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Sangihe Dwarf Kingfisher *Ceyx sangirensis*: a distinct and extinct endemic species

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Summary.—Adolf Meyer, first author of the name of the dwarf kingfisher *Ceyx sangirensis*, never visited the island of Sangihe, north of Sulawesi, on which he and co-author Wiglesworth stated the two syntypes were collected (by hired hunters) in the 1870s. The form was lumped with Sulawesi Dwarf Kingfisher *Ceyx fallax* in 1945 and split again only in 2014, based on characters shown by two other specimens Meyer had sent to the UK. However, because (a) the species was (apparently) not seen again after Meyer's birds were collected in 1874 and (b) Meyer wrote elsewhere that the original labels of some of his Sulawesi material were lost, it was recently suggested that *C. sangirensis* did not originate on the island. Two further specimens have come to light (including one apparently taken in 1876, thus not by Meyer's collectors) and, although one syntype has been destroyed, the total of birds conforming to key diagnostic features and labelled from Sangihe is now six. This evidence combined with other information indicates that *C. sangirensis* is or was indeed endemic to Sangihe, and comparisons with 39 *C. fallax* confirm that it should be treated as a separate species, distinguished by its longer bill and tail, more extensive blue-spangled black crown, few or no shining pale turquoise lower dorsal feathers, more mauve or magenta wash dorsally with cobalt- or royal-blue on the uppertail-coverts, and less extensive white throat. A review of field work, including three months by one of us in remaining forest on the island in 2015, shows that the species has not definitively been seen since the 1870s and must regrettably be regarded as extinct.

The Sangihe Dwarf Kingfisher *Ceyx sangirensis* was described by Meyer & Wiglesworth (1898) based on two specimens, an unsexed adult and an unsexed juvenile, taken on the island of Sangihe, Indonesia, in the eastern Celebes Sea between Sulawesi and Mindanao in the Philippines. The adult was given to the Naturhistorisches Museum Wien (NMW 35170) in 1877 (Meyer & Wiglesworth 1898, Schifter *et al*. 2007); the juvenile went to the Staatliche Museum für Tierkunde, Dresden (SMTD C884), evidently much later, after the original description (Eck & Quaisser 2004). Adolf Meyer himself never visited Sangihe, but sent his 'hunters' there in 1874 (Meyer 1884)—not 1870–71 as in White & Bruce (1986)—and any specimens that came to him must be presumed to date from that time. He sent two other specimens, an unsexed adult and an unsexed juvenile (bill short and dark), to the Marquis of Tweeddale, who died in 1878 (Anon. 1879), bequeathing them along with his entire ornithological collection to what is now the Natural History Museum, UK. There the specimens were registered as NHMUK 1888.10.20.392 and 1888.10.20.393 (Gunther 1892). The Dresden juvenile was destroyed by Allied bombing in 1945 (Eck & Quaisser 2004), but an appeal through eBEAC (see Acknowledgements) yielded a fifth bird in the Statens Naturhistoriske Museum in Copenhagen (ZMUC 60.029), with label information reading '20/12 [18]76, Sanghir, Mr J. Wroblewsky, ♂ ad.'. The sex of this bird appeared to solve a puzzle that Forshaw (1985) set when he gave the measurements of a male without

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mentioning where he examined it, but correspondence in October 2022 revealed that the holding institution for this male—a sixth specimen—was in fact the Muséum national d'Histoire naturelle (MNHN), Paris (J. Forshaw *in litt.* 2022).

Provenance

Recently, however, the provenance of the material constituting the form *sangirensis* has been challenged. Eaton *et al*. (2021) declared that 'both [*sic*] known specimens [were] reported to be from Sangihe but [were] obtained in Manado' (where Meyer at least briefly stayed). The implication of this assertion is that the provenance of the form *sangirensis* cannot confidently be ascribed to Sangihe; and the basis for it, kindly explained by J. Eaton (*in litt*. 2022), lies (1) in Meyer's (1879) admission that, owing to inadequate labelling, 'the exact localities where I got my specimens were often destroyed, and the exact dates when I got them nearly always so', and (2) in his observation in the same paper that *C. fallax* (as he then called it, long before he detailed points of divergence from Sulawesi birds) 'appears to be plentiful' in Tabukan (the type locality), an area along Sangihe's east side, when no other certain record of the bird on the island had ever come to light. Curious as this circumstance may be, the view that *sangirensis* is unattributable to Sangihe is difficult to sustain in the face of contextual evidence and argument (points 1–4 below), and even harder following the discovery of the Copenhagen and Paris specimens (points 5–6), unknown to Eaton *et al*. (2021) at the time of their writing.

(1) The quotation from Meyer (1879) is not so self-damning as to destroy trust in what he himself trusted. It referred to his explorations in and around Sulawesi more widely, and stated that labels with '*exact* localities' were '*often* destroyed' (our emphases), not that they were all destroyed or that general localities such as islands were confused during labelling. In any case we know of no evidence or indication that his Sangihe sample was affected by the problem he was openly admitting.

(2) His remark on the apparent plentifulness of the species in Tabukan immediately followed his disclosure that he 'did not procure many specimens' of it on Sulawesi and, in this context, he seems simply to have been offering a speculative reaction to the contrast of receiving five (as it transpires) specimens from a single area in a relatively short space of time. In counter-speculation, one might argue that, given the two young specimens involved, four of the birds might have come from two families or even just one, and therefore cannot constitute an indication of local abundance.

(3) Meyer (1884) and Meyer & Wiglesworth (1898) listed the species for Sangihe without any qualification or doubt, reflecting a confidence in provenance which overrides other considerations. If Meyer had acquired his specimens of *sangirensis* in Manado, or even simply been unsure where they came from, he would surely have admitted as much.

(4) The type of Cerulean Flycatcher *Eutrichomyias rowleyi* was also taken in 'Tabukan' (Meyer 1878), a provenance never questioned despite the lapse of more than 120 years before the indisputable rediscovery of the species on the island (Riley 2002). Notably, at the end of his original description Meyer (1878) referred to the small number of bird species known then from Sangihe 'at least, from trustworthy sources'—a phrase which surely signals his own scrupulousness in sifting the evidence.

(5) The Copenhagen specimen (ZMUC 60.029) was apparently collected in 1876, only a few years after Meyer's collectors were on Sangihe, and appears therefore to have

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been acquired independently (subverting the proposition that the only evidence for the form on Sangihe is Meyer's). The collector or purchaser, J. Wroblewsky, 'was a Danish physician associated with several Danish zoologists such as Mørch and Steenstrup' (Ng *et al*. 2020). The specimen was probably obtained by Finn Salomonsen in an exchange (J. Fjeldså *in litt*. 2022).

(6) The Paris specimen (MNHN-ZO-MO-1991-693) has no original label, but bears one from the Boucard Museum that mentions Meyer as its collector and 'Sanghir' as its provenance. This is the sixth specimen (a) sharing the characters of *sangirensis* (see below) and (b) labelled as from Sangihe.

On the strength of these considerations the most parsimonious interpretation is surely to treat the form *sangirensis* as a Sangihe endemic.

Taxonomic status

Meyer & Wiglesworth (1898) distinguished *C. sangirensis* from Sulawesi's *C. fallax* on multiple characters, namely the larger and more extensive blue spangling covering the black-based crown, larger (and magenta) spots on the wing-coverts, magenta wash to the mantle, longer and different-shaped bill ('not so much narrowed in its terminal third or so much broadened at its base'), and slightly larger ('little greater') overall size. Nevertheless, Peters (1945) reduced the form to a subspecies of *fallax*, an arrangement which prevailed until del Hoyo & Collar (2014) re-evaluated the morphological evidence (comparing the NHMUK's two specimens with the museum's only two *fallax*—NJC) and returned *sangirensis* to species rank based on its larger size, much more extensive blue-spangled crown (unlike in *fallax* covering the supercilium and nape), royal- or cobalt-blue vs. shining pale turquoise rump and uppertail-coverts, and much brighter rufous dorsal area and wing-coverts. The split was of particular significance because it resulted in *sangirensis* being given the IUCN category Critically Endangered, owing to the paucity of evidence that a population still persisted (see BirdLife International 2023).

Subsequent examination of the surviving syntype of *sangirensis* in NMW showed the diagnosis above to be in need of adjustment. The dorsal area of this specimen is *darker* than the museum's only *fallax*, and the rump has two shining pale turquoise-blue feathers (Fig. 1). The larger, magenta wing-covert spotting, magenta wash to the mantle, less attenuated bill and narrower bill base were not apparent (presumably therefore the diagnosis in Meyer & Wiglesworth 1898 was a composite of notes taken on some or all of the material Meyer obtained from Sangihe). However, the strikingly long bill of adult *sangirensis*, its larger general size and far more extensive blackish crown with larger blue spangling were upheld (Figs. 1–3, Tables 1–2). A re-examination of the two NHMUK specimens of *sangirensis* confirmed this basic diagnosis but also revealed that the lower back

TABLE 1

Measurements in mm of the five extant specimens of Sangihe Dwarf Kingfisher *Ceyx sangirensis*. Apart from the bill (see Fig. 5), the dimensions of the juvenile indicate it is valid to include them in the sample average.

Specimen	sex	age	bill	wing	tail
NMW 35170 (syntype)	?	ad	39.4	61	24
NHMUK 1888.10.20.392	?	juv	—	61	25
NHMUK 1888.10.20.392	?	ad	42.0	59	26
MNHN-ZO-MO-1991-693	m	ad	39.6	61	24
ZMUC 60.029	m	ad	40.7	58	27

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Figure 1. Syntype of Sangihe Dwarf Kingfisher *Ceyx sangirensis* (NMW 35170), below, next to a specimen of Sulawesi Dwarf Kingfisher *C. fallax* (NMW 50522), in dorsal view, showing the much more extensive black crown with larger blue spangling, less turquoise in the rump and uppertail-coverts, and larger size; but note the darker dorsum, unlike in the NHMUK sample (Figs. 5–6) (N. J. Collar)

Figure 2. Syntype of Sangihe Dwarf Kingfisher *Ceyx sangirensis* (NMW 35170), below, next to a specimen of Sulawesi Dwarf Kingfisher *C. fallax* (NMW 50522), in ventral view, showing the longer bill and (in this comparison) *slightly* more constrained white throat, not extending onto the upper breast (N. J. Collar)

and rump of the adult is a magenta- or mauve-washed pale blue, shading to royal blue or cobalt on the uppertail-coverts, while the juvenile has the lower back and rump mainly dull turquoise-blue, again shading to cobalt on the uppertail-coverts (Figs. 4–6, Tables 1–2). By contrast the two NHMUK specimens of *fallax* have broad streaks of shining pale turquoise-blue from the rump to uppertail-coverts, with only the tips of the latter shading to blue (Figs. 5–6). The Copenhagen and Paris specimens of *sangirensis* validate the diagnostic characters enumerated here, showing very slight tints of mauve or magenta and lacking the shining pale turquoise-blue on the rump (Figs. 7–10). The somewhat recondite point about

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Figure 3 (left). Syntype of Sangihe Dwarf Kingfisher *Ceyx sangirensis* (NMW 35170), below, next to a specimen of Sulawesi Dwarf Kingfisher *C. fallax* (NMW 50522), in lateral upper body view, showing the longer bill and much more extensive black crown with larger blue spangling (N. J. Collar)

Figure 4 (right). Adult Sangihe Dwarf Kingfisher *Ceyx sangirensis* (NHMUK 1888.10.20.393) below, adult Sulawesi Dwarf Kingfisher *C. fallax* (NHMUK 88.10.20.391) above, showing former's longer bill and more extensive black-and-blue crown (N. J. Collar, © Trustees of the Natural History Museum, London)

Figure 5. Top to bottom: Sulawesi Dwarf Kingfisher *Ceyx fallax* (NHMUK 1888.10.20.390, juvenile, and 1888.10.20.391, adult) and Sangihe Dwarf Kingfisher *C. sangirensis* (NHMUK 1888.10.20.393, adult, and 1888.10.20.392, juvenile); note the more extensive blue crowns of *C. sangirensis* and, in this sample (but see text and Fig. 1), their brighter, lighter upperparts (N. J. Collar, © Trustees of the Natural History Museum, London)

bill shape in the original description of *sangirensis* could not be judged with any confidence and was set aside from further consideration.

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TABLE 2

Mean measurements (and ranges) in mm of five specimens of Sangihe Dwarf Kingfisher *Ceyx sangirensis* (Table 1) and 39 Sulawesi Dwarf Kingfisher *C. fallax* (17 males, ten females, 12 unsexed; AMNH *n* = 13, MNHN *n* = 3, Naturalis *n* = 15, NHMUK *n* = 1, NMW *n* = 1, SMTD *n* = 1, USNM *n* = 1, *n* = ZMB 4; for museum acronyms, see Acknowledgements). *n* = number of specimens; [1]*n* = 4; [2]*n* = 37.

Taxon	*n*	bill	wing	tail
Ceyx sangirensis	5	40.4 (39.4–42.0)[1]	60 (58–61)	25.2 (24–27)
Ceyx fallax	39	35.0 (30.4–38.2)[2]	57.2 (55–60)	21.2 (19–23)[2]

Figure 6. Upperparts (left to right) of Sangihe Dwarf Kingfisher *Ceyx sangirensis* (NHMUK 1888.10.20.393, adult, and 1888.10.20.392, juvenile) and Sulawesi Dwarf Kingfisher *C. fallax* (NHMUK 1888.10.20.391, adult, and 1888.10.20.390, juvenile), the two former showing the cobalt or royal blue of the uppertail-coverts with little or none of the bright metallic turquoise-blue feathering of the two latter (note the lighter dorsal area of the two former) (N. J. Collar, © Trustees of the Natural History Museum, London)

Eight (mounted) syntypes (Fig. 11), four mounted specimens (Fig. 12) and eight study skins of *C. fallax* (Fig. 13) in Naturalis—the 15 evident adults amongst which were measured for Table 2—all show shining pale turquoise-blue streaks in the lower dorsal and rump feathers. Thus it can be said with confidence that the proportion of cobalt-blue on these areas is significantly greater in *sangirensis* than in *fallax*. A further consideration is that the white on the throat of *sangirensis* cuts off rather sharply at the upper breast, whereas in *fallax* it overruns with softer edging onto the top of the breast (Figs. 2 and 14–16).

Measurements of all five known extant specimens of *C. sangirensis*—three unsexed and two male—show very little variation (Table 1). Their means and those of 39 evidently adult (pale-billed) *C. fallax* are presented in Table 2 (the bill of the juvenile *sangirensis* is omitted but, given the tiny sample, its other measurements, overlapping the other three adults, are used). Sexed and unsexed birds are combined (in two-sample equal variance *t*-tests no significant differences appear between the sexes: 17 male and ten female *C. fallax* have bill

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Figure 7 (left). Male Sangihe Dwarf Kingfisher *Ceyx sangirensis* (ZMUC 60.029), dorsal view (Peter A. Hosner)

Figure 8 (right). Male Sangihe Dwarf Kingfisher *Ceyx sangirensis* (MNHN-ZO-MO-1991-693), dorsal view (Patrick Boussès). Both images show a broadly blue-spangled black crown and lack bright turquoise feathers in the rump and uppertail-coverts.

Figure 9 (below). Male Sangihe Dwarf Kingfisher *Ceyx sangirensis* (ZMUC 60.029), lateral view (Povl Jørgensen)

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Figure 10. Male Sangihe Dwarf Kingfisher *Ceyx sangirensis* (MNHN-ZO-MO-1991-693), lateral view (flipped for easier comparison with Fig. 9) (Patrick Boussès)

Figure 11. Eight syntypes of Sulawesi Dwarf Kingfisher *Ceyx fallax* in Naturalis Biodiversity Center, Leiden, showing the prevalence of bright electric blue feathers on the rump and uppertail-coverts (N. J. Collar)

35.3 and 35.1 mm [P = 0.80], wing 56.8 and 57.7 mm [P = 0.11], tail 20.9 and 21.1 mm [P = 0.65], respectively). Inspection of all material was undertaken by NJC, with measurements of bill (tip to skull), wing (curved) and tail (tip to point of insertion) taken using digital callipers. Comparisons between the five *sangirensis* and 39 *fallax* specimens indicate that the bill of the former is 13% longer than that of the latter (rather more than the 10% suggested by Fry *et al*. 1992); neither this nor the tail shows overlap with *fallax* (Table 2).

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Figure 12. Four mounted specimens of Sulawesi Dwarf Kingfisher *Ceyx fallax* in Naturalis Biodiversity Center, Leiden, showing the prevalence of bright electric blue feathers on the rump and uppertail-coverts (N. J. Collar)

Figure 13. Eight study skins of Sulawesi Dwarf Kingfisher *Ceyx fallax* in Naturalis Biodiversity Center, Leiden, showing the prevalence of bright electric blue feathers on the rump and uppertail-coverts (N. J. Collar)

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Figure 14. Upper underparts (left to right) of Sangihe Dwarf Kingfisher *Ceyx sangirensis* (NHMUK 1888.10.20.393, adult, and 1888.10.20.392, juvenile) and Sulawesi Dwarf Kingfisher *C. fallax* (NHMUK 1888.10.20.391, adult, and 1888.10.20.390, juvenile), the two former showing the less extensive white throat than in the two latter (N. J. Collar, © Trustees of the Natural History Museum, London)

Figure 15. Specimen of Sangihe Dwarf Kingfisher *Ceyx sangirensis* (MNHN-ZO-MO-1991-693), below, with one Sulawesi Dwarf Kingfisher *Ceyx fallax* (MNHN-ZO-MO-1968-192), showing the greater bill length of the former and the sharper cut-off white throat above the upper breast (Guy M. Kirwan)

Using the Tobias criteria (see Tobias *et al*. 2010, del Hoyo & Collar 2014: 30–40) we would revise the scores for the diagnostic characters of *sangirensis* as: distinctly longer

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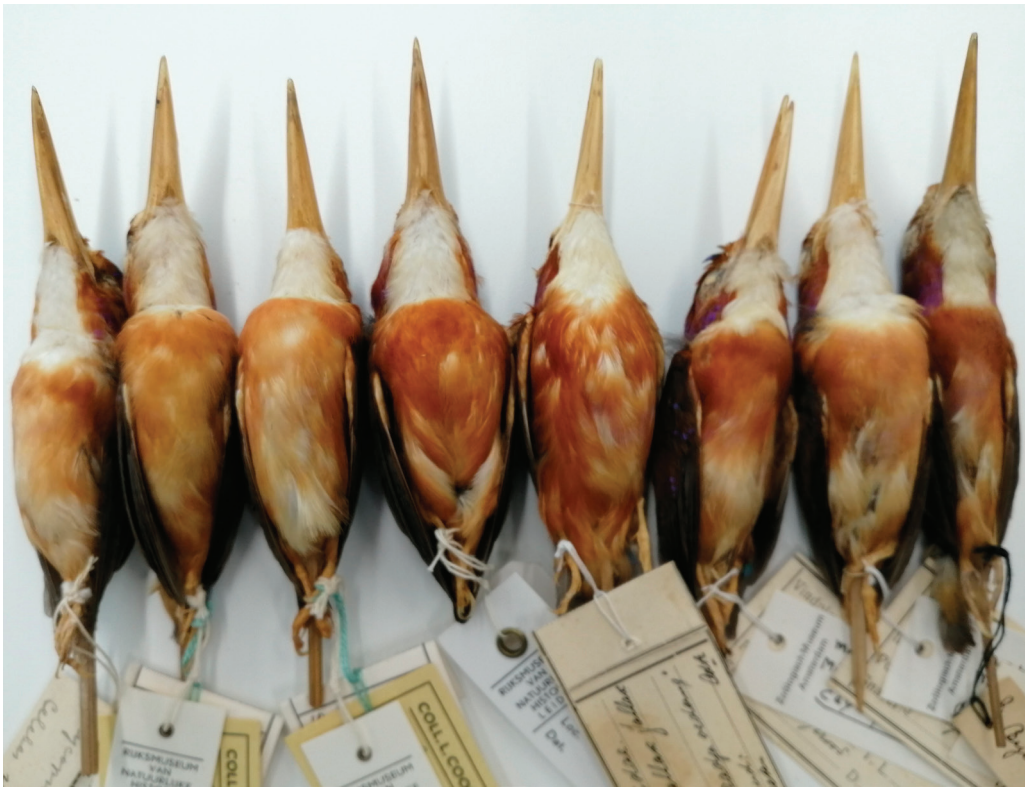

Figure 16. Eight study skins of Sulawesi Dwarf Kingfisher *Ceyx fallax* in Naturalis Biodiversity Center, Leiden (same birds as in Fig. 13), to show that the white of the throat extends onto the upper breast in most (and probably all) of the specimens (N. J. Collar)

bill and tail (2; no effect size calculated as the sample for *sangirensis* is too small); more extensive coverage of the crown by black with larger blue spangles (2); little or no shining pale turquoise streaking on the rump and uppertail-coverts, which instead show mainly soft magenta- or mauve-tinged blue rump feathers grading to soft royal blue or cobalt uppertail-coverts (2); and more circumscribed white throat (1). A score of 7 is one point lower than in del Hoyo & Collar (2014) owing to the omission of the seemingly rather strong difference in dorsal coloration that is apparent in Figs. 5 and 6 but which Fig. 1 shows not to be a consistent character; but it is still sufficient to retain *sangirensis* as a species. Certainly at least in morphological terms *sangirensis* is more obviously distinct from *fallax* than many congeners recently separated as species on both morphological (del Hoyo & Collar 2014) and molecular (Andersen *et al*. 2013, 2018) grounds, e.g. Dimorphic *C. margarethae* and Moluccan Dwarf Kingfishers *C. lepidus*, North Philippine *C. melanurus* and South Philippine Dwarf Kingfishers *C. mindanensis*, and Northern Indigo-banded *C. cyanopectus* and Southern Indigo-banded Kingfishers *C. nigrirostris*. We also note that *sangirensis* shares with *fallax* the vestigial fourth toe that Woodall (2001) regarded as a distinguishing character of this species. However, *contra* Woodall (2001) this toe has a nail and it is also present in (at least) Madagascar Pygmy Kingfisher (NJC pers. obs.), which Woodall placed in *Ceyx* and considered closest to *C. fallax* but which is now treated as *Corythornis madagascariensis* and regarded as basal to its genus (see del Hoyo & Collar 2014).

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Evidence of extinction

Whatever the taxonomic rank of *sangirensis*, its continued existence as a living entity is regrettably improbable. The most important ornithological exploration of Sangihe was carried out by Dr and Mrs Platen in 1886–87, just over a decade after Meyer's collectors visited, but they did not encounter the species (Blasius 1888). A hundred years later, in a pioneering paper drawing attention to the plight of bird species on the island, Whitten *et al*. (1987) reported that 'virtually all of Sangihe has been converted to coconut and nutmeg plantations or else is covered by patches of secondary forest from abandoned gardens'. Coates & Bishop (1997) considered the kingfisher 'possibly extinct… due to habitat loss' (repeated in Woodall 2001) and simultaneously Riley (1997a), reporting no post-1986 sightings, suggested that it had been 'unable to adapt to the loss of forest habitat'. However, the final report of the Action Sampiri expedition (Riley 1997b) mentioned a possible encounter along the Sahendaruman ridge in November 1996 and a record by P. Verbelen (*in litt*.) of an individual in the Sahendaruman ridgetop forest in March 1997 which was 'apparently… the first field observation of this species… this century'. Five years later the same author (Riley 2002) mentioned the latter record again: a single bird in the tiny remnant Sahendaruman Forest in March 1997. However, with no sightings during an extended period of field work on the island, 1998–99, Riley (2002) concluded that 'unless further sightings are made soon… this kingfisher is extinct'. In kindly responding to our enquiry, P. Verbelen (*in litt*. 2022) reported that he put a question mark next to his March 1997 identification in his field notebook and now withdraws the record.

The continued lack of sightings this century, reported by Eaton *et al*. (2016, 2021), is presumably based on the testimony of many Indonesian and foreign biologists, bird tours and birdwatchers recently visiting the island. Moreover, during three months, from 10 February to 16 May 2015, RWM conducted bird surveys covering the last woodland and forest patches on Sangihe, involving Gunung Awu in the north, Gunung Otomata in the centre and Gunung Sahendaruman in the south. Almost 80 km of transects were surveyed on foot (56.5 km around Gunung Sahendaruman, 20 km around Gunung Awu and 2.4 km in two transects around Gunung Otomata), with 468 five-minute point counts undertaken at a minimum spacing of 100 m. *C. sangirensis* was never encountered either on the transects or on the (often considerable) walks necessary to reach and leave them.

There was one false alarm. As also reported by Riley (1997a), a local contact claimed a very recent sighting from Gunung Sahendaruman during field work planning. RWM and his team immediately visited the site in question, where a Ruddy Kingfisher *Halcyon coromanda* was located within a few minutes. A local guide with superb knowledge of all bird species within the forest around the Sahendaruman crater had mistakenly understood this species to be the endemic *Ceyx*. Curiously the initial 1995–97 Action Sampiri expedition did not record Ruddy Kingfisher on Sangihe (Riley *et al*. 1997) but reported the local name of *Ceyx fallax sangirensis* as 'Bengka biasa'. This roughly translates as 'regular' kingfisher in contrast to 'Bengka besar', the 'big' kingfisher, which is the Sangihe Lilac Kingfisher *Cittura sanghirensis*. Presumably 'Bengka biasa' was the local name for Ruddy Kingfisher, which is a scarce resident on Sangihe (subspecies *Halcyon coromanda rufa*) but also a regularly encountered non-breeding visitor to the island (subspecies *H. c. major*) (Coates & Bishop 1997, Eaton *et al*. 2016, 2021, Kamminga & Creuwels 2023).

Possible causes of extinction

Sangihe Dwarf Kingfisher is therefore essentially unknown beyond six (now five) museum specimens. However, given the obvious sister relationship of *C. fallax* and

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C. sangirensis, it seems likely (albeit by no means certain) that the two were similar in ecology. Sulawesi Dwarf Kingfisher is itself poorly known, and even the limited published information is somewhat contradictory: Schlegel (1866) reported that it is 'very rare' and 'lives on the edges of creeks in the mountainous parts of the island', whereas Stresemann & Heinrich (1939–41) found it in lower-lying areas (highest 600 m) in 'deep-shaded forest at a considerable distance from streams' and considered it 'a true primary forest bird in no way tied to watercourses' (our translation). Somewhat by contrast Watling (1983) reported it 'quite common although rarely observed in lowland and lower montane rain forest up to about 1,000 m'. At Manembonembo Nature Reserve, North Sulawesi, Bororing *et al*. (2000) found it common in primary and secondary forest and plantations, and caught a bird in secondary scrub. Moreover, RWM found it in dry secondary forest with frequent ginger in northern Sulawesi, and, even though Eaton *et al*. (2021) characterised it as 'scarce in primary and secondary forest, <600 m, rarely <1000 m', J. Eaton (*in litt*. 2022) remarks that 'all Asian *Ceyx* are highly tolerant of forest/plantation mix'.

Potential causes of the extinction of *C. sangirensis* are not obvious except for the extensive habitat loss on Sangihe first mentioned by Whitten *et al*. (1987), and possibly competition with Sangihe Lilac Kingfisher. The stomach of one *C. fallax* specimen astonished the preparator by revealing a lizard 110 mm long, 20 mm longer than the body of the bird itself (Stresemann & Heinrich 1939–41), and the fact that *C. sangirensis* has an even larger bill than *C. fallax* suggests commensurately larger prey. If extensive habitat loss intensifies food competition between species seeking similar-sized prey, the smaller species seem likely to suffer disproportionately. Alternatively or additionally, the birds' food base may have been reduced by an extensive programme of pesticide application (as reported by RWM's contacts) to control the orthopteran coconut pest *Sexava* in the 1970s. However, if *C. sangirensis* was restricted to the lowlands there may have simply been too little non-plantation habitat on Sangihe even by the end of the 19th century to have allowed it to persist.

Ornithological importance of Sangihe

Since the islands of Sangihe and Talaud were identified as an Endemic Bird Area more than 30 years ago (Bibby *et al*. 1992), the biological importance of both islands, but particularly Sangihe, has only increased. With taxonomic revisions the number of bird species endemic to the latter has risen from three—Sangihe Hanging-parrot *Loriculus catamene*, Cerulean Flycatcher and Elegant Sunbird *Aethopyga duyvenbodei*—in 1998 (Stattersfield *et al*. 1998) to ten in 2023, through the addition of Sangihe Scops Owl *Otus collari*, Sangihe Lilac Kingfisher, Sangihe Dwarf Kingfisher, Sangihe Pitta *Erythropitta caeruleitorques*, Sangihe Whistler *Coracornis sanghirensis*, Sangihe Golden Bulbul *Hypsipetes platenae* and Sangihe White-eye *Zosterops nehrkorni* (HBW & BirdLife International 2022). With habitat loss as the particular threat, only the owl is not on the IUCN Red List: the dwarf kingfisher, whistler, flycatcher, bulbul and white-eye are Critically Endangered, pitta and sunbird Endangered, and lilac kingfisher and hanging-parrot Near Threatened. This is one of the greatest concentrations of threatened species of bird on a single small island, and the lamentable extinction of one of them, the dwarf kingfisher, should not be allowed to pass—as has evidently happened with the nominate subspecies of Red-and-blue Lory *Eos histrio histrio* (del Hoyo & Collar 2014; RWM pers. info.)—without being used widely and loudly to rally the forces of conservation around the remaining species that are so seriously in need of help.

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