C. pectoralis*.

Chappuis (1981) noted that significant and constant differences separate the songs of *C. (p.) nigriscapularis* and *C. (p.) fervidus*, but felt it possible that song differences may not be sufficient to prevent hybridisation should they meet. Dowsett & Dowsett-Lemaire (1993), after examining a number of sonograms, concluded that song differences between these two forms are no greater than the geographic variations within each form, and that the voices of *C. pectoralis* and *C. nigriscapularis* are sufficiently alike to suggest they are conspecific.

Measurements.—While song is of no diagnostic value if dealing with a bird in the hand or museum, measurements of key characters do usually provide reliable diagnoses. My dichotomous identification keys to the nightjars of Africa were based almost entirely on mensural characters, since plumage patterns are too variable (Jackson 1984, 2000).

When identifying Afrotropical nightjar species in the hand, the single most useful character, with a low coefficient of variability, is the percentage emargination on p9 (Jackson 1984). My (Jackson 1993, 2002a, 2003) lack of support for the elevation of both *C. ruwenzorii* and *C. nigriscapularis* to full species status was based on the evidence provided by this character. The emargination percentages for *C. p. poliocephalus* ($n = 57$) and *C. p.*

ruwenzorii ($n = 39$) are 43.3 ± 1.5 (40.1–47.6) and 43.6 ± 1.4 (40.0–47.5), respectively (Jackson 2002a), suggesting that they are probably conspecific, a possibility that I am currently investigating. The mean value of the emargination ratio in *nigriscapularis* (42.0%) is exactly halfway between the lowest mean value (*pectoralis* 41.6%) and the highest mean value (*crepusculans* 42.4%) among races of *C. pectoralis* (Table 2), which suggests strongly that they too are probably conspecific.

Clinal variation in some measurements (Table 1) and in song and whooting duration (see above) tend to isolate *C. nigriscapularis* in the north, but despite this, the analysis of variance results (Table 2) show clearly that the null hypothesis linking *nigriscapularis* to the races of *C. pectoralis* cannot be rejected. This conclusion is supported by the evidence provided by body mass data (Jackson 2003), the mean values (g) of the races being 51.2 (*pectoralis*), 48.3 (*crepusculans*), 54.0 (*fervidus*), 49.8 (*shelleyi*) and 50.6 (*nigriscapularis*). The mean of *nigriscapularis* in the north does not differ significantly ($t = 0.1150$, $P > 0.1$) from the nominate race in the south, and matches well with other *C. pectoralis* races.

Sympatry.—Anderson (2012) presented photographic evidence of possible sympatry in the south-east corner of Rwanda, with a probable record of *C. nigriscapularis* near Rusumo on 13 December 2009, and a positive record of *C. pectoralis* near Kibungo, c.33 km to the north-west, on 21 August 2010. It is difficult to identify the former with certainty, despite the conspicuous blackish shoulders, because it is a rufous morph. According to Fry & Harwin (1988) *C. nigriscapularis* does not possess a rufous morph, except perhaps in respect of crown colour, while *C. pectoralis* does. However, they overlooked Benson & Colebrook-Robjent (1977), who noted that erythrism may be frequent (but irregular) in *nigriscapularis*; ten adults in the Natural History Museum, Tring, all have some rufous in the tail, and half of them, including three from Uganda, have the crown, and / or throat and breast, rufous. One of the specimens they examined, from Sierra Leone, is illustrated in Anderson (2012). The rufous plumage of the Rusumo bird does not serve to identify it either way.

Amadon & Short (1992) define sympatric species as taxa that occur in the same area (range) at least in part and at least during the breeding season. The *C. nigriscapularis* breeding season in central Africa appears to cover all months except October–November, while the breeding season for *C. pectoralis* is August–December (Holyoak 2001). The dates of the Rwandan photographs appear marginal to the breeding season concerned. No evidence of breeding was found, and, since the records were eight months and 33 km apart, the two birds were not actually in the same area in the same breeding season, so it could be argued that there is no definite sympatry. Southern populations of *C. pectoralis* are partially migratory, performing regular post-breeding movements, sometimes in response to high rainfall (Clancey 1994, Vernon & Dean 2005), so the Kibungo *C. pectoralis* could have been an off-season wanderer.

Amadon & Short (1992: 22) stressed the importance of interbreeding between two taxa in determining that they belong to the same species. That *C. nigriscapularis* and *C. pectoralis* may already have come together, and hybridised, is suggested by four specimens (from Burundi, Rwanda and DRC) that Louette (1990; and *in litt.* to J. Anderson 2011—see Anderson 2012) considered to be intermediate.

Conclusion

Mayr *et al.* (1953) recommended that it is preferable to treat doubtful allopatric populations as subspecies. However, Prigogine (1985: 100) wrote 'I believe that it is useful to give species status to taxa, even when the real taxonomic rank (species or subspecies) is not fully demonstrated, with the object to draw the attention on a problem that needs more

investigation.' This appears to be the current practice, and is the one followed by Holyoak (2001) in his monograph of the Caprimulgiformes.

Prigogine (1985: 93) also stated that 'one has to be careful in giving too much weight to song differences as a taxonomical criterium ... and they must be evaluated critically and compared with other informations of taxonomic signification, especially for allopatric taxa.' This is the approach that I have followed here by considering not only the differences in voice and plumage patterns, but also the available mensural data, which appear to have been largely overlooked by previous authors.

The minor vocal and plumage differences do not appear sufficient to support the elevation of *C. p. nigriscapularis* to species. The mensural data, in contrast, especially the analyses of variance, but also the emargination and body mass data, provide compelling evidence that *C. nigriscapularis* is no more than a subspecies of *C. pectoralis*. My conclusion, therefore, is that Black-shouldered Nightjar is the northern race of Fiery-necked Nightjar, a conclusion supported by the possible hybridisation between the two in Burundi, Rwanda and the DRC (Louette 1990).

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Appendix: Museum specimens of *Caprimulgus pectoralis* analysed.

Museum acronyms: ALBM = Albany Museum, Grahamstown (South Africa); AMNH = American Museum of Natural History, New York (USA); BMNH = Natural History Museum, Tring (UK); CMNH = Carnegie Museum of Natural History, Pittsburgh (USA); DURM = Durban Museum (South Africa); ELM = East London Museum (South Africa); FMNH = Field Museum of Natural History, Chicago (USA); KAFM = Kaffrarian Museum, King William's Town (South Africa); LACM = Los Angeles County Museum (USA); MNHN = Museum National d'Histoire Naturelle, Paris (France); NATM = Natal Museum, Pietermaritzburg (South Africa); NMW = Naturhistorisches Museum, Vienna (Austria); PEM = Port Elizabeth Museum (South Africa); RMCA = Royal Museum for Central Africa, Tervuren (Belgium); RMNH = Rijksmuseum van Natuurlijke Historie (Naturalis), Leiden (Netherlands); TMP = Transvaal Museum, Pretoria (South Africa); USNM = United States National Museum of Natural History, Washington DC (USA).

C. p. pectoralis ($n = 43$): ALBM no No. a, no No. b, 728, 733, 736, 1249, 2207, 2464, 4092; AMNH 633324, 633325, 633328; BMNH 1933.7.14.178, 52.3.8.6, 74.5.1.187, 90.12.16.58, 90.12.16.59; ELM 1866, 2816, 3222, 7950, 7958, 11352, 12764, 13115; KAFM B785, B786, B2902, B3544; MNHN 1858-393; PEM 1494/76, 1500/93, 1512/15; RMNH 5, 6; TMP 2662, 2760, 2800, 3268, 7775, 14660, 26278; USNM 163823.

C. p. crepusculans ($n = 42$): BMNH 1905.12.29.203, 1905.12.29.211, 1933.3.1.309–1933.3.1.311, 1933.7.14.179, 98.12.2.424; CMNH 148295; DURM 14502–14505, 16257, 16514, 19374, 20570, 23848, 29427; ELM 8128; FMNH 282662; NATM 2057, 2059, 2060, 2062, 2063, 2066; PEM 1484/31; RMNH 8; TMP 4706, 7794, 9001, 12702, 19065, 19796, 20083–20085, 27959, 27960, 35255; USNM 448384, 457818.

C. p. fervidus ($n = 6$): BMNH 1910.7.1.243; ELM 9635; FMNH 87253, 87254; LACM 63562; TMP 9213.

C. p. shelleyi ($n = 42$): AMNH 414149, 633338–633342, 633345, 633352, 633354, 633356–633358, 633360, 633361; BMNH 1932.5.10.730, 1935.10.9.104, 1935.5.11.2, 1939.2.25.484, 88.12.1.5; CMNH 109270, 109277, 147018; FMNH 100090, 205346, 220716, 224172, 224173, 262898; KAFM B2341; LACM 69601; MNHN 1947-416, 1957-70, 1958-395, 1965-1051; NMW 23510, 35060; RMCA 119359; TMP 28342, 28343; USNM 351690, 448213, 448214.

C. p. nigriscapularis ($n = 12$): AMNH 158705, 262374–262377, 633329, 633330; BMNH 1926.5.3.305, 1953.1.8; FMNH 194471, 298274; LACM 64152.

The extinct macaws of the West Indies, with special reference to Cuban Macaw *Ara tricolor*

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SUMMARY.—The best-known species of West Indian macaw, and the only one for which skin specimens exist, is Cuban Macaw *Ara tricolor*, although at least seven and sometimes as many as 15 different species of *Ara* and *Anodorhynchus* have been speculated to have formerly occurred in the Greater and Lesser Antilles. We review available historical and prehistorical evidence for the existence of these different species and conclude that only two or three, St. Croix Macaw *Ara autochthones*, *A. tricolor* and perhaps Montserrat Macaw *Ara*. sp., and can be definitively admitted, with reasonably strong evidence for another, Gosse's Macaw *Ara gossei* of Jamaica. In addition to reviewing the causes and patterns of decline in West Indian macaws, we provide a complete overview of available knowledge concerning *A. tricolor*, including details of all extant specimens (19). In particular, we draw attention to a commonly repeated error in much of the ornithological literature over the past six decades concerning the final demise of Cuban Macaw, as well as to historical data that suggest the species' range was wider than is often admitted.

Although only a few sketchy passages exist from those who saw live macaws in the West Indies, those florid descriptions give us an appreciation of the former beauty, now in large part lost, of those islands' diverse parrot fauna. Columbus described the macaws of the Antilles as 'by far the most beautiful ornaments of the gloomy forest which covered the land given up to nature' (Buffon 1774: 177). Du Tertre (1654: 294) said of West Indian macaws, 'It is the finest sight in the world to see ten or twelve Macaws in a very green tree; never are more charming colors displayed.' Gundlach (1893: 152) vividly described Cuban Macaw *Ara tricolor* as he lamented the loss of these large, long-tailed birds. Tragically, Cuban Macaw was just one of many spectacular psittacines lost in the region in historic times.

Three groups of psittacids inhabited the West Indies at the time of 'discovery' by Europeans: macaws (*Ara* and possibly *Anodorhynchus*), parrots (*Amazona*) and parakeets (*Aratinga*). Du Tertre (1667: 247) noted that 'These birds are so dissimilar according to the grounds where they procure their food, that every island has its Parrots, its Aras, and its Parroquets, different in size of body, in tone of voice, and in the tints of the plumage.' Williams & Steadman (2001) suggested that the remarkable total of as many as 60 endemic species of psittacids formerly occupied the West Indies but, as noted by Clark (1905a) and Forshaw (1978), parrots and their kin are among the first to be exterminated from any given locality, especially when confined to an insular habitat. Sadly, today only 12 species (three parakeets, nine parrots) survive in the West Indies, a loss of up to 80% of psittacid species from the region (Wiley 1991, Williams & Steadman 2001, Wiley *et al.* 2004).

The original psittacine fauna in the West Indies may have included as many as 15 species of macaws, with most Greater Antillean and several Lesser Antillean islands supporting one or more indigenous species (Williams & Steadman 2001). Although none survives today, macaws persisted into historic times on at least Cuba, Isla de Pinos, Jamaica, Guadeloupe, Dominica and Martinique, but certainly some were lost during prehistoric

human occupation of islands such as Montserrat. The fossil from the last-named island has been variously identified as a new species, an unidentified macaw, or the same species as that formerly present on Guadeloupe (see next section). Rothschild (1905, 1907a,b) concluded that the region had seven macaw species in historic times and many subsequent treatments follow his. However, it should be noted that Rothschild completely confounded much of the evidence associated with insular parrots, for example making significant errors in describing Mascarene taxa (Hume 2007; J. P Hume *in litt.* 2013). Most recently, Williams & Steadman (2001) listed 15 species, with evidence ranging from poor (only hearsay) to good (specimens or repeated, substantiated observations). Only four are represented by specimens: three by subfossil skeletal remains and one by entire skins and fossil partial skeletons (Walters 1995, Olson & Suárez 2008). The paucity of specimens and reliable reports has led others to tally far fewer species. Olson & Suárez (2008) found no credible evidence in support of each of the Antilles having one or two indigenous species of macaw; they noted that the archaeological record, the strongest evidence, suggested perhaps just two species in the region. Hume & Walters (2012) suggested perhaps only 3–4 species in the Antilles, noting that ‘otherwise the presence of endemic macaws on other West Indian islands is extremely dubious.’ Among the other 11 macaw species Williams & Steadman (2001) cited, we consider one of good reliability, one of moderate reliability and six of poor reliability; we present evidence that the three remaining macaws considered by Williams & Steadman are synonyms of other species or probably did not exist.

Aside from Cuban Macaw and the two or three species evidenced by prehistoric bones, all information is based on casual accounts by travelers, colonists and the few naturalists who resided or passed through the islands between the 15th and 19th centuries. Confounding some early reports are compilations by authors of regional or world faunas (e.g., Buffon), who cobbled together information in a way that makes identification of species and their location difficult if not impossible. Nevertheless, sufficient evidence exists to state that macaws were formerly abundant on several islands. As examples of historical abundance, Peter Martyr d’Anghera (1457–1525; *in* MacNutt 1912: 72) proclaimed that parrots and macaws were ‘as numerous in all these islands [West Indies] as sparrows or other small birds are with us’ [Europeans], whereas Hans Sloane (1660–1753; 1725: 297) reported ‘the Small Maccaw’ as ‘very common in the Woods’ of Jamaica, and Bryan Edwards (1743–1800; 1806: 19), who resided on Jamaica most of his life, noted that ‘The parrot, and its various affinities, from the macaw to the parroquet ... are as plentiful in the larger islands of the West Indies as the rook [*Corvus frugilegus*] is in Europe.’

Whereas some have argued that many of the macaws described by early explorers were probably exotics, imported first by Amerindians and subsequently by European settlers, statements of du Tertre (1654: 296), repeated by Labat (1742: 212), that each island had forms distinct in plumage suggests that not all of the Antillean macaws were imported species (Hume & Walters 2012). Further, Hume & Walters (2012) noted that the observations of du Tertre and Labat on their gentle and docile nature contradicts that of mainland macaws.

Our objective here is to review the relevant historical information concerning the presence and distribution of macaws in the West Indies, and to present such scant biological information as is available. We focus on what is known of Cuban Macaw, presenting data on specimens, and examine possible reasons for the extinction of that species, as well as other Antillean forms.

Macaws in the West Indies

Unfortunately, so few data are available for most suggested species of West Indian macaw that they are considered ‘hearsay species’ (Greenway 1967: 315). Hume &

Walters (2012) noted that 'no other group of extinct birds has aroused such overzealous misinterpretation' as Antillean macaws. Nevertheless, much archaeological investigation remains to be done throughout the West Indies, particularly in the Lesser Antilles. Compared to many mainland areas, fossil remains are uncommon in the West Indies and little is known of vertebrate fossils, especially in the Lesser Antilles (Olson 1978, Woods 1989). Here we present additional evidence or clarify certain reports of macaws in the Antilles.

Bahama Islands.—No evidence of a macaw to date.

Cuba.—One species, Cuban Macaw, *Ara tricolor* (Bechstein, 1811), survived until the mid-19th century.

Jamaica.—At least one, perhaps three, native species, but identifications in many original accounts are muddled. Williams & Steadman (2001) thought it plausible that multiple species of *Ara* could have occurred on Jamaica, because it is a large island with diverse habitats, although it should be noted that the much larger island of Cuba, with considerably more varied habitats, apparently only ever supported one species of macaw. Nevertheless, Jamaica is one of only two of the Antilles that supports two endemic *Amazona*. Species attributed to Jamaica include Red-headed Green Macaw *Ara erythrocephala* Rothschild, 1905, Red-tailed Blue-and-yellow Macaw *A. erythrura* Rothschild, 1907, and Gosse's Macaw *A. gossei* Rothschild, 1905. Evidence is good for at least one species, although no specimen exists, but poor for the other two species. All Jamaican macaws were apparently extinct in the wild by the mid-19th century, as William T. March (1804–72; 1863), a native Jamaican and reliable observer, reported his last information on wild macaws was in 1849.

Ara erythrocephala: Greenway (1967: 320) portrayed Red-headed Green Macaw as an 'almost mythical bird,' given the tenuous circumstances upon which Rothschild (1905) established it as a unique species. Rothschild (1905, 1907a) described the bird as predominately green, with a red head, based on an account by Richard Hill (1794/5–1872; *in* Gosse 1847: 261–262), a resident Jamaican and trustworthy observer. More than a century earlier, Sloane (1725: 297) wrote that the 'Small Maccaw[s]... 'are very common in the Woods, and are eaten as Pigeons, but when young, are tamed, and kept as Parrots.' Browne (1756: 472) described a 'small green long-tailed Parrot' as native to Jamaica; this was probably a small macaw, because Browne also listed both native parrots (*Amazona collaria* and *A. agilis*) and parakeet (*Aratinga nana*). But Browne does not describe a macaw similar to Rothschild's *A. erythrocephala*.

Hill (*in* Gosse 1847: 263) noted that a captive Jamaican macaw (*A. erythrocephala*?) had been purchased from hog-hunters by a Mr White of Oxford estate (Trelawny parish; c.18°27'00"N, 77°34'58"W; 200 m). W. Osburn (*d.* 1860; 1859) visited Trelawny specifically to search for macaws, but found none and said the local sportsmen knew nothing of it. Osburn (1859) referred to a long-term resident of Trelawny who reported 'constantly' seeing macaws but, when pressed by Osburn, recalling seeing macaws 'about four or five times in twenty-five years, ... always flying at a great height.' Osburn concluded that macaws should be listed as 'occasional wanderers' to Jamaica.

Hill (*in* Gosse 1847: 261) wrote that macaws, 'with unquestionable certainty...are occasionally, if not constantly, denizens of our mountain forests.' Further, Hill (*in* Gosse 1847: 262–263) reported macaws were found in 'the Black grounds' [Trelawny parish; 18°15'50"N, 77°31'58"W; 738 m], 'the never failing resort of these Mexican Macaws [*A. militaris*]. I have been assured that several birds have been procured there. This is said to be nearly as far eastward as they have been found.' Hill (*ibid.*) also noted that young, in 'the

first year's plumage,' had been procured in the 'neighbourhood of Accompong Maroons' (18°13'33"N, 77°45'14"W; 450 m), in the hills of St. Elizabeth parish.

Hill (*in* Gosse 1847: 261–262) thought the birds were Military Macaws *A. militaris*, which he believed migrated from the mountain ranges of the continent, where they bred, and did not return until the first part of the year. During its absence from the mainland, Hill thought it was a casual visitor in Jamaica, where the macaw inhabited the mountains. Clark (1905b) argued that it was unlikely that macaws would cross great extents of water, and thought it more plausible that such individuals represented feral birds. He agreed with Cory (1889: 178) that 'it is not impossible that *Ara militaris* may have occurred in Cuba and Jamaica, but it is improbable. The bird recorded as such was perhaps *A. tricolor* wrongly identified.' Clark (1905b) suggested that at least some species attributed to the Greater Antilles by early writers had apparently been brought from Middle or South America to Jamaica, and then were re-shipped to the Old World as native to the island.

March (1863) observed the partial remains of a macaw shot by a settler near Maroon Town (18°20'40"N 77°47'43"W; 440 m; St. James parish) in 1834. Although not a perfect match with *A. erythrocephala* as described by Rothschild (1905), March's description from memory ('the head and neck were a bright green with red in the forehead and chin, the tail blue and red, and the wing blue and green.') is closest to *A. erythrocephala* among species attributed to Jamaica by Rothschild (1907a). March's description, however, is much closer to Military Macaw than to *A. erythrocephala*.

Snyder *et al.* (1987: 40) suggested that *A. erythrocephala* may represent Military Macaw or Great Green Macaw *A. ambiguus*, both Middle American species. Lack (1976: 255) thought the small green macaw described as *A. erythrocephala* was an endemic species derived from Military Macaw.

Ara erythrura: Rothschild (1907a) named *A. erythrura* based on Charles de Rochefort's (1605–83; 1658: 154) report of blue-and-yellow parrots, with all-red tails. Rothschild (1905) first named the bird *Anodorhynchus coeruleus*, and said it was from Jamaica, but later (1907a: 54) corrected the name to *Ara erythrura* *nom. nov.* and noted it was from 'One of the West Indian Islands.' However, Greenway (1967: 319) regarded Rothschild's description as not credible because de Rochefort had not visited Jamaica but, as others (e.g., de la Harpe 1759) and even de Rochefort noted, took much of his material from du Tertre. Greenway (1967) suggested that *A. erythrura* is a synonym of *A. martinica* [*unmartiniicus*], a poorly documented form supposedly from Martinique.

Sloane's (1725: 296) 'Great Maccaw' (*Psittacus Maximus cyanocroceus*) is clearly closest to *Ara erythrura* among those described for Jamaica by Rothschild, but Sloane's account differed: 'On each side of the Head was a redish fleshy bare Membrane near the Eyes, with some few black Feathers growing on it'; also, Sloane (1725) said the tail was blue, not red as depicted by Rothschild (1907a: Pl. 15). In fact, Sloane's bird more closely resembles Blue-and-yellow Macaw *A. ararauna*. Browne (1756: 472), who called it 'the blue Macaw of Edwards,' said he had observed one or two in St. Ann's (St. Ann's parish; c.18°26'25"N, 77°11'23"W), and 'yet keep some of the feathers of one that was killed there by me.' Although Browne (1756) said it was a native of Jamaica ('tho' seldom caught there'), he added that 'most of those that are generally seen about gentlemen's houses' had been 'introduced there from the main, where they are more common.' He said they were very rare in Jamaica, where they 'keep in the most unfrequented inland parts.' Coke (1808: 390) was probably referring to the same bird when he stated that 'The Blue Mackaw, a more beautiful bird, though not so gaudy as the red, is a native of Jamaica, but not common, and is wild in the woods, particularly in the parish of St. Anne.' Revd. Coward (*in* Gosse 1847: 261) observed macaws in flight about 1842 in 'a plain at the foot of a chain of mountains

dividing [St. Elizabeth] parish from St James [parish], and consequently nearly in the medial line of the island.' Residents of the area familiar with these birds told Coward the macaws were blue and yellow, which led Gosse (1847) to assume they were *A. ararauna*. In 1836, March (1863) was told by Richard Elmas Breary, a resident of St. James, that he had seen three blue-and-yellow macaws flying high overhead on a mountain road between St. James and St. Elizabeth parishes.

Lack (1976: 253) thought the blue-and-yellow macaws were introduced, and cited the fact that no writer since March claimed *A. ararauna* (*A. erythrura*) for Jamaica. Possibly all were feral *A. ararauna*, escaped or released after transport to Jamaica as cagebirds.

Ara gossei: Of the three species suggested for Jamaica, the strongest evidence exists for Gosse's Macaw. Philip Henry Gosse (1810–88; 1847: 260), who resided there from December 1844 to July 1846, referred to it as 'Yellow-headed Macaw? *Ara tricolor*', noting that it differed from the Cuban species and was possibly an undescribed species. Like *A. tricolor*, *A. gossei* was predominately red, but its forehead was yellow rather than red. Anthony Robinson (*ob.* 1768; *in* Gosse 1847: 260) examined a stuffed bird (now lost) shot about 1765 by a Mr Odell in the mountains of Hanover parish, c.10 miles east of Lucea, west of Montego Bay. Gosse (1847: 260) said it was very rare, but still it is surprising that neither Sloane (1725), who resided on Jamaica in 1687–88, or Browne (1756) recorded a macaw matching Robinson's (*in* Gosse 1847: 260) description of the bird that Rothschild (1905) would designate *A. gossei*.

Bond (1978) agreed with Lack (1976: 252–254) in rejecting the evidence that an indigenous *Ara* (*A. gossei*) inhabited Jamaica. Wetherbee (1985) suggested that *A. gossei* was not valid, but was probably a 'tapiré' artefact; i.e., a specimen altered in its coloration by Amerindians.

In addition, non-native red-plumaged macaws were reported from Jamaica by several writers, including Browne (1756: 472), who wrote that the 'red Mackaw of Edwards ... is not a native of Jamaica, but they are frequently brought there from neighbouring parts of the Main, where they are pretty common.' Albin (1738a: 16) also reported a red-plumaged macaw ('The Maccaw from Jamaica'), considering it the male of a species in which the female was blue and yellow. A watercolour made in Jamaica by John Lindsay in 1765 depicts a probable Scarlet Macaw *A. macao* (Turvey 2010). Olson & Maíz López (2008) noted that the stylised macaw illustrated in Fisher & Warr (2003: 156) from paintings by a Lt. L. J. Robins entitled *The natural history of Jamaica* (1765) was similar to Cuban Macaw and suggested that species had been brought to Jamaica from Cuba.

Hispaniola.—Many accounts of the island's parrots have included a macaw, but its status is confused. As evidence of a macaw there, writers have referred to reports by Las Casas (1876: 298–299) and Oviedo y Valdés (1851: 443), as cited by de Armas (1888). Macaws were said to have been common formerly in Hispaniola, but rare by 1760 (Clark 1905b). Buffon (1793: 160) reported a macaw, based on the statement of resident naturalist Chevalier Lefebvre Deshayes [*ob.* 1786] (*in litt.* to Buffon 1847: 507), who stated that macaws were once very common in Hispaniola, but had become rarer and confined to tops of mountains. Olson (2005) dismissed Deshayes' statement noting it had no connection to Hispaniola. Rothschild (1905) suggested that the *Ara* on Hispaniola represented a species other than those already known from Cuba and Jamaica. Williams & Steadman (2001) listed it as '*Ara tricolor?* or *Ara* unknown sp.', noting that among the three psittacids reported by Las Casas (1876: 298) on Hispaniola at the end of the 1400s was a macaw that differed from those on other islands in having a white forehead, not red like *A. tricolor*. Most recently, Olson (2005) examined 16th-century descriptions by Las Casas (1876) and Oviedo y Valdés (1851) and convincingly concluded that there was 'no credible evidence for the existence of a macaw on Hispaniola in historic times.' There is a record of a transatlantic shipment of

'long-tailed parrots [= macaws]' to Spain in 1494, when 60 were brought from Hispaniola to Cadiz for trading (George 1980: 80).

Based on the de Armas (1888) report, Wetherbee (1985) developed an unfounded hypothesis that Cuban and Hispaniolan macaws had been confused and extant specimens represented both species. Further, he applied the name *A. tricolor* to the Hispaniolan macaw and renamed the Cuban bird *A. cubensis*, but Walters (1995) rejected Wetherbee's revision and returned *A. tricolor* to the Cuban population, suggesting that the Hispaniolan bird probably formed a superspecies with the similar Jamaican form, *A. gossei*.

Puerto Rico.—Olson & Maíz López (2008) reported several bones of one St. Croix Macaw *A. autochthones* from an archaeological site in south-central Puerto Rico.

St. Croix, US Virgin Islands.—A tibiotarsus of an adult-sized immature macaw from a prehistoric archaeological site on St. Croix is the basis for St. Croix Macaw (Wetmore 1937, Olson 1978). Olson & Maíz López (2008) reported several skeletal elements from Puerto Rico. Olson (1978), Wing (1989) and Olson & Maíz López (2008), however, cautioned that *A. autochthones* was not necessarily indigenous to St. Croix and Puerto Rico because prehistoric West Indian people were known to trade live psittacids. On the other hand, Williams & Steadman (2001) argued that St. Croix could have sustained an indigenous macaw.

Montserrat.—An undescribed species, Montserrat Macaw *Ara* sp., was recently suggested to have existed on the basis of subfossil remains (University of Florida, Gainesville; UF; catalogue no. 4416) of an *Ara* recovered by D. R. Watters at an archaeological site at Trant's (c.16°45'N, 62°09'W), Saint Georges Parish, (Williams & Steadman 2001). However, it possibly represents '*A. guadeloupensis*' (see above). As skeletons, most large parrots and macaws are sexually dimorphic in size and exhibit great individual variation (see Hume 2007) and Olson & López have suggested that the single coracoid is not diagnostic at species level and that more material is needed before any attribution can be made.

Guadeloupe.—Diego Álvarez Chanca (c.1450–1515; *in* de Ybarra 1907: 428) joined Columbus on his second voyage (1493–94) and reported taking 'two parrots ['Guacamayos' or macaws], very large and quite different from the parrots we had before seen' from the houses of Carib inhabitants of Guadeloupe. Two macaws have been named for the island: Guadeloupe Macaw *A. guadeloupensis* Clark, 1905, and Guadeloupe Violet Macaw *Anodorhynchus purpurascens* Rothschild, 1905.

Guadeloupe Macaw, a predominately red bird, is based on the account of du Tertre (1654: 294), who also produced a rudimentary illustration (1667: between pp. 246–247; copied by Labat 1742: between pp. 216–217). Johann Huttich (c.1480–1544; 1534: 31) recorded a red macaw 'present in such numbers as grasshoppers are with us...'. Clark (1905b) considered *A. guadeloupensis* as occurring on Guadeloupe, Dominica and Martinique, but later he (1908, 1934) distinguished the macaw of Dominica (*A. atwoodi*) from those on Guadeloupe and Martinique. Williams & Steadman (2001) found no evidence for Clark's (1905a: 269) suggestion that *A. guadeloupensis* also occurred on Dominica and Martinique, but concluded that it would seem more likely that the Lesser Antillean macaws were endemic to each island or set of nearby islands based on what is attributed to Jean-Baptiste Labat (1663–1738; *in* Clark 1905a: 269).

Hume & Walters (2012) noted the remarkable similarity between the descriptions of Guadeloupe Macaw by du Tertre (1654: 294) and Labat (1742: 212), and that this may support the presence of a macaw from the island. That similarity, however, may be the result of Labat copying du Tertre's work; several illustrations in Labat are re-renderings of du Tertre's originals. An illustration by D'Aubenton (*in* Buffon 1765–83: Pl. 12) closely resembles the descriptions of du Tertre and Labat, which Hume & Walters (2012) considered possible evidence that at least one Guadeloupe Macaw reached Europe.

Because Carib Amerindians were able to inform Columbus the direction of the mainland, Greenway (1967: 318) suggested that Guadeloupe Macaw could have been an exotic species, imported through trade with Mesoamerica or Mexico. Still, Williams & Steadman (2001) argued it was just as likely that macaws were indigenous.

Rothschild (1905) based his description of Guadeloupe Violet Macaw on Martín Fernández de Navarrete y Ximénez de Tejada's (1765–1844; cited as 1838: ii: 425 in Rothschild 1907a: 55, but not found by us) account of 'le gros Perroquet de la Guadeloupe', a very large macaw of an intense purple colour', 'called Onécouli, by the Caraïbes, according to Fernand Columbus' (Rothschild 1907b: 202). Navarrete's narrative was based on Las Casas' rediscovered abstract of the log Columbus made of his second voyage, not on first-hand observations. Martyr (*in* MacNutt 1912: 72) provided more detailed and convincing evidence of a purple macaw on Guadeloupe, recounting that Columbus took 'seven parrots larger than pheasants, and totally unlike any other parrots in colour. Their entire breast and back are covered with purple plumes, and from their shoulders fall long feathers of the same colour.... The other feathers are of various colours, – green, bluish, purple, or yellow.' Greenway (1967: 320) and Snyder *et al.* (1987: 40) suggested that *Anodorhynchus purpurascens* was based on either a poor description of Guadeloupe Parrot *Amazona violacea* (now extinct) or Lear's Macaw *Anodorhynchus leari* of Brazil, which must have been imported to Guadeloupe. At best, the evidence for a Guadeloupe *Anodorhynchus* is weak.

Marie Galante.—Williams & Steadman (2001) reported a single ulna of a species referred to as 'Marie Galante (Guadeloupe?) Macaw *Ara cf. guadeloupensis*'; i.e., probably *A. guadeloupensis*, but an extinct species for which no specimen exists. The specimen was discovered at an archaeological site at Folle Anse (c.15°57'N, 61°20'W), Grande Anse, Marie Galante, and is deposited in the UF archeological collections (Folle Anse 68, Box 68-10). However, Olson & Maíz López (2008) examined the specimen reported by Williams & Steadman, and considered it best referred to Imperial Parrot *Amazona imperialis*.

Dominica.—Dominica Macaw *Ara atwoodi* Clark, 1908, is a poorly documented species, based mainly on Thomas Atwood's (*ob.* 1793; 1791: 29) 18th-century report of a macaw larger than native Dominican parrots (*Amazona arausiaca*, *A. imperialis*) and was 'in great plenty, as are also parrots in this island.'

Martinique.—Considerable confusion exists concerning the macaw(s) of Martinique. Williams & Steadman (2001) listed two species, '*Ara martinica*' Rothschild, 1905, and '*Anodorhynchus martinicus*' Rothschild, 1905, both called Martinique Macaw. In his three publications referring to extinct macaws of the West Indies, however, Rothschild does not mention two species from Martinique. Rothschild (1905) first assigned *Anodorhynchus* [*Anodorhynchus*] *martinicus* to a blue-and-orange macaw recorded by Père Jacques Bouton (1592–1658; 1640: 71). Rothschild used the name *Anodorhynchus martinicus*, *nom. nov.* in his paper (1907b: 202) but, in his *Extinct birds* (1907a: 53), he referred to it as *Ara martinicus*, noting *Anodorhynchus martinicus* Rothsch. 1905 as a synonym. We suggest only one, if any, species existed on Martinique, and propose that *Ara martinicus* Rothschild, 1907, be assigned to it. Certainly, whether one or two species, it is poorly documented, being based solely on Bouton's (1640) scanty account. Salvadori (1906) considered it to be Blue-and-yellow Macaw. Greenway (1967: 319) suggested Bouton described a captive bird and, with Snyder *et al.* (1987: 39–40), also thought that the species concerned was Blue-and-yellow Macaw, which could have been traded to Martinique. Snyder *et al.* (1987), however, noted that a distinctive macaw once occurred on Martinique. Regardless of its name, we agree with Williams & Steadman (2001), who suggested that both supposed species of *Anodorhynchus* in the Lesser Antilles require corroboration. As noted by J. P. Hume (*in litt.* 2013), that an *Anodorhynchus* macaw once occurred on the West Indies is, for now, probably best regarded

as a figment of Rothschild's imagination, given that no modern-day *Anodorhynchus* occurs anywhere near the West Indies, and all of the available evidence suggests that this genus was rare even in historical times making it unlikely that such birds would have arrived in the Antilles via trade. In contrast, several species of *Ara* macaws occur on the adjacent mainland of South and Middle America.

In 1936, the Cuban scientist Mario Sánchez y Roig (1890–1962) thought he had found a specimen of *Ara martinicensis*. He claimed that it was collected in September 1845 and mounted in 1846 (*in litt.* to L. C. Sanford, 21 February 1936). On examining the specimen, however, J. T. Zimmer determined it to be a composite hoax, using the head, body and wings of Burrowing Parakeet *Cyanoliseus patagonius byroni* (now *bloxami*) of Chile, and tail of a dove, apparently an Old World *Streptopelia*. Zimmer (*in litt.* American Museum of Natural History, 27 March 1936) noted 'It has very little resemblance to the Macaws, even in its made up condition.'

Natural history of Cuban Macaw, with comments on other West Indian macaws

Earliest records.—Columbus and others, including José de Acosta (1540–1600; 1590), Bartolomé de Las Casas (c.1484–1566; 1552–61), Diego Álvarez Chanca (1494; *in de Ybarra* 1907), and Gonzalo Fernández de Oviedo y Valdés (1478–1557; 1950: 167) mentioned macaws in their reports of the exploration of Cuba and other of the Antilles. Juan Ignacio de Armas (1888: 114–115) summarised these early records. Cuban Macaw's beauty was well appreciated and illustrated in early treatments based on specimens, including Levaillant (1801 Vol. 1: Pl. 5), D'Aubenton (*in Buffon* 1765–83: Pl. 641: 'Le petit Ara'), Bechstein (1811: Pl. 1) and Brehm (1842: Pl. 3). The court painter Leopold Brunner produced a painting of *A. tricolor* in the late 18th century (H.-M. Berg pers. comm.).

Relationships.—Speculation on relationships among West Indian macaw species is presently impossible because no reliable, detailed descriptions or specimens exist other than for *A. tricolor*. Williams & Steadman (2001) noted that overall the plumage of Cuban Macaw suggests that its nearest mainland relative was Scarlet Macaw, because the distribution of red and blue is similar, as is the presence of a white facial patch that is featherless except for small crescentic lines of tiny red feathers. *A. tricolor* is distinct in lacking a yellow shoulder patch, its all-black bill and substantially smaller size. Greenway (1967: 315) affirmed that *A. tricolor* was clearly a representative of *A. macao*, and believed other forms of what he considered a superspecies occurred on Jamaica, Hispaniola and Guadeloupe. *A. tricolor* and *A. macao* share a species of feather mite (see Parasites), which further supports their relationship.

Range and status of Cuban Macaw.—Early writers described the range of *A. tricolor* as not only Cuba and Isla de Pinos, but also Haiti and Jamaica (Cory 1892, Gundlach 1893, Todd 1916), but most recent authors have limited its range to the first two islands (Bond 1978, Olson 2005, AOU 2012).

Clark (1905b) stated that young *A. tricolor* was largely green, although he presented no source for this. If the juvenile of *A. tricolor* was predominantly green, that could account for early reports of *A. militaris* on Cuba and Jamaica (Clark 1905b, Williams & Steadman 2001). On the other hand, Military Macaws were imported to the islands and could have occurred in a feral state, thereby adding to the confusion (see Trade).

Cuba.—Fossil evidence exists for Ciego Montero, Cienfuegos province (22°20'0"N, 80°24'0"W; Wetmore 1928; Pleistocene); Cueva de Paredones, Caimito, La Habana province (22°84'0"N, 82°63'0"W; Arredondo 1984; Quaternary); and Casimba en Los Buentes, Mal Páez, Sagua La Grande, Villa Clara province (22°48'0"N, 80°04'0"W; Olson & Suárez 2008;

Quaternary) (Fig. 1). Arredondo (1984) said that Cuban Macaw was abundant at the time of the European arrival, although Barbour (1923: 80) suggested it probably never was widespread. Moreno (1992) considered it restricted to central and western Cuba, as well as Isla de Pinos.

The Italian Giovanni Gemelli Careri (1651–1725; *Giro del mundo* 1699–1700; *in de la Torre* 1857) mentioned killing large numbers of parrots and two macaws near La Habana on 20 January 1698. An anonymous resident ('By a physician' 1844) of Cuba listed the macaw in the 1840s, but by the mid-19th century d'Orbigny (1839) wrote that it was becoming rare. Most accounts of the macaw's range and numbers at this time are based on Gundlach's (1810–96) reports from Ciénaga de Zapata, a vast swamp comprising about one-third of the province of Matanzas, on whose southern boundary it is located. Gundlach (1893: 151) noted that the macaw was still fairly common at the swamp's northern edge (e.g., Hanábana, where the río Hanábana flows into the swamp) in 1850, but thereafter it retreated into the interior. He (1874; 1876: 126) reported it occurring from Hanábana (Hacienda Hanábana = 'Hato Zarabanda'; 22°24'0"N, 80°58'01"W; 12 m) to the Ensenada (Bahía) de Cochinos (Bay of Pigs; 22°10'48"N, 81°09'59"W; c.32 km south-west of Hanábana). Gundlach passed nine months in the Ciénaga, from September 1849 to mid 1850, mostly at its north-eastern edge (González López 1990). It was probably during his 1849–50 visit that Gundlach collected several macaws from one of the last bands, which he said came regularly to feed at Hanábana (Ramsden 1918). In early 1850, Gundlach traveled to Hato Cabeza de Toro (22°06'0"N, 80°48'0"W; 10 m; c.38 km south-east of Hacienda Hanábana, and c.39 km east-southeast of Bahía de Cochinos), but left no record of macaws in that part of the Ciénaga. Gundlach made another trip to Ciénaga de Zapata in June 1856, his first stop on an extended journey through Cuba. By 1856, Gundlach (1856) considered the macaw rare in Cuba. Barely a decade later, Gundlach (1865–66, 1873, 1874, 1876: 126) noted it was confined to only a few places, with the population consisting of a few pairs. In later years he did not find it in Ciénaga de Zapata, although Gundlach told Cory (1886, 1889: 177–178) that he believed *A. tricolor* still survived in Zapata about 1885.

The only report of macaws from western Cuba is that of Barbour (1923: 80), who was told of its former presence at Guane (western Pinar del Río province; 22°12'07"N, 84°05'16"W; c.300 km west of Bahía de Cochinos; Fig. 1); he remarked that no macaws were seen in western Pinar del Río after the great hurricane of 1844.

In 1867, Antonio Perpiña (1889), a Spanish writer, geographer and priest, traveled widely through central Cuba, some of the cayos, and as far south-east as Pico Turquino,



Figure 1. Cuba and Isla de Pinos (Isla de la Juventud) with major cities and sites mentioned in text, and known localities of Cuban Macaw *Ara tricolor* from observations (dots) and fossil specimens ('x').

Sierra Maestra (Fig. 1). Perpiña described passing through extensive virgin forests in which he found many animals, and gave a detailed and acceptable description of Cuban Macaw, which he called the 'king of the parrots' because of its brilliant colour and size. Perpiña (1889: 32) recorded that his entourage shot a macaw, six parrots, four parakeets and 23 other birds during a day of hunting in Valle de San Antonio (c.21°32'0"N, 77°28'0"W; 24 m, near Sierra de Cubitas and c.31 km east-northeast of Camagüey; Fig. 1). Later in his expedition, Perpiña (1889: 242) reported another macaw and many parrots were killed by his party near Jobabo (20°54'32"N, 77°17'06"W; 82 km south-east of Camagüey), between Guáimaro (21°03'0"N, 77°21'0"W) and Las Lomas de Rompe (Sierras de Rompe; 21°02'42"N, 77°10'55"W), west-northwest of Las Tunas (Fig. 1). Further, Perpiña (1889: 247) wrote of the great red macaw ('lorirojo') observed at Las Lomas de Rompe, where he also noted Ivory-billed Woodpecker *Campephilus principalis bairdii*, Cuban Parakeets *Aratinga euops* and other birds. Although Perpiña's observations appear credible, it is surprising that Gundlach did not encounter macaws in central Cuba, including around Camagüey in May 1859; however, Gundlach was told of macaws in central Cuba (Gundlach 1893: 151). Although Gundlach made extensive explorations of the easternmost region of Cuba, he failed to find macaws and said that no one knew of it there (Gundlach 1893: 151).

Isla de Pinos.—Gundlach explored Isla de Pinos (= Isla de la Juventud) twice, in 1854 (December) and 1855, including six weeks at Santa Fé (21°44'31"N, 82°45'18"W); he also made a five-week trip early in 1892 (Poey 1866, Gundlach 1854: 426, Dathe & González López 2002; *in litt.* to F. Ramsden, La Habana, 26 April 1892; JWW pers. archive). Despite these extended periods of travel, Gundlach was unable to adequately explore the extensive Ciénaga de Lanier (21°34'0"N, 82°52'0"W; 10 m) because of the distance from his base at Santa Fé (= La Fé; c.25 km north-east of Lanier) and so passed just one day at the swamp's northern edge. Although Gundlach (1893: 151) listed the macaw from Isla de Pinos, he collected none there; he was told that some macaws still survived on the edge of the Ciénaga de Lanier and reported that the macaw and Ivory-billed Woodpecker occurred in the southern Ciénaga (Dathe & González López 2002). Walter Reaves Zappey (1878–1914) traveled extensively through Isla de Pinos, collecting for Rothschild's Tring Museum in 1902, and for E. A. & Outram Bangs in 1904, but did not find macaws. Zappey was told that the last pair of macaws known in the island was killed about 1864 at San Francisco de la Vega (21°37'0"N, 82°46'0"W; Fig. 1), 13 km north of the Ciénaga de Lanier; none was reported thereafter (Bangs & Zappey 1905, Todd 1916). The pair killed at San Francisco de la Vega apparently was not preserved (Olson & Suárez 2008). The Isla de Pinos macaws were probably subject to intense harvesting as the Cuban population dwindled. As parrots became scarcer on Cuba, harvesting became much more intense on Isla de Pinos to supply demand (Smith 1944); we suspect its macaws also became more vigorously sought for the same reason.

Because Bangs & Zappey (1905) referred to the locality of the 1864 record merely as 'La Vega,' rather than its complete name of San Francisco de la Vega, many authors (e.g., Greenway 1967, Day 1981, Luther 1995, Fuller 2001, Olson & Suárez 2008, Hume & Walters 2012) have wrongly assigned the location to La Vega, Cienfuegos province (22°05'0"N, 80°21'0"W), in Cuba, rather than to the correct Isla de Pinos location. La Vega, Cuba, is c.300 km east-northeast of San Francisco de la Vega, Isla de Pinos. Equally, many authors since Rothschild (1907a), especially in recent decades, have referred to this record as only having involved a single individual.

Habitat.—Cuban Macaw occupied open terrain with scattered trees, especially palm savanna, characteristic of Ciénaga de Zapata. Many years after Gundlach, Barbour (1943: 73, 1945: 152) traveled the río Hanábana to where that river flowed into the swamp, describing

the morass as bordered by a wide area of open country with scattered clumps of palms and hardwood *cayos* or hammocks. The border zone sloped gently toward the swamp and its extent varied as the rains caused the water levels to rise or fall throughout the entire Ciénaga.

Perpiña (1889) described limitless tracts of unbroken forests from north of Camagüey to Las Tunas. The natural vegetation of central Cuba was seasonal evergreen, semi-deciduous (dominated by *Swietenia mahagoni*) and gallery forests, in stark contrast to the almost complete conversion of that region to crops and pastures with only remnant forest and palm savanna today (Borhidi 1991). The habitat where Perpiña found macaws around Lomas de Rompe formerly consisted of extensive rainforest-like gallery forests, but has been impoverished by human influence, and today only a few degraded stands of forest remain; natural vegetation has been replaced by treeless marshy meadows and moist savannas (Borhidi 1991). Also, the area around Guane, Pinar del Río, is mostly converted habitat, but the flatlands and gently rolling hill country of the region originally were characterised by mixed palm-pine woodlands with a loose canopy layer, in which *Colpothrinax wrightii*, *Acoelorrhaphes wrightii*, *Pinus tropicalis* and *P. caribaea* were dominant (Borhidi 1991).

Ciénaga de Lanier has not been substantially altered since the mid-19th century and is today characterised by mangroves at its southern fringe, and a variety of seasonally inundated habitats including semi-deciduous forest, marshy grasslands, hardwood and palm hammocks, and palm savanna in the interior.

Buffon (1793: 161), probably speaking of more than one species of red macaw, said these birds lived in woods and wetlands with palm trees, and fed mainly on fruit of palms, of which there were immense forests in the flooded savannas. M. de le Borde (*in* Buffon 1793: 160) reported that West Indian macaws 'retire to the least frequented places, and are no more observed to approach the plantations.' Browne (1756: 472) stated that the 'blue Macaw of Edwards' generally kept to the most unfrequented inland parts of Jamaica. Richard Hill (*in* Gosse 1847: 261) reported Jamaican macaws (*Ara* sp.) were 'found exclusively in the central mountains westward of the island, and are observed on the skirt of the partially cleared country, at an elevation of 2500 or 3000 feet [750–900 m] above the sea.' March (1863: 283) noted that all records of macaws in Jamaica were from mountainous and wooded areas, in contrast to the Cuban Macaw, which was mostly found in lowland savanna, including coastal regions, and low-elevation interior forests.

Habits.—Few data are available on behaviour of West Indian macaws, but du Tertre (1654: 294) said 'Their voice is loud and piercing, and they always cry when flying. If one imitates their cry, they stop short. They have a grave and dignified demeanor'. Labat (1742: 212) likewise noted that the voice of West Indian macaws in general was strong. Atwood (1791: 29) characterised Dominican Macaw vocalisations as a 'disagreeable, harsh noise,' and 'loud chattering noise, which at a distance resembles human voices.' Gosse (1847: 263) reported that Jamaican macaws (*Ara* sp.) flew extremely high, in pairs, giving harsh screams, before finally alighting on the 'loftiest of the forest trees, in their chosen resting places.' In Dominica, Atwood (1791: 29) said macaws gathered atop the highest trees, where they 'feed on the berries in great numbers together.' De Rochefort (1658: 154) said Lesser Antillean macaws commonly flew in flocks. Gundlach (1874, 1876) reported that Cuban Macaw lived in pairs or in families, and noted (1893) it had a loud vocalisation like the macaws of Central America.

Diet.—Gundlach (1874, 1876, 1893) characterised the diet of Cuban Macaw as including fruits, palm fruit, seeds of Chinaberry tree *Melia azedarach*, tender shoots and buds. Chinaberry tree is native to Asia, Australasia, and some Pacific islands, but has been naturalised widely in warmer parts of the world, including the West Indies. The fruit is a

slightly fleshy marble-sized (c.15 mm in diameter), nearly round drupe. The oblong seed is 3.5×1.6 mm and surrounded by pulp, which was probably the part consumed by macaws, as it is by Cuban Parrots *Amazona leucocephala* and Cuban Parakeets (pers. obs.). The fruit is mildly toxic to humans. Cuba has a diverse palm flora (Leiva Sánchez 1999) and seeds of several species that occur in Ciénaga de Zapata were probably important in the macaw's diet (Olson & Suárez 2008). Dominant species of palm there include *Roystonea regia* and *Sabal maritima*. Local palms have large fruit upon which many birds, including parrots, feed. Olson & Suárez (2008) attributed certain features of Cuban Macaw's skull to its probable diet of very hard seeds, especially those of palms, as is typical of larger mainland macaws.

In Jamaica, Browne (1756: 250) noted that the seeds of a *Sloanea* ('the large oval-leaved *Sloanea*, or brake-axe tree'; probably *S. jamaicensis*) were 'much coveted by the mackaw and parrots,' further stating that these were the only birds that could 'break thro' those thick and lignous seed-vessels.' Further, Browne (1756: 343–344) listed two Jamaican palms—'The Mackaw Tree' and 'The Great Mackaw Tree'—but without reference to the bird. He noted that their fruits were large and rich in palm-oil. Lunan (1814: 468) said the Macaw-Tree was so called 'from a large bird that feeds upon the fruit of this tree, which is of the palm kind. There are two sorts of them...': 'great macaw-tree' and 'small macaw tree.' There may be confusion as to the true origin of the names of these palms, because the vulgar names may relate to the Portuguese name of macaúba for a kind of palm tree.

Oviedo y Valdés (1535: Libro Septimo, Capitulo ii: lxxii) reported West Indian macaws fed on manchineel *Hippomane mancinella*, which is common in the West Indies but is a powerful caustic poison to man and other animals. Du Tertre (1654: 296) said West Indian macaws fed 'on seeds and several fruits of trees, but mainly on the apples of the manchineel.' Later, du Tertre (1667: 249) elaborated, saying macaws only ate manchineel in times of necessity, and cautioned that meat of macaws that had eaten manchineel was unhealthy and even poisonous to man.

Breeding.—Unfortunately, Gundlach did not observe the breeding behaviour of *A. tricolor* as he did not visit Hanábana at the appropriate season (Gundlach 1865–66, 1873, 1874, 1876). He described the nest as a hollow in a palm based on sites shown to him by local residents (Gundlach 1876). The egg has not been preserved or described.

Atwood (1791: 29) noted that Dominican Macaws 'breed on the tops of the highest trees.' Du Tertre (1667: 249) stated 'The male and the female [West Indian macaw] are inseparable companions, and it is rare that one is seen singly', further noting, 'When they wish to breed (which they do once or twice a year) they make a hole with their beaks in the trunk of a large tree, and construct a nest with feathers from their own bodies. They lay two eggs, the size of those of a pigeon, marked like those of partridge.'

Parasites.—Du Tertre (1667: 249–250) said West Indian macaw nestlings were infested with two worms in the nostrils, with another in a small tumour on top its head, and noted that the maggots died once the chicks were feathered. These worms were probably warble fly *Philornis pici* larvae, which commonly parasitise psittacine nestlings in the West Indies (Snyder *et al.* 1987; pers. obs.). The maggots pupate within their host, and so may appear as though the larvae have died. Mey (2005) reported a new species of chewing louse *Psittacobrosus bechsteini*, now probably extinct, from a Cuban Macaw collected by Gundlach c.1849. Cuervo Pineda & Pérez Ortiz (2009) found a feather mite *Genoprotolichus eurycnemis* on a Cuban Macaw collected by Gundlach in 1849. This species is also known from Scarlet Macaw. Cuervo Pineda & Pérez Ortiz (2010) also found a new species of mite, *Distigmesikya extincta*, on the skin of a Cuban Macaw.

Population decline and extinction of West Indian macaws

At the time of Columbus, parrots and macaws were abundant in the islands (Huttich 1534: 31, Sloane 1725: 297, Atwood 1791: 29, Deshayes *in* Buffon 1793: 160, Edwards 1806: 19, Martyr *in* MacNutt 1912: 72), but by the 18th century macaws were rare in the Lesser Antilles (and presumably elsewhere) (Clark 1905a). M. de le Borde (*in* Brisson 1760: 183) stated 'In all these [West Indies] the Macaws have become very rare'. Seventy years earlier, John Taylor (*fl.* 1687; 2008: 142–143) noted that Jamaican macaws were 'held as a great rarity, there being but a few of them on this island and those hard to be come at, because they are noewhere to be found but in the woody mountaines.' Further observers of macaws in Jamaica also reported declining populations. Browne (1756: 472) said the 'blue mackaw of Edwards' was very rare, Stewart (1822: 79) noted that 'The maccaw is become very scarce', and Gosse (1847: 260) reported they were very rare during his residence (December 1844–July 1846). March (1863) stated that he had not heard of any reports on Jamaica since 1849, the last dependable report for the island.

Several dates have been proposed for the extinction of Cuban Macaw, including c.1850 (Bond 1940, Adams *et al.* 2003), c.1864 (Bond 1959, Balát & González 1982, Olson 2005), c.1884 (Vincent 1966–71, Moreno 1992), c.1885 (Greenway 1967, Prestwich 1970), between 1864 and 1885 (Lantermann 1984), and end of the 19th century (Garrido & García Montaña 1975, Moreno 1992). The last reliable reports, however, were Gundlach's from Ciénaga de Zapata in the early 1850s, Perpeña's in central and south-west Cuba in 1867, and possibly Zappey's second-hand record from Isla de Pinos in 1864.

Causes of extinction

Hunting.—Hunting for psittacids was a part of subsistence and traditional cultural activities of Amerindians before the arrival of Europeans. In Mexico, Hernando Cortés (Díaz del Castillo 1956) saw parrots for sale as food in the Aztec capital Tenochtitlan in 1520. Antillean Amerindians included parrots and macaws in their diets, and du Tertre (1667: 249) said that macaws were eaten regularly on some islands. The presence of macaw remains in St. Croix, Puerto Rico and Montserrat kitchen middens supports this. On Dominica, Columbus' men were shocked to find 'popingiayes' (macaws) along with geese, ducks and human flesh in earthen vessels, presumably being food larders, in houses of natives (Huttich 1534: 31, Arber 1885: 30).

West Indian macaws were easily killed, even using bow and arrows (Labat 1742: 81). Martyr noted the ease at which macaws could be captured by hand or noose, and the curious fact that they were not alarmed by gunshots (*in* Buffon 1793: 162, MacNutt 1912: 409). Du Tertre (1654: 294) said West Indian macaws were 'far from being alarmed by many shots fired under a tree where they are perched, they gaze at their companions who fall dead to the ground without being disturbed at all, so that one may fire five or six times into the same tree without their appearing to be frightened.' de Rochefort (1658: 154) considered Lesser Antillean macaws 'bold and resolute, for they are not alarmed by the report of fire-arms, and if none are wounded at the first discharge, they await a second without moving from the place where they are; but there are many who attribute this boldness to their natural stupidity rather than to their courage.'

Du Tertre (1667: 248–249) described how Amerindians in the Antilles captured macaws alive. The hunters waited until they descended to the ground to feed on fallen fruit, at which point the men stealthily approached, surrounding the birds, then burst forth, shouting and clapping, which startled the birds so that they did not fly, but fell on their backs and defended themselves with bills and claws. The Indians shoved sticks at the birds,

which they grasped with claws and beak, whereupon the birds were tied up with vines. In Cuba captive parrots were used as decoys. A native equipped with a captive parrot and a noose would climb a tree, where he hid in a straw 'hide.' When the trapper touched the decoy parrot's head, it cried out and attracted other parrots. The noose was slipped over the head of any inquisitive parrots, its neck wrung and let fall to the ground (Krieger 1929: 44).

Live macaws and parrots were kept captive until such time as they became meals for Amerindians. Huttich (1534: 31), speaking of *Ara guadeloupeensis*, noted 'they feed some of them so that they are better to eat.' Martyr (*in* MacNutt 1912: 72) reported that macaws and parrots were kept in captivity by Amerindians, 'and just as we keep magpies, thrushes, and similar birds to fatten them, so do these islanders also keep birds to eat, though their forests are full of parrots.'

Parrots, including macaws, were hunted as food by 15th and 16th-century explorers (Cooper & Armitage 2013), though they were probably eaten by the Europeans far less than by native peoples, and then only in desperation (Boehrer 2004, Cooper & Armitage 2013). Still, Labat (1742: 215) noted that while in Guadeloupe he ate more parrots than partridges when in Europe. Long (1774: 865, 951) noted that parrots were eaten by Amerindians but, although he listed parrots and parakeets, he did not include macaws among birds commonly eaten by Jamaican colonists. The reason for macaws not being eaten by Europeans may relate to the quality of their flesh. Du Tertre (1654: 294) said of West Indian macaws, 'The flesh of this bird is very tough, and considered by many unwholesome, and even poisonous.' Atwood (1791: 29–30) described the flesh of the Dominican Macaw as '...being very fat, it wastes in roasting, and eats dry and insipid; for which reason, they are chiefly used to make soup of, which is accounted very nutritive.' Conversely, Taylor (2008: 142–143) noted that the flesh of Jamaican macaw (*Ara* sp.) was 'very good but they are seldom eaten.' Sloane (1725: 297) said 'the Small Maccaw' was 'eaten as Pigeons', and further noted that other native parrots were eaten, including the 'common parrot of Jamaica' (Yellow-billed Parrot *Amazona collaria*) which he recorded as being 'bak'd in Pyes' and tasting of pigeon. This is more or less seconded by Coke (1808: 391), who stated that 'There are two species of parrots in the woods, natives of the island, both green; but one sort has a yellow bill. They are neither so beautiful, nor such good talkers, as the gray and green of other countries; they are, however, esteemed as delicate food, and are served up at some tables in preference to pigeons.' Browne (1756: 473) noted that parrots were 'generally reckoned very delicate meat, and eat not unlike pigeons; ... and frequently served up at gentlemen's tables in all the country parts of the island [Jamaica].' M. de le Borde (*in* Brisson 1760: 183) stated 'In all these [West Indies] ... the inhabitants destroy [macaws] for food.' The price commanded by parrots as game is suggested by Taylor (2008: 142), who wrote that 'you may bie of them dead for two royalls a duzen... at Jamaica.'

Several writers have pointed to hunting as contributing to Cuban Macaw's extinction (Rothschild *in* Lönnberg 1928, Barbour 1943, Arredondo 1984). Greenway (1967) noted that hunting was the only known reason for its extinction. Apparently, as reported for other West Indian macaws, Cuban Macaws were easily taken; Barbour (1943) was told that adults were stupid and slow to take flight when approached. Gemelli Careri (1699; *in* Pérez de la Riva & Berthe 1971) commented on the tasty flesh of Cuban Parrots, but diplomatically remarked that the Cuban Macaw should be conserved for the beauty of its feathers. Gundlach (1865–66, 1873, 1874, 1876) was more direct and noted that macaw flesh was undesirable, being tough and having an especially unpleasant odour (Gundlach 1893). Nevertheless, it was killed for food (Greenway 1967) and Todd (1916) noted it was even valued for its meat.

Trade.—Harvesting activities began even before the European arrival, with substantial numbers of animals (including macaws) captured by Amerindians for pets or trade among islands (Olson 1982, Wing 1989). Olson & Maíz López (2008) suggested that some populations of West Indian macaws may have been so precious in trade that every possible nest was sought to obtain young birds, and that vigorous harvesting of such large and comparatively uncommon species might conceivably reduce populations to extinction over the nearly 2,000 years that some islands had been occupied. They further suggested that Amerindians may have maintained the last Hispaniolan macaws in captivity, even after their extinction in the wild but, with the collapse of their cultures soon after the European arrival (Rouse 1992), the macaws became extinct.

The earliest explorers' accounts strongly suggest macaws were kept commonly as pets and perhaps bred in captivity by Amerindians (Greenway 1967, Dunn & Kelley 1989). Although adults were taken alive, nestlings were preferred as companion birds, but du Tertre (1667: 249) noted that adults could be tamed even when caught by such traumatic methods as described above. In northern Mexico and the American south-west, where they do not occur naturally, macaws (mainly *Ara macao*) were an important item of commerce and ritual among Amerindians, and large captive-breeding facilities were used to sustain ritual sacrifices (Hargrave 1970, Minnis *et al.* 1993, Creel & McKusick 1994). Bernal Díaz del Castillo (1492–1584; 1956: 212) described Hernando Cortés' entrance into Mexico City, where he found a royal zoo containing birds of all sorts, including 'parrots of many different colours, and ... so many of them that I forget their names.' Cortés (*in* Boehrer 2004: 56) described the Aztec zoo as superior to any in Spain. Smith (1937) noted that Columbus was 'astonished at the swarms of tame birds at liberty in the villages' of Cuban Amerindians. Chanca (*in* de Ybarra 1907) reported Columbus' men took two macaws from the houses of Caribs on Guadeloupe in November 1493. Being the largest and most colourful of West Indian parrots, macaws were probably of great prestige and value, and would have been traded afar.

In addition to native species, Amerindians may have imported macaws from the mainland. The husbandry and trade in live psittacines by West Indian people has raised concern among archaeologists and biogeographers who analyse material excavated from cultural sites (Wing 1989, Williams & Steadman 2001). Prehistoric peoples transported animals for trade and sustenance on their passages among islands, thereby confounding the determination of the former number and original distribution of macaws and other psittacids (Oviedo 1959, Wilson 1990, Williams & Steadman 2001). Thevet (1971) reported that native peoples carried macaws with them during war against enemies, '...for to eat them, and other things.' Olson (1982) presented evidence of bird transportation and extinctions caused by early man, noting that a lively trade in macaws existed between Indians in tropical Mexico and those in south-west North America, and suggested that trade in macaws probably also occurred in the West Indies.

Besides using macaws and other psittacines as barter and as pets, they were vigorously sought by Amerindians for their feathers, to decorate ceremonial dress and otherwise enhance the body (Labat 1742: 85, Navarrete 1828: 277, 280, Krieger 1929). An account of Francisco de Orellana's 1542 exploration of the Amazon describes local Indians keeping macaws as a source of ceremonial feathers (Heaton 1934: 415). The value native people placed on parrot feathers was recorded by Amerigo Vespucci who noted that those peoples' riches consisted in part 'of variegated birds' feathers,' and one tribe presented him with 'feathers of very great value, ... and ... numberless parrots of different colors' (Waldseemüller 1907: 98, 109). Du Tertre (1654: 294) noted that 'The natives [of Guadeloupe] hold the feathers of the tail [of macaws] in great esteem; they stick them in their hair, and pass them through the

lobe of the ear and the septum of the nose to serve as mustaches, and consider themselves then much more genteel and worthy of admiration of Europeans.'

Macaws and parrots were among the valued items traded by Amerindians for the trinkets brought to the Antilles by the earliest European explorers and, in turn, were displayed among the treasures as those explorers returned to Europe. Columbus traded red caps, bells and glass beads to natives, who in turn gave him such things as they valued most, including gold and parrots (Navarrete 1828: 42, 45, 186, Dunn & Kelley 1989: 65, 71, 223, 259, 271). In fact, Columbus was eager to obtain macaws and requested these from Amerindians who readily supplied them (Navarrete 1828: 186). In Columbus' triumphant march to Barcelona, he paraded his most cherished and representative treasures, leading his entourage on horses and mules, with captive Indians adorned with feathers and various bright ornamental apparel, their ears decorated with gold pendants, their arms with bracelets and wearing bead necklaces. Red-and-green parrots perched on their shoulders. All of these treasures Columbus presented to the king and queen (Collis 1977: 108, Davidson 1997: 285). Oviedo y Valdés (1535: Libro Segundo, Capitulo vii: ix) recorded that Columbus arrived in Barcelona with riches including gold, native Indians and many macaws. Martyr (*in* MacNutt 1912: 65) related that Columbus returned from his first voyage with 'some forty parrots, some green, others yellow, and some having vermilion collars like the parrakeets of India...; and all of them have the most brilliant plumage. Their wings are green or yellow, but mixed with bluish or purple feathers, presenting a variety which enchants the eye.' Morison (1970: 435) recounted that Antonio de Torres, returning from Hispaniola to Cadiz, in March 1494, brought 'sixty parrots of different colors, eight of them being big as falcons and the fairest species of fowl that fly in the air.'

Throughout the Age of Exploration of the New World, travelers brought specimens of exotic animals to Europe: live, to be exhibited in royal collections, dead, for museum cabinets (George 1980). As travel to the New World increased with accelerating exploration and colonisation, so did trade. Much as did the Amerindians, Europeans valued macaws and carried them among islands and to the mainland from the beginning of commerce in the New World. The Italian naturalist, Ulisse Aldrovandi (1522–1605) saw his first macaw at Mantua, Italy in 1572, and remarked that they were then of great admiration and were highly esteemed, and that the nobility gave them to one another as rare and valuable presents (*in* Buffon 1793: 157). Although parrots were considered novelties during this era, before long the entrepreneurial nature of adventurers and travelers recognised the trade value of parrots in the Old World. In fact, so many were brought back to Europe that a mere 34 years after Columbus' first voyage, Oviedo y Valdés (1950: 167) wrote 'there are many parrots, and of so many kinds and diversity, that it would take a long time to describe them, but because so many are brought to Spain, I will not waste time talking of them.' Similarly, Labat (1742: 211) stated that West Indian psittacines were too well known for him to waste time portraying them. Long (1774: 896), writing for a European audience, said of Jamaica's five species of psittacines, including 'Blue Mackaw', 'These are all native, and too generally known to need any description.' Nicolaus Joseph Freiherr von Jacquin's (1727–1817) expeditions to the Caribbean islands and elsewhere in the New World, 1754–59, resulted in large collections of natural history objects, but Jacquin (1784) did not include *Ara tricolor* among those species reported from his exploration of Cuba (1759) and, in fact, he was given instructions by Emperor Francis I not to collect parrots (C. Riedl-Dorn pers. comm.), again, probably because these birds were already so well known in Europe.

As Europeans rapidly became familiar with New World parrots, their desire to own these exotic status symbols continued to increase. The number of species described from captive birds attests to the multitude of psittacine species and numbers that were kept as

pets in Europe in the 17th and 18th centuries, particularly among the upper classes and especially the nobility (e.g., Albin 1738a, 1740, Edwards 1751). Edwards (1751: Pl. 161) stated that 'the large Green Parrots, [are] commonly brought to us from the West-Indies,' and elsewhere (1751: Pl. 161) said the 'Great Green Parrot, from the West-Indies' was 'pretty common in London.' Edwards (1751: Pl. 168), speaking of the 'Little Green Parrot,' said '...I take it to be from the West-Indies, from whence most of the Green Parrots we have in London are brought.' Further, authors of descriptive works on parrots frequently mentioned several London and European dealers specialising in foreign birds, including macaws. Apparently even stuffed parrots found a market in Europe, as Edwards (1751: Pl. 173) mentioned buying a 'beautiful and rare little Parrot ... exposed to Sale (stuffed, and set on a Perch) in a Toy-Shop Window, in London'.

The great incentive to harvest parrots for European trade can be appreciated from the high prices commanded by macaws and others of their tribe there. Even in their native islands, psittacines were worth a considerable sum of money. For example, of *Amazona* parrots, Taylor (2008) recorded that '...a young one alive out of the nest will cost six royalls [reales] at Jamaica.' But captive parrots were valued far more in Europe. As examples, Albin (1738b: Pl. 13) wrote that a 'Laurey from the Brasils' [Purple-naped Lory *Lorius domicella*] sold for 'twenty Guineas,' the equivalent in today's money of c.£1725; Blue-and-yellow Macaw was 'commonly sold for ten Guineas' (c.£860 today) (Albin 1840: Pl. 10); and the 'Maccaw from Jamaica' [likely *Ara gossei*, but perhaps *A. macao*], which was 'commonly brought from Jamaica, and other parts of the West-Indies,' were 'commonly sold for ten Guineas' (Albin 1738a: Pl. 16). About 1680, the cost of a parrot in Amsterdam was recorded as 'roughly sixty guilders' (Margóesy 2010), when a guilder was a 10.61 g, 90% pure silver coin, demonstrating the high value of pet birds. Such prices initially made owning a macaw or parrot accessible only to the affluent and thus a substantial status symbol in Europe. But as more parrots were imported, classes other than the nobility and aristocrats were able to acquire them. Thus wealthy merchants and affluent citizens sought the parrots that were becoming staples in the growing number of bird dealers' shops. Thomas (1983) wrote that commercial bird dealers first appeared in England 'in Tudor times and in the late seventeenth century there was a large London market in singing-birds, some caught at home by professional bird-catchers, others exotics imported from the tropics.' Trade in parrots continued to increase into the 19th century, with parrot popularity as household animals reaching its peak in the 1800s (Boehrer (2004). This high point in the importation of psittacines coincides with what is probably the period when the last West Indian macaws became extinct.

Macaws were kept as companions by colonists in the islands. Du Tertre (1667) included an illustration depicting what appears to be a macaw perched at a 17th-century plantation. Taylor (2008) noted that macaws were 'kept tame as a curiosity' in Jamaica, and Gosse (1847: 263) reported that a captive Jamaican macaw kept by a Mr White was 'for some time the admiration and talk of the country round.'

Trade in all Cuban psittacines has long been a cause of concern (Gundlach 1893, Bangs & Zappey 1905, Todd 1916, Noegel 1979) and is vigorous today, even under national and international regulation, bringing about modern declines. The enormity of the trade in recent times is particularly well documented on Isla de Pinos, where parrots and parakeets were formerly numerous (Gundlach 1893, González Alonso *et al.* 2012). Gundlach (1893) predicted that if rates of capture for the pet trade were maintained, the parakeet would be exterminated on Isla de Pinos in a few years. Sadly, his prediction was fulfilled; the parakeet was extirpated early in the 20th century (Bangs & Zappey 1905). The parrot, however, has survived there, albeit in much-reduced numbers.

Although we have found no data to appreciate how many macaws and other psittacids were being exported during the 16th through 19th centuries, the few statistics of the enormous parrot trade in Cuba during the early 20th century provide an appreciation of the international demand in that period. During the first decade of the 20th century, some 3,000–5,000 pairs of parrots were exported from Isla de Pinos to the USA annually (Anon. 1910a). Because of their depredation of crops, parrots were unprotected until 1909. Numbers increased rapidly thereafter, but protests by planters soon led to the protective legislation being repealed and within a few years large numbers were again being exported; e.g., one large shipment of 2,500 parrots in 1910 (Anon. 1910b,c) and c.1,000 birds imported by one US dealer in July 1914 (Anon. 1914). It is certainly within reason to assume that the Cuban Macaw was even more desirable than parrots and parakeets (Olson 1982).

Cuban Macaws were kept locally and also exported to private collectors and royal and public zoos overseas, leading several writers to suggest that harvest for the pet and commercial trade was in large part responsible for its extinction (Gundlach 1874, Lönnberg 1928, Moreno 1992, Dathe & González López 2002). Local interest in Cuban Macaws as pets had a long and consistent history, until the time of its extinction. Gundlach (1865–66, 1873, 1874, 1876) reported that the macaw was a much sought-after cagebird, but noted (1874) that captives damaged furniture and other items using their powerful bills. Yet, despite this, we suspect that the macaw was a more desirable pet in Cuba than Cuban Parrot, which continues to be vigorously sought by island residents and, despite strong legal protection, is common in households.

Cuban Macaws were equally popular overseas. García Montaña (1980) said that they were given to the kings of Spain, and that over the centuries thousands were exported to Europe. Barbour (1943) supported that claim and Finsch (1863) stated that it was well known in captivity in Europe, but even so was rare. Lönnberg (1928) suggested that at one time Cuban Macaw had been very popular and that it was kept as an ornamental bird in Sweden in the 1700s.

The ever-increasing local and international demand for parrots certainly had a devastating effect. Lönnberg (1928) recognised the problem of such harvesting of young macaws in that natural reproduction was greatly reduced. As populations of native macaws diminished and it became more difficult to supply local demand, exotic species were imported to meet it. Exotics from other islands and beyond were imported to supply cagebirds for local markets in the face of dwindling native populations. Importing macaws and parrots during the colonial period is particularly well recorded in Jamaica, where, as early as the 17th century, Taylor (2008) wrote that the 'African or Guinea parrot' (Grey Parrot *Psittacus erithacus*) was 'brought to Jamaica and sold at reasonable rates.' Regarding Grey Parrot, Edwards (1751: Pl. 163) wrote 'I am well assured that what we have are brought from Africa, generally by the Way of the West-Indies, by our Guinea Traders, that supply our Sugar Islands with Negroes.' Sloane (1725: 297) also reported that Grey Parrot was 'brought to the Island of Jamaica in great Quantities from Guinea' [Africa]. Further, Sloane (1725) said '*Psittacus viridis alarum costa superna rubente*' [Red-shouldered Macaw *Diopsittaca nobilis* or Yellow-crowned Parrot *Amazona ochrocephala*; neither from the West Indies] was brought to Jamaica 'from the Spanish Main, or Continent of America frequently hither'. He also noted that Cuban Parrots were 'brought from Cuba to Jamaica frequently.' In addition, Sloane (1725: 296) recorded that 'the Great Maccaw' '*Psittacus Maximus cyanocroceus*' (*Ara ararauna* of South America) was kept in captivity. Browne (1756: 472) noted that most of the 'blue Mackaw[s] of Edwards' were introduced to Jamaica from the mainland. Further, Browne (1756: 472) said the non-native 'red Mackaw of Edwards *Psittacus maximus Jons*' was frequently brought to Jamaica from the neighboring parts of the main'.

Further evidence of extensive trade in exotic macaws in Jamaica comes from a painting by the Revd. John Lindsay dated 1765 and part of a series of volumes of watercolour illustrations and manuscript descriptions of Jamaican flora and fauna in the collection of the Bristol City Museum and Art Gallery. The macaw appears to be Scarlet Macaw, and probably represents a captive individual or introduced population (Crane 1981, Fisher & Warr 2003, Turvey 2010). Scarlet Macaw was one of the most popular of parrots among 18th-century Parisian nobility (Robbins 2002) and was widely traded in the Americas by pre-Columbian Amerindians (Olson & Maíz López 2008). Thus, the species could have been imported to Jamaica via trade.

One of the attractions of psittacines as pets is their ability to 'speak', and that capacity was often noted by early writers. Taylor (2008) reported that Jamaican macaws 'spake much plainer and lowder than any parrat whatsoever.' Labat (1742: 212) noted that West Indian macaws could be tamed and, especially if taken young, spoke very well, their voices being strong and distinct. Sloane (1725: 296) said a Jamaican macaw, probably *A. erythrura*, was 'more Articulate than any Bird I ever heard.' In contrast, accounts gave Cuban Macaw poor marks regarding speaking ability. Gemelli Careri (*in de la Torre* 1857) remarked that Cuban Macaws could not speak. Gundlach (1865–66, 1873, 1874, 1876) said that although it imitated some words, Cuban Macaw did not have the skills of Cuban Parrot. It is probable, however, that ability to talk took second place to the size and showiness of macaws. Several other observers noted their poor speaking abilities. Of Lesser Antillean macaws, de Rochefort (1658: 154) commented that the tongue was 'too thick to enable them to speak as well as parrots and the smaller parakeets', and Atwood (1791: 29) said macaws 'cannot be taught to articulate words.'

West Indian macaws were often kept in royal menageries and public zoos. Taylor (2008) said that he saw one Jamaican macaw ('marcough' *Ara* sp.) 'amongst His Majesty's birds at Saint James's Park [London].' Moreno (1992) noted that many Cuban Macaws were exported to Europe where they were sought for exhibit in zoological gardens. Cuban Macaw was probably not rare in zoological collections in Europe judging from the number of specimens preserved after dying in zoos. In total, six specimens are known to have been kept previously in zoos, while an additional four were probably held as captives (Table 1). Additional Cuban Macaws were also reported in zoos, but are not known to have been deposited in museums after death; e.g., Bolle (1856) reported one in the London Zoo on 2 January 1856 (perhaps BMNH 1858.5.13.1?).

Habitat destruction.—D'Orbigny (1839: 120–121) noted that Cuban Macaw was becoming increasingly rare as natural lands were cultivated in association with human population growth. Later writers also considered habitat destruction as probably contributing to the macaw's extinction (e.g., García Montaña 1980, Moreno 1992, Dathe & González López 2002). Of particular harm was the way in which nestlings were obtained for trade. Gundlach (1893) described how adults were observed to find the nest tree, then the harvester would wait until the chicks were well grown before felling the tree to obtain the nestlings. Some chicks undoubtedly died as a result, but a more serious and long-lasting effect was the cumulative loss of the best nesting habitat; i.e., palms with cavities of sufficient dimensions and security. After many years of such selective destruction, macaws may have been left with few, and possibly only suboptimal, nest sites. This method of harvesting psittacine chicks in Cuba has continued to the present, to the point that such habitat destruction has greatly affected populations of the two surviving species (de las Pozas & González Alonso 1984, Kirkconnell & Wiley *in prep.*).

This practice was also common on other islands and may have affected their macaws as well. Taylor (2008) wrote that parrots and parakeets in Jamaica 'commonly breed in the

TABLE 1
Museum specimens of Cuban Macaw *Ara tricolor* known or suspected
to have originated as zoo captives or cagebirds.

Museum ¹ and catalogue no.	Zoological institution where formerly held	Comments
BMNH 1858.5.13.1	Presumably a captive bird	Obtained from the Zoological Society (Knox & Walters 1994).
WML D645	Knowsley Park aviaries of 13th Earl of Derby	Died March 1846; arrived in museum 1851.
MNHN 2000-725	Jardin de Plantes, Paris	Donated to museum in 1842 after its death (Jouanin 1962).
NMW 50.796	Imperial Menagerie, Schönbrunn	Died 1835 (Fitzinger 1853) or \geq 1806 (Moreno 1992).
SMNG A03466a	?	Probably a cagebird (C. Dücker pers. comm.).
NRM 569592	?	Thought to have been a cagebird in Stockholm; wing feathers clipped (U. Johansson pers. comm.).
NRM 523094	Amsterdam Zoo	Died 1858
SMTD 3466	?	Probably formerly a captive, by its frayed plumage (M. Päckert pers. comm.).
MCZ 72526	?	Obtained from Lafresneye Collection, France; with one clipped wing,
AMNH 205178	Zoological garden of Berlin	Presented to museum by Barbour, 1923.

¹Abbreviations: BMNH = Natural History Museum, Tring; WML = World Museum, Liverpool; MNHN = Muséum National d'Histoire Naturelle, Paris; NMW = Naturhistorisches Museum, Wien; SMNG = Senckenberg Museum für Naturkunde, Görlitz; NRM = Naturhistoriska Riksmuseet, Stockholm; SMTD = Staatliches Museum für Tierkunde, Dresden; MCZ = Museum of Comparative Zoology, Cambridge, Massachusetts; AMNH = American Museum of Natural History, New York.

hollow trunk of cabadge trees up in the mountains soe that they are hard to come by, and you must fell the tree to come at 'em.'

Crop pest.—Gundlach (1865–66, 1873) mentioned that Cuban Macaws may have caused damage to fruit trees, but noted (1874, 1876) that, because they lived far from dwellings, the damage was not great (but added, also, that the bird provided no benefit). Hill (*in* Gosse 1847: 261) noted that macaws in Jamaica fed in 'small companies' on the 'full-eared maize, while the grain was soft, milky, and sweet, and the very husk was sugary.' There is no reason not to believe that Cuban Macaw also depredated crops and, as a consequence, was persecuted. Today, Cuban Parrots and, especially, Cuban Parakeets are soundly punished for such infractions!

Hurricanes.—Barbour (1923) reported that Cuban Macaw disappeared from western Pinar del Río after the great hurricane of 1844 (4–5 October). Even if that storm did not eliminate the last macaws in western Cuba, the devastating hurricanes of 1846 (the 'Great Havana Hurricane'; 10 October; Category 5) and 1856 (late August; Category 3) could have further decimated remnant and fragmented habitat, and scattered populations beyond recovery. Similarly, a strong tropical storm ravaged Ciénaga de Zapata on 21 August 1851. When original forests are extensive, hurricanes have positive effects, producing habitat for cavity-nesting birds. However, once macaw populations were restricted to a few, relatively small areas of fragmented habitat, a direct hit by a powerful storm could destroy sufficient critical habitat to cause extirpation (Wiley & Wunderle 1993). Some of the small, disjunct populations of the Critically Endangered Puerto Rican Parrot *Amazona vittata* were probably destroyed by such events (Snyder *et al.* 1987). Not only did those populations suffer the

direct effects of the storm, but habitat critical to their survival was severely damaged. Further, in the aftermath of hurricanes, parrots were more vulnerable as they moved to hostile areas seeking food, meeting humans also desperately seeking to survive.

Disease.—Imported pets and domestic fowl may have carried exotic diseases, which could have spread to wild indigenous parrots, and against which they had little or no resistance. Du Tertre (1654: 294) mentioned that although Guadeloupe Macaw was long-lived ('live longer than a man'), they were 'almost all subject to a falling sickness [epilepsy].' Labat (1724: 217) also remarked on the long-lived psittacids of the West Indies, and their susceptibility to the 'falling sickness.' De Rochefort (1658: 154) noted that Lesser Antillean macaws were 'so sensitive to cold that it is difficult to bring them across the sea.' Williams & Steadman (2001) suggested that a disease outbreak, combined with hunting pressure, caused the extinction of Guadeloupe Macaw.

Specimens of *Ara tricolor*

No modern skeletal specimens of *A. tricolor* exist (Williams & Steadman 2001) but we can account for 19 skins or mounted specimens in 15 collections (Table 2). All were collected in Cuba, or from an unknown locality. When and from where and whom the museums obtained these specimens is unresolved in many cases.

Gundlach's specimens.—Gundlach collected several of the last group of Cuban Macaws that came regularly to feed at a site in Ciénaga de Zapata in 1849–50 (Barbour 1923). These may have been the only macaws Gundlach collected, because he does not mention additional specimens taken during later visits to the Ciénaga. If true, Gundlach must have kept several specimens for years, eventually giving all but one to friends and institutions. Before he left Germany for Cuba in November 1838, an organisation was formed to furnish support funds by the sale of stock, to be repaid by Gundlach with specimens collected during the expedition, which was originally planned to continue to Surinam. Although Gundlach made it only as far as Cuba, he set to work collecting and shipping materials to those who had bought stock, not ceasing until he paid all his debts. Even after meeting his financial obligations, he continued to send specimens to Germany, including his precious macaws.

Cory (1889) mentioned that Gundlach had several macaw specimens, by which time Gundlach had dispersed a good portion of his collection to foreign institutions. Although Gundlach did not record how many macaws he collected, it was at least four (see below). By the time of his death in 1896, only one remained at the Instituto de Segunda Enseñanza, where Gundlach's collection was maintained (Ragués 1914).

During the mid-19th century, it became fashionable among wealthy Cubans to adorn their drawing-rooms with natural history specimens, and Gundlach gifted friends and acquaintances specimens he had prepared. He thus became known to the most influential citizens of that day, who in turn provided him with assistance (Ramsden 1918). Gundlach may have included one or more macaw specimens among those given to Cuban friends and patrons (see below).

TABLE 2
Distribution of known skin or mounted specimens of Cuban Macaw *Ara tricolor* among 15 collections worldwide.

Collection	No.
IES	1 ¹
BMNH	2
WML	1
MNHN	2
NMW	1
ZMB	1
SMF	1
SMNG	1
NRM	2
SMTD	1
EHM	1
RMNH	1
MCZ	1
AMNH	1
USNM	2
Σ	19

¹Stolen in 2007.

Specimens in Cuban and foreign institutions

Instituto de Ecología y Sistemática (IES), La Habana, Cuba One: CZACC-6.59937. No date or precise locality; coll. Juan Gundlach. Adult. Mount. Specimen no. 165 from the Gundlach collection formerly in the Instituto de Segunda Enseñanza, it was stolen from IES in 2007.

Natural History Museum, Tring (BMNH) Two: BMNH 1851.7.21.5. No date (received no later than 1859), locality or collector. Adult. Skin, ex-mount. Purchased from Lt. A. Smith, but R. Prýs-Jones (pers. comm.) thinks this may be in error, and all that can be said safely is that it was purchased. Knox & Walters (1994) noted that the correct registration number should be 1851.7.24.5. BMNH 1858.5.13.1 No date, locality or collector. Adult. Skin, ex-mount. Source given as Zoological Society and presumed to have been a captive bird (Knox & Walters 1994).

World Museum, Liverpool (WML) One: D645. No date or collector. Locality given as 'Mexico'. ♀. Skin. Obtained from Knowsley Park aviaries of 13th Earl of Derby, where it died March 1846. Acquired in 1851, and maintained today in Derby Collection.

Muséum National d'Histoire Naturelle, Paris (MNHN) Two: MNHN 2000-725. No date, locality or collector. Adult. Mount. Maintained in captivity in Jardin de Plantes, Paris, from 30 May 1840 and, after its death, on 6 October 1842, presented to MNHN by L. F. E. Rousseau (1788–1868), an assistant naturalist at MNHN (1834–60) (from *Catalogue des Animaux morts à la ménagerie 1840–1853*, where noted 11 October 1842; A. Previato pers. comm.). MNHN CG 2000-726. No date, locality or collector. Adult. Mount. Type. Jouanin (1962) noted it as from 18th century. M. Portas (pers. comm.) believes it was from old collection of Jardin du roi (museum before Revolution = pre-1789). It formed part of the 'Exposition permanente des Produits de l'Algérie et des Colonies,' displayed in the Palais de l'Industrie in Paris in 1860, and curated by Aubry-Lecomte, but no information as to duration of exhibit or when transferred to MNHN (A. Previato pers. comm.).

Naturhistorisches Museum, Wien (NMW) One: NMW 50.796. No date, locality or collector. ♀. Mount. Obtained from Imperial Menagerie of Emperor Franz II (Franz I of Austria; 1768–1835) (de Germiny 1937; G. Heindl pers. comm., H.-M. Berg pers. comm.). Acquired by NMW in 1832, the same year it died at the menagerie (Fitzinger 1853: 166; H.-M. Berg pers. comm.), although Moreno (1992) set date of acquisition as 1806. Fitzinger (1853: 86) listed two *A. tricolor*, a male and female, in the menagerie as from 'Brasilien. 1760,' but G. Heindl (pers. comm.) noted that one of these birds was probably *A. macao*. G. Heindl (pers. comm.) suggested the two specimens, including the Cuban Macaw, from 1760 were collected during Nicolas Joseph Jacquin's expeditions to the Caribbean islands in 1754–59, including Cuba in 1759, but Jacquin (1784) does not include *A. tricolor* among species reported by his expedition (C. Riedl-Dorn pers. comm.).

Museum für Naturkunde, Zentralinstitut der Humboldt-Universität, Berlin (ZMB) One: ZMB 24886. No date or locality; coll. Gundlach, probably in 1849 [1850?] at Hanábana, Ciénaga de Zapata (Stresemann 1954). ♂. Adult. Skin. Sent by Gundlach to ZMB in November 1880 (letter from Gundlach to Peters, 16 November 1880; S. Frahnert pers. comm.). Received by ZMB in December 1880.

Senckenberg Forschungsinstitut und Naturmuseum, Frankfurt (SMF) One: SMF 17345. No date, locality or collector. Ex-mount. From Hartert Coll. (No. 2399) (Mertens & Steinbacher 1955).

Senckenberg Museum für Naturkunde, Görlitz (SMNG) One: SMNG A03466a. No date, locality or collector. ♂. Mount. Possibly a cagebird (C. Dücker pers. comm.). Donated (without year) to 'Naturforschende Gesellschaft zu Görlitz' by Dr H. Böttcher (1834–1904)

from village of Quolsdorf. Böttcher bought the macaw from G. Schneider (1834–1900), a dealer in natural history objects and corresponding member of the Goerlitz Society, Basle, Switzerland. Böttcher, a renowned bird collector, donated more than 100 birds to the Görlitz museum in 1861; the macaw might have been included in that gift (C. Düeker pers. comm.).

Naturhistoriska Riksmuseet, Stockholm (NRM) Two: NRM 569592. No date, locality or collector. Mount. Very old specimen from private collection of A. U. Grill (1752–92). Grill's collection was donated to NRM in 1829. No date when acquired by Grill, but probably c.1791–92 (U. Johansson pers. comm.). Locality given as 'Stockholm?', which U. Johansson (pers. comm.) interprets as it having been a cagebird in Stockholm. NRM 523094. No date, locality or collector. Mount. Purchased 1858 from G. A. Frank, a dealer in natural history objects in Amsterdam. Frank bought 80 birds from T. G. van Lidth de Jeude (1788–1863) and U. Johansson (pers. comm.) believes the NRM macaw came via this route, although it is unclear whether there is any documentation in favour of this supposition. The van Lidth de Jeude collection originated in the early 18th century and was assumed to include many old specimens (Boeseman 1970). U. Johansson (pers. comm.), however, notes that if a bird died in Amsterdam Zoo in that period, the NRM specimen may originate from there (see Lönnberg 1928). Moreno (1992) noted that a Cuban Macaw died in the Amsterdam Zoo in 1858, and presumed it was the NRM specimen.

Staatliches Museum für Tierkunde, Dresden (SMTD) One: SMTD 3466. No date, locality or collector. Mount. Moreno (1992) said it was part of an old collection from mid-19th century. Formerly a captive, by its frayed plumage (M. Päckert pers. comm.).

Eichsfelder Heimatmuseum, Heilbad Heiligenstadt (EHM) One: EHM IA1/310. No date, locality or collector (*vide* V. Merten). Mount. From among 750 bird and other natural history specimens accumulated by K. W. J. Strecker (1818–87) of Dingelstädt. Strecker donated, via his will, his collection to EHM in 1885.

Nationaal Natuurhistorisch Museum, Leiden (RMNH) One: RMNH.Aves.110095. No date or collector. Locality given as 'Cuba'. Mount. No further specimen or acquisition information (S. van der Mije pers. comm.).

Museum of Comparative Zoology, Harvard University, Cambridge, MA (MCZ) One: MCZ 72526. No date, locality or collector. Original label missing. Ex-mount. From Lafresnaye Collection. Fine condition, but one wing clipped, suggesting a cagebird.

American Museum of Natural History, New York (AMNH) One: AMNH 205178. No date, locality or collector. Mount. Lacks tail. Died Berlin Zoo, date unknown. T. Barbour presented it to AMNH in 1923. Original label inscribed '*Psittacus tricolor* Bechst. 1881 West Indies, 10189,' as well as a note in ink: 'Zool. Garden, Berlin.' Also: AMNH FARB 6199 ?*Ara tricolor*, proximal end of carpometacarpus Pleistocene, Baños de Ciego Montero; coll. B. Brown, 1918.

United States National Museum of Natural History, Smithsonian Institution, Washington DC (USNM) Two: USNM 135137. No date or locality; coll. Gundlach. Skin. Acquired by AMNH from Gundlach 13 December 1894. USNM 17167. No date, locality or collector. Mount. On exhibit in Hall 13 'Birds of the World.' History of this specimen involved and partially unsolved. Probably collected in Ciénaga de Zapata by Gundlach and carried with him, along with other birds, to Puerto Rico during Cuba's Ten Years War (1868–78). Barbour (1923) said Gundlach used the specimens, which also included two Ivory-billed Woodpeckers, to repay favours afforded by his friends, probably the apothecary and naturalist Tomás Blanco y González (1840–92) and naturalist Agustin Stahl (1842–1917).

With the encouragement of Blanco and Stahl, in 1866 the Padres Jesuitas de Puerto Rico invited Gundlach to build a natural history collection for the Colegio Seminario they had established in San Juan in 1865. Gundlach eventually made two extended trips to Puerto Rico to collect specimens for the Instituto Civil de Segunda Enseñanza de San Juan, established the same year as his first expedition (1873; López Yustos 1991). Stahl became a professor of natural history there, and Gundlach apparently provided the woodpecker and macaw specimens. Stahl and Blanco maintained the specimens at the Instituto, along with others collected by Gundlach during his 17 months in Puerto Rico. But, after the Spanish-American War (1898) and the Treaty of Paris, the Instituto was closed in 1899. Blanco had died in 1892 and Stahl was deported from Puerto Rico by the Spanish government in 1898, so the Instituto collection had lost its main advocates. Barbour (1923) thought Gundlach's Ivory-billed Woodpeckers were later acquired by AMNH, which matches at least one of the three specimens, AMNH 144873, a male, which has two labels, one of which reads, 'This bird was collected by Gundlach in Cuba and sold by him to Porto Rico High School.' The second label says 'Purchased from High School collection at St. Juan Porto Rico in 1901.' The AMNH catalogue adds 'collected in Cuba and sold to the Porto Rico High School where it was found' (P. Sweet *in litt.* 2012).

The macaw was apparently found in the Instituto by Major W. A. Glassford, US Army, Chief Signal Officer, stationed in San Juan, Puerto Rico during the post-Spanish-American War occupation by the US military. C. W. Richmond (1868–1932), who was in Puerto Rico collecting birds and herptiles with L. H. Stejneger (1851–1943) from 12 February to 19 April 1900, received the specimen from Glassford, whereupon Richmond deposited the macaw at USNM (accession date 16 May 1900).

Hypothetical or lost specimens.—Several rumours exist of additional specimens of Cuban Macaw in collections within Cuba, and some may have been extant quite recently. One rumour involves a macaw among the natural history exhibits at the Escuela 'Rafael María Mendive' (= Colegio Dolores or Convento de Dolores) at Santiago de Cuba. G. G. Hechavarría and L. O. Melián Hernández (pers. comm.) recalled that the exhibits contained a large collection of mounted birds including two Ivory-billed Woodpeckers and a Cuban Macaw. By the time JWW was permitted to visit the school in May 2006, all that remained were four badly damaged mounts, none of them a macaw. The school's director informed JWW that all of the other specimens had been destroyed during building reconstruction over the previous two years. The director said that, until the reconstruction, the natural history materials, including a macaw, had been well conserved and the most valuable specimens were in a case away from the main school activities.

That such specimens may have existed in the Escuela 'Rafael María Mendive' is supported by Leyva (1922), who noted a specimen of Ivory-billed Woodpecker and collection of butterflies made by Gundlach in the Museo Municipal de Santiago de Cuba, part of which may have found its way to the Escuela. O. H. Garrido (pers. comm.) recalled that he and F. García Montaña obtained a mounted specimen of the near-extinct Cuban Kite *Chondrohierax uncinatus wilsoni* from the same collection. Further, documents in the Archivo Nacional de Cuba include records that establish the collection of birds in the Escuela came from the Brooks family, which may link that collection to Gundlach. In 1884–85, Gundlach was guest of his friend Theodoro Brooks at Cafetal 'Jaguey' in the mountains of Yateras and, as characteristic of Gundlach, he may have given Brooks bird and other specimens to repay the family for their hospitality.

Barbour (1945) recounted that other macaw specimens had been in Cuban collections, including one in the cabinet of the Habana Academy of Sciences, but that disappeared and was rumoured to have gone to a notorious private collector abroad. Fuller (2001:

236) suggested that collector was Walter Rothschild. Barbour (1945) reported that another specimen was said to have been in a museum at Cárdenas, but thought it had been destroyed by insects; JWW found no record of it at Museo 'Oscar María de Rojas,' the museum presently holding natural history specimens in Cárdenas. Barbour (1945) claimed that yet another specimen was formerly in the Matanzas Institute.

Among Cuban Macaw specimens not currently accounted for in museum collections is one that was part of the collection of Prince Masséna d'Essling, Duke of Rivoli (1799–1863) (Souancé 1856: 57). Masséna accumulated a collection of 12,500 avian specimens, which he sold to Dr T. B. Wilson in 1846. Wilson gave the collection to the Academy of Natural Sciences of Philadelphia, but that collection does not contain a Cuban Macaw.

Discussion and Conclusions

Additional sources of information on West Indian macaws.—It is reasonable to hope that further paleontological and archaeological investigations will yield data to clarify the numbers of species and their distribution in the West Indies. Current work by W. Suárez & S. L. Olson in Cuba and their planned investigations of fossil and subfossil materials in Hispaniola may provide the type of information that will enable a better understanding of macaw populations. Investigation of Amerindian sites also may produce further information on macaw distribution and the interactions of native peoples with indigenous and introduced macaws.

Additional research of published and manuscript accounts by early travelers to the Antilles could yield confirmation of known reports of macaws. Also, correspondence archived in natural history museums may provide records of additional macaw specimens, now lost. We also hope that further surveys of museums, large and small, may reveal additional macaw specimens.

Another potential source of valuable information on West Indian macaws may lie in art museums, especially in Europe. Many parrot owners included macaws within formal portraits that hang on gallery walls. Macaws were considered prestige symbols, especially in the Renaissance, and often appear in the background or alongside their owners. Although often stylised, some depictions approximate species suggested for the West Indies. As Cooper & Armitage (2013) have suggested, examination of such art could prove a fertile field for learning more of macaw distribution and description. Greenway (1967) noted that a macaw in an early 17th century painting by Roeland Savery matches descriptions of some West Indian macaws. Macaws feature prominently in other paintings, including Bartholomeus van Bassen's (1590–1652) 'Renaissance interior with banqueters'. Hume & Walters (2012), however, urged caution in interpreting such evidence as found in paintings, noting that artistic license may alter an artist's rendition of a bird, as well as the fact that the painting may have been made from fading memory, plagiarised or modified to suit composition.

Extinction of West Indian macaws.—Any one of the many problems that faced the Cuban and other West Indian macaws could have caused their extinctions, but the combination of environmental changes and human-related pressures most certainly sealed the fate of all Antillean macaws. Killing of adult macaws for subsistence or to protect crops probably had a substantial effect; although such persecution had been underway for some two millennia, the arrival of Europeans with their advanced guns must have vastly increased the efficiency with which macaws could be killed, thereby accelerating population declines. Similarly, harvest and trapping of wild macaws had its origin in Amerindian culture, but it was not until the opening of many markets, far and wide, that populations suffered to the point of extirpation. As Europeans colonised the Antilles, they increased the

speed and extent of habitat modification, through improved tools and ever-growing human populations. Particularly devastating was the practice of felling macaw nest trees to obtain young birds for personal use or trade. With the high demand for macaws, domestically and abroad, the harvest of nestlings and associated destruction of nesting habitat must have had a profound effect. The effects of other factors, including hurricanes and disease, are less easily predicted, but nonetheless potentially contributed to declines and extinctions. Disease, perhaps introduced via domestic poultry or exotic parrots bought to islands in trade, and to fill the demand for pets as local species became rare or disappeared, could have had an immediate, fateful effect on populations reduced to small numbers and restricted to remnant habitat. Island populations of birds are particularly susceptible to introduced diseases, often against which no defences exist. Whereas hurricanes have always been powerful forces of change in the West Indies, even the strongest storm probably had little effect on healthy populations of macaws when original habitats were extensive. Once habitat was fragmented by human activities and macaws had been reduced and confined to a few remnant habitats, a direct hit by a powerful storm would have destroyed forest critical to a population's survival, as well as perhaps killing birds outright. No matter whether one or a combination of factors led to the extinction of the Antillean macaws, certainly birds so rare, so easy to kill, so much in demand, and so very beautiful had little hope for survival.

Number of species and distribution in the Antilles.—Macaws certainly occurred over a wide area of the Caribbean, and on several islands, but the number of species is controversial. At this point, with available evidence, just how many species and on which islands depends in large part on how much credence is given to the vague accounts of early explorers, travelers and colonists. If all records unsupported by skins, fossil or subfossil

TABLE 3

Records of extinct *Ara* and *Anodorhynchus* in the West Indies, with level of confidence of their former existence based on source of evidence.

Island	Species	Evidence	Confidence
Cuba	<i>Ara tricolor</i>	19 skins; fossil materials; last recorded 1850s	Specimens
Isla de Pinos	<i>Ara tricolor</i>	Multiple accounts; last recorded in 1864	Good, based on competent reporter
Jamaica	<i>Ara erythrura</i>	Multiple accounts; possible introduced species	Poor
	<i>Ara erythrocephala</i>	Multiple accounts; possible introduced species	Poor
	<i>Ara gossei</i> [<i>Ara tricolor</i> ?]	Multiple accounts; possible introduced species	Good, based on competent observers
Hispaniola	<i>Ara tricolor</i> ? or <i>Ara</i> unknown species	Multiple accounts	Poor
Puerto Rico	<i>Ara autochthones</i>	Skeletal material from kitchen midden	Specimen
St. Croix	<i>Ara autochthones</i>	Skeletal material from kitchen midden	Specimen
Montserrat	<i>Ara</i> undescribed sp.	Skeletal material from archaeological site	Specimen
Guadeloupe	<i>Ara guadeloupensis</i>	Multiple accounts & possible illustration	Moderate
	<i>Anodorhynchus purpurascens</i>	Multiple accounts; possible introduced species	Poor
Marie Galante	<i>Ara</i> cf. <i>guadeloupensis</i>	Skeletal material from archaeological site; = <i>Amazona imperialis</i> ?	Specimen
Dominica	<i>Ara atwoodi</i>	Single account	Poor
Martinique	<i>Ara martinica</i>	Single account; possible introduced species	Poor
	<i>Anodorhynchus martinicus</i>	Synonym of <i>Ara martinica</i>	-

remains are rejected, the number of species may be just three (Cuban Macaw, St. Croix Macaw, Montserrat Macaw) from five islands (Cuba, Isla de Pinos, Puerto Rico, St. Croix and Montserrat) (Table 3). Even among those species and islands with specimens, questions persist as to whether at least some species were native or transported there. If the list of probable species is extended to accept the most reasonable of those species supported only by written accounts, the number of islands and species is increased by only one: Gosse's Macaw from Jamaica. Yet even that species, the best described of all of the other purported macaws in the region, could have been based on a feral population of Scarlet Macaw introduced via trading and pet-keeping activities in the colonial period.

Among other suggested species, we consider the possibility of Guadeloupe Macaw moderately plausible. But, again, existence of Guadeloupe Macaw as endemic is confounded by possible introduced or transported species.

We consider all other species of macaws noted by early writers and formalised by Rothschild and others as poorly supported by current evidence. To date, no reliable verification is available of a macaw on Hispaniola. The existence of Dominica Macaw rests solely on Atwood's account, and macaws on that island may have their origin as an introduced or transported species. One named species, *Anodorhynchus martinicus*, is a synonym of *Ara martinicus*. Guadeloupe Violet Macaw was fairly well described as unique by early explorers, but there is a reasonable likelihood that this was a South American species transported to the island by Amerindians or colonists. Similarly, two, and perhaps all, of the three macaws listed by some for Jamaica were possibly feral birds resulting from releases or escapes of imported birds. Certainly, a vigorous trade in exotic parrots was established at the time accounts of macaws on Jamaica were recorded and their descriptions could relate to species known to have been traded on the island.

What we know of psittacid speciation and distribution in the Antilles supports the possibility, and even probability, of multiple endemic species of macaws, so there is no reason why each of the macaws described by explorer-naturalists could not have existed. Nevertheless, although the early accounts are alluring, without further proof, we recommend a conservative stance. We hope that future information, perhaps best searched for in the fossil and subfossil record, will provide solid proof that the primordial forests of most Antilles were alive with the squawks and brilliant plumages of macaws.

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Extent of overlap between two Common Fiscal *Lanius collaris* subspecies in Lesotho

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Common Fiscal *Lanius collaris* Linnaeus, 1766, is widespread throughout the Afrotropics, and is generally considered to be represented by up to ten subspecies (Harris & Franklin 2000). In southern Africa, four subspecies are currently accepted: *L. c. collaris*, *L. c. subcoronatus* A. Smith, 1841, *L. c. capelli* (Bocage, 1879) and *L. c. aridicolus* Clancey, 1955 (Dean 2005). The entire region encompassed by the Republic of South Africa, Lesotho and Swaziland is inhabited by the nominate and *L. c. subcoronatus* (Dean 2005). However, the boundaries between these two subspecies in southern African are not so clearly delimited as the maps in Hockey *et al.* (2005) suggest. In fact, *L. c. collaris* and *L. c. subcoronatus* appear to be almost randomly scattered across the region. The latter subspecies differs from the nominate one in its distinct white supercilium, while the rump and uppertail-coverts are greyer (less white) in the nominate. The two subspecies are easily separated in the field, making it possible to precisely delimit their geographical ranges.

Maclean & Maclean (1976) found evidence of a clinal change in the percentage of the races *L. c. subcoronatus* and *L. c. collaris*: between Winburg (28°31'S, 27°01'E) and Brandfort, Free State (28°42'S, 26°28'E) 100% of examined birds were *L. c. collaris* ($n = 5$), Brandfort–Kimberley 35% : 65% ($n = 20$), Kimberley–Kuruman 44% : 56% ($n = 48$), Kuruman–Van Zylsrus 77% : 23% ($n = 9$) and between Van Zylsrus and Askham, Northern Cape (26°12'S, 18°35'E) 100% were *L. c. subcoronatus* ($n = 2$). In the most recently published maps of the distribution of these subspecies, the nominate is shown as occurring throughout Lesotho, except for a narrow strip in the northern lowlands, where the nominate and *L. c. subcoronatus* co-occur (Hockey *et al.* 2005, Chittenden *et al.* 2012).

Lesotho is an enclave within the Republic of South Africa. Three-quarters of the country, the highlands (or Maloti) lie above 2,200 m. Lowlands are those areas below 1,700 m while the foothills are between 1,700 and 2,200 m. Lowlands (total surface area 6,051 km²) form a strip of land lying along the enclave's north-east to south-west frontier and extending east to the Cave Sandstone Foothills. The foothills (2,964 km²) form a narrow band bordering the highlands to the east and lowlands to the west, constituting an intermediate region. The Senqu Valley lies below 1,800 m and occupies 3,398 km² (Ambrose *et al.* 2000). Natural vegetation in the lowlands is Highveld Grassland, while in the foothills and highlands it is Afromontane Grassland (Acocks 1988).

During the years 1998–2002, which I spent in Lesotho studying birds (Kopij 2011), I attempted to distinguish the two subspecies of *L. collaris*. As shown in Table 1, both subspecies occur together throughout Lesotho. The extent of this overlap differs regionally and by altitude. Clinal change is evident in the lowlands: the proportion of *collaris* to *subcoronatus* was 1 : 0 in the north, but 0.5 : 0.5 in the centre and 0.6 : 0.4 in the south. Both in the foothills and Senqu Valley, the proportion was 0.3 : 0.7. In the highlands, it was everywhere 0.4 : 0.6, without any apparent regional (clinal) change. Soobramoney *et al.* (2005) found that patterns of variation in morphology and anatomy were significantly correlated with 11 climatic trends along an altitudinal gradient. Common Fiscals were largest in cooler, less humid, more arid areas, and smallest in warmer, wetter, more humid localities, in accordance with Bergmann's Rule.

TABLE 1
Extent of overlap between two Common Fiscal *Lanius collaris* subspecies in Lesotho during the years 1998–2002.

Site	Coordinates	Number of birds	
		<i>subcoronatus</i>	<i>collaris</i>
LOWLANDS		(29)	(35)
<i>Northern</i> (north of Maputsoe)		(0)	(10)
Leribe Plateau	28°07'S, 29°05'E	0	10
<i>Central</i>		(12)	(13)
Berea	29°17'S, 27°38'E	3	4
Ha Baroana: Lipiring Gorge	29°21'S, 27°47'E	3	1
Thaba-Bosiu	29°22'S, 27°37'E	3	2
St. Michael	29°26'S, 27°40'E	0	3
Maseru	29°20'S, 27°12'E	3	3
<i>Southern</i> (south of Maseru)		(17)	(12)
Morija	29°38'S, 27°31'E	6	7
Matsieng	29°37'S, 27°35'E	6	3
Mantšebo: Qeme Plateau	29°29'S, 27°31'E	5	2
FOOTHILLS (central)		(16)	(35)
Nyakosoba	29°31'S, 27°46'E	7	7
Moitšsupeli	29°34'S, 27°45'E	1	12
Popanyana	29°31'S, 27°44'E	6	4
Thaba Telle	29°45'S, 27°40'E	2	8
Dikolobeng	29°29'S, 27°55'E	0	4
SENQUE VALLEY		(5)	(15)
Masitise-Villa Maria	30°24'S, 27°38'E	2	8
Quthing	30°25'S, 27°43'E	2	4
Qacha's Nek	30°07'S, 28°42'E	1	3
HIGHLANDS		(21)	(29)
<i>Northern</i>		(12)	(15)
Mokhotlong	29°18'S, 29°03'E	6	9
Mapholaneng	29°12'S, 28°52'E	6	6
<i>Central</i>		(7)	(11)
St. Theresa	29°37'S, 28°48'E	1	1
Thaba Tseka	29°31'S, 28°36'E	4	6
Marakabei	29°33'S, 28°07'E	2	4
<i>Southern</i>		(2)	(3)
Semonkong	29°51'S, 28°03'E	2	3
TOTALS		61	114

Overall in Lesotho, the nominate was almost twice as common as *L. c. subcoronatus*. The extent of overlap varied spatially and probably also temporally. Although both subspecies are common and widespread in Lesotho, hybridisation is apparently rather rare. Only four (2.3%) intermediate individuals (the white supercilium being less distinct, shorter and narrower, and the rump dark grey) were recorded during my work (at Matšebo: 28 September 1999, Matsekua: 13 May 2000, Morija: 3 July 2001, and Matsieng: 3 July 2001), but others could have been missed. In the Roma Valley, where the species was closely studied during the breeding season, in 1999–2002 26–36 pairs bred on the 82-ha National University of Lesotho campus, with c.10% of 31 pairs in the 2000/2001 breeding season mixed, while in all others both sexes were of the nominate subspecies (Kopij 2002, 2004, 2006). Because there



Figure 1. Numbers of two subspecies of Common Fiscal *Lanius collaris* recorded in Lesotho: *subcoronatus* (first) and *collaris* (second).

is only slight sexual dimorphism in Common Fiscal (Dean 2005), no attempt was made to detect any sexual bias towards one subspecies.

A low level of interbreeding between *L. c. collaris* and *L. c. subcoronatus* recorded in Lesotho perhaps indicates that some *L. c. subcoronatus* migrate from the highlands to the lowlands in the dry season, i.e. the non-breeding season, which possibility was also suggested by Clancey (1980). However, in this study most records were made in the wet (breeding) season. The two forms, therefore, occur in Lesotho sympatrically. Furthermore, at least in the Roma Valley, both the level of hybridisation is low and the number of hybrids even lower. It is, therefore, plausible that the two forms might represent separate species within a superspecies. This premise merits further investigation.

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First record of Oriental Cuckoo *Cuculus saturatus optatus* in Africa

by Clive F. Mann

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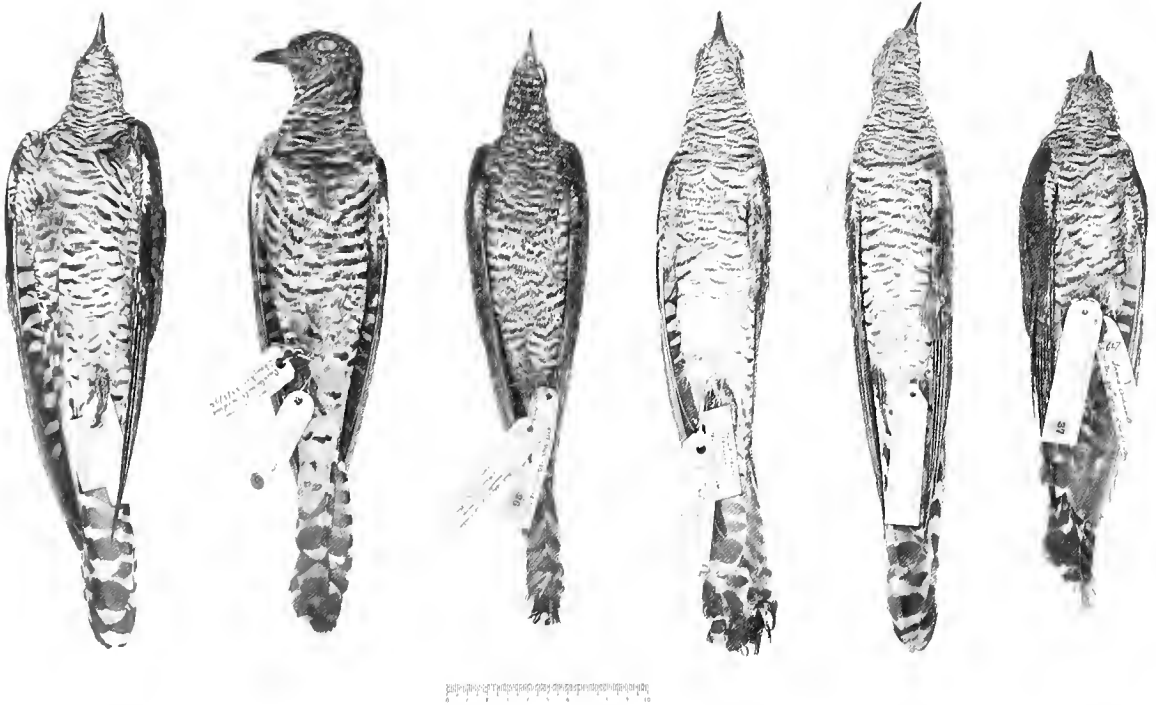
While examining specimens at the Natural History Museum, Tring, for a monograph on cuckoos (Erritzøe *et al.* 2012) I discovered a hepatic female Oriental Cuckoo *Cuculus saturatus optatus* specimen (BMNH 1911.12.23.966), collected by Boyd Alexander in Zambia (near the confluence of the Zambezi and Kafue Rivers, close to the modern border with Zimbabwe) on 27 December 1898. He did not label it to species, but subsequently it was labelled *C. canorus* (Common Cuckoo) and placed with the African Cuckoos *C. gularis*. However, he did identify it as *canorus* in a paper (Alexander 1900) that was subsequently mentioned by Benson (1956).

The most noticeable features are the heavy dark barring on the deep rufous-chestnut rump and uppertail-coverts, with no pale feather tips, and the broader dark barring on the ventral surface. Hepatic female Common Cuckoo has little or no barring on the rump and uppertail-coverts. Hepatic juveniles of the latter are barred, but each feather has a narrow whitish tip, and the rufous-chestnut is generally paler. Hepatic juvenile African Cuckoo is much less rich, often with some grey admixed. The ventral barring of the Alexander skin is broader than that of Common or African Cuckoos. The two subspecies of Oriental Cuckoo (n nominate and *optatus*) are extremely similar (Figs. 1–2), being reliably separated only by measurements or perhaps vocalisations. The wing length of Alexander's specimen (224 mm) places it in *optatus* rather than the nominate (Table 1).

Madagascar Cuckoo *C. rochii* and Lesser Cuckoo *C. poliocephalus* can be eliminated on size. Red-chested Cuckoo *C. solitarius*, Black Cuckoo *C. clamosus*, African Cuckoo *C. gularis*, and the two subspecies of Common Cuckoo, *C. canorus bakeri* and *C. c. bangsi*, can be eliminated by plumage.

Characters that indicate *optatus*.—The rump of the Alexander skin lacks pale tips to the dark feathers. Hepatic adult female Common Cuckoo has almost completely unbarred rump / uppertail-coverts; hepatic juvenile has dark bars, but the feathers have small whitish or grey tips. Both subspecies of Oriental Cuckoo (n nominate and *optatus*) lack these tips. The ratio of the width of dark to pale bars on the ventral surface of Alexander's specimen is 0.751 (versus *C. c. canorus* 0.321–0.573, $n = 30$; *C. c. subtelephonus* 0.316, 0.355, 0.465, $n = 3$; *C. c. bakeri* 0.483, 0.654, $n = 2$; *C. s. optatus* 0.605–1.21, $n = 16$). Five dark and five pale bars were measured in the mid-chest area, and the means calculated, which were then used to calculate the ratios (from hepatic female / juvenile specimens at the Natural History Museum, Tring). Furthermore, the Alexander specimen matches the wing formula for *saturatus* given by Payne (2005). However, the wing formulae of *canorus* and *saturatus* are very similar, and I found them to be unreliable for separating the two species over long series.

Distribution (from Erritzøe *et al.* 2012, and references therein).—**Oriental Cuckoo** *C. s. saturatus* Blyth, 1843. Southern Himalayas, north and east Burma, Thailand to China south of 32°N, including Taiwan and Hainan. Winters in South and South-East Asia, Greater Sundas, Philippines and western New Guinea. Some vagrancy. *C. s. optatus* Gould, 1845. European Russia east of 45°E to Pacific coast, south to Kazakhstan and Mongolia to north of 32°N in China. Winters and migrates through South-East Asia, Sundas and Philippines east to south-west Pacific and Australia. Much vagrancy, with two records in Israel, in August



Figures 1–2. Dorsal and ventral views of, left to right, Alexander's specimen (BMNH 1911.12.23.966); Oriental Cuckoo *Cuculus saturatus optatus*; *C. s. saturatus*; Common Cuckoo *C. canorus canorus*; *C. c. subtelephonus*; and African Cuckoo *C. gularis* (Harry Taylor © Natural History Museum)

TABLE 1

Mensural data (wing, tail and bill) from *Cuculus* specimens at the Natural History Museum, Tring, including Alexander's specimen (BMNH 1911.12.23.966) collected close to the modern-day Zambia / Zimbabwe border.

	Mensural data											
	wing length (mm) (max. chord)				tail length (mm)				bill to skull (mm)			
	range	mean	sd	n =	range	mean	sd	n =	range	mean	sd	n =
Alexander's specimen	224			1	167			1	22.9			1
<i>Cuculus saturatus saturatus</i> male	174–194	183.4	± 5.8	35	113–152	136.4	± 11.7	35	17.9–22.1	20.5	± 1.1	21
<i>C. s. saturatus</i> female	163–190	175.4	± 8.2	15	113–152	136.6	± 10.6	15	18.5–23.0	20	± 1.4	11
<i>C. s. optatus</i> male	214–223	218.4	± 1.9	26	128–173	156.7	± 11.8	16	19.7–24.6	22	± 1.7	17
<i>C. s. optatus</i> female	213–222	216.9	± 2.3	16	128–168	142.6	± 11.8	14	17.9–23.7	20.9	± 1.7	18
<i>C. canorus canorus</i> male	213–230	221	± 4.3	52	170–186	177	± 4.1	52	25.5–31.2	27.7	± 1.5	52
<i>C. c. canorus</i> female	204–216	210	± 3.7	35	158–177	167	± 5.6	35	25.2–28.6	26.8	± 1.0	35
<i>C. c. subtelephonus</i> male	201–249	221.9	± 15.2	30				0	25.2, 26.2			2
<i>C. c. subtelephonus</i> female	180–223	200.5	± 13.1	18				0	24.7–27.0	26.2	± 1.1	4
<i>C. c. bakeri</i> male	198–232	214.3	± 9.9	16				0				0
<i>C. c. bakeri</i> female (no hepatic morph)	195–215	205.1	± 6.8	9				0				0
<i>C. c. bangsi</i> male	199–215	206.7	± 6.2	7				0	24.5–29.5	26.9	± 1.0	12
<i>C. c. bangsi</i> female (no hepatic morph)	194–207	200.6	± 5.4	5				0	25.9–28.2	27.2	± 1.2	6
<i>C. gularis</i> male	204–226	215.3	± 8.4	9	143–166	152.9	± 10.8	9	20.7–23.6	26.1	± 0.5	9
<i>C. gularis</i> female (no hepatic morph)	197–209	205.3	± 5.1	10	141–156	147	± 5.5	9	19.0–22.4	20.7	± 1.2	9

1985 (Shirihai 1996) and April 2008 (www.israbirdig.com/israelbirdsforum), being the closest to Africa.

Common Cuckoo *C. c. canorus* Linnaeus, 1758. Palearctic from Ireland to Kamchatka and Japan. Winters equatorial Africa, India and South-East Asia. *C. c. bangsi* Oberholser, 1919. Iberia and Maghreb. Probably winters Africa south of equator. *C. c. subtelephonus* Zarudny, 1914. Transcaspia to west and north China, Iran and Afghanistan. Winters Middle East, India and Africa south of Sahara. *C. c. bakeri* E. Hartert, 1912. North-east Indian Subcontinent, Assam, Nepal, Bhutan, northern South-East Asia, south-east Tibet and south China. Winters India and South-East Asia.

TABLE 2

Wing formulae data for relevant *Cuculus* taxa. The formulae for *saturatus*, *optatus*, *canorus* and *gularis* are from Payne (2005). However, in long series I found them to be an unreliable discriminant.

	Wing formulae (except Alexander's specimen, from Payne 2005)
Alexander's specimen	P 8>9>7>6>5>4>10>3>2>1
<i>C. saturatus saturatus</i>	P 8>9>7>6>5>4>10>3>2>1
<i>C. saturatus optatus</i>	P 8>9>7>6>5>4>10>3>2>1
<i>C. canorus canorus</i>	P 8>7>9>6>5>4>10>3>2>1
<i>C. gularis</i>	P 8>7>9>6>5>4>10>3>2>1

Conclusion

Although *C. s. optatus* has an easterly migration route, it is prone to vagrancy and has been recorded twice in Israel (Shirihai 1996; www.israbirdig.com/israelbirdsforum). Some *Cuculus* are notoriously difficult to distinguish in the field unless vocalising. Birds of this genus are infrequently trapped in mist-nets, and birds that die in Africa are usually scavenged very quickly. Thus species such as Oriental Cuckoo may occasionally occur in Africa undetected. The specimen in question, although quite distinct, could easily be passed off as Common Cuckoo. Field observers would not normally consider identifying a cuckoo in Africa as Oriental, due to the lack of precedent, but I urge them to consider this possibility in the future and attempt to capture any *Cuculus* that does not match the known local species. Collections may also benefit from closer scrutiny.

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