

Rediscovery of the Critically Endangered Banggai Crow *Corvus unicolor* on Peleng Island, Indonesia, part 2: taxonomy

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SUMMARY.—Since its description in 1900, the Banggai Crow *Corvus unicolor* has been known solely from two specimens of questionable provenance. The taxon has sometimes been considered a subspecies of Slender-billed Crow *Corvus enca*, but is currently treated as a Critically Endangered species, and has been considered possibly extinct. Recent field work has been undertaken in the Banggai Islands on crows thought to be *C. unicolor*, but the presence of *C. enca* there precluded certain field identification. The collection of two specimens on Peleng Island in 2007 enabled morphological comparisons with the syntypes and unequivocally corroborates the continued existence of the Banggai Crow, as do recent field observations. Here we show that the 2007 Peleng birds are the same taxon as the syntypes of *C. unicolor*, designate a lectotype, provide new data on the morphological and vocal characteristics of *C. unicolor*, and demonstrate that *C. unicolor* is certainly not a subspecies of *C. enca*. We recommend that *C. unicolor* is best treated as a distinct species under the Biological Species Concept.

Banggai Crow *Corvus unicolor* (Fig. 5) has been known for over a century only from two specimens. Although some sources have indicated that the type specimens were from Banggai Island, one of the main islands in the Banggai Islands (Madge & Burn 1994, Dickinson 2005; Fig. 1), the provenance of the syntypes of *C. unicolor* has never been satisfactorily resolved, and indeed the species' continued existence has been doubted. Several authors have followed Vaurie (1958) in considering *C. unicolor* a subspecies of Slender-billed Crow *C. enca*, while Dorst (1947) treated *C. unicolor* as a subspecies of Piping Crow *C. typicus*. Although most recent authors (e.g. Inskipp *et al.* 1996) have followed Goodwin (1976) in considering *C. unicolor* a species, the taxonomic status of *C. unicolor* remains equivocal.

Rothschild & Hartert (1900) described two unsexed crow specimens in a collection made by natives on 'Banggai, Sula Islands' as a new species *Gazzola unicolor*. Subsequently, Hartert attempted to fix one as the type by tying a Rothschild type label on the specimen (M. LeCroy *in litt.* 2009), and he (Hartert

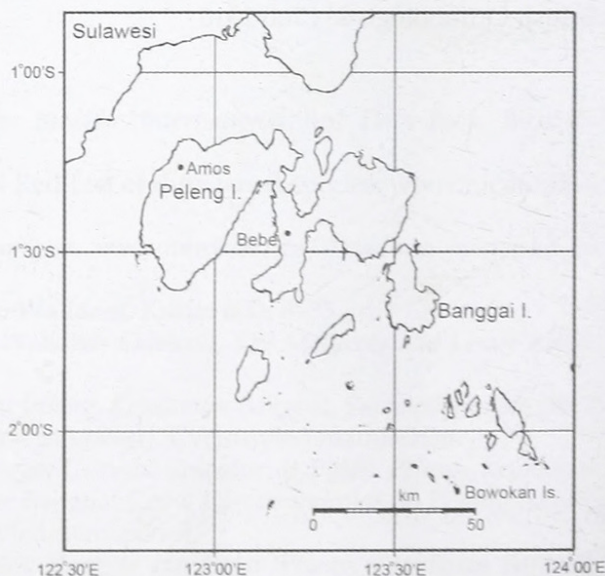


Figure 1. Map of the Banggai Islands showing localities mentioned in the text.

1919) wrote that in 1900 the Tring Museum 'received a number of well-prepared skins, collected by natives, from Mr. van Renesse van Duivenbode. They were said to come from Banggai in the Sula group, east of Celebes' (Fig. 1), and that '[a]mong these skins were the two specimens of *Gazzola unicolor* . . .'. Hartert (1919) further claimed that '[t]hough the localities of skins from this source are often doubtful and incorrect, the locality must have been correct this time, as shown by certain other species and subspecies.' Meinertzhagen (1926) stated they 'appear to be 'trade' skins prepared by natives, neither having any reliable data attached'; however, the specimens are not trade skins but well-made skins prepared by Duivenbode's trained local collectors (M. LeCroy *in litt.* 2009). Neither of the two syntypes (AMNH 673966, 673967), which came to the American Museum of Natural History (New York) as part of the Rothschild Collection, have original collector's labels, and the date and locality of the two specimens is obscure. Although several collectors worked in the Banggai Islands (see Discussion), and a few recent observers have been there specifically seeking *C. unicolor* (although these observers did not venture high into the hill forests; Bishop 1992, King 2007), no further information about this enigmatic taxon has come to light since its description. This has led to speculation that the species might be extinct (Madge & Burn 1994, Dickinson 2003). Owing to the lack of field observations and recent reports, Banggai Crow was assumed to have a very small population and was listed as Critically Endangered in the IUCN Red List of Threatened Species (BirdLife International 2006, 2007).

Ecological studies (Masala *et al.* 2008, Indrawan *et al.* 2010; Celebes Bird Club unpubl.) and very recent independent observations by F. Rheindt and PV in West Peleng in March and April 2009 have revealed the contemporary survival of the Banggai Crow in western Peleng, especially in the sub-districts of Buko, Bulagi and Liang. These studies have resulted in the first data on the behaviour, ecology, vocalisations and conservation status of Banggai Crow (Indrawan *et al.* 2010). Field identification of *Corvus unicolor* was based on plumage, size and vocalisations, and to a lesser extent behaviour and ecology (Indrawan *et al.* 2010). Two specimens were collected (see below) and are now in the Museum Zoologicum Bogoriense, Cibinong (MZB). However, although never reported by early explorers, crows provisionally considered to be an undetermined subspecies of Slender-billed Crow *C. enca* are evidently now widespread in disturbed lowlands of the Banggai Islands, which has led to doubts about the identification and diagnosability of *C. unicolor*, and hence its continued survival. *C. enca* was first recorded on both the islands of Peleng and Banggai in 1981 (Bishop 1992), and by 1991 was widespread with a nesting record as far south as the Bowokan Islands, between the main Banggai Islands and the Sula Islands (Indrawan *et al.* 1997). The lack of historic records may indicate that *C. enca* has recently colonised following anthropogenic habitat conversion. However this hypothesis requires further research considering that older villagers in Western Peleng claim that 'the big lowland crow' was also present in their childhood when disturbed forest dominated low elevations on Peleng (Rheindt *et al.* 2010).

Given that identification criteria diagnosing these all-black birds in the field are not well known and in the absence of knowledge of the vocalisations of the crows on Peleng, it has heretofore been problematic to provide unassailable evidence of the continued existence of Banggai Crow. This is largely because no specimens of *C. enca* are known from the Banggai Islands and because variation within this highly polytypic, widespread species is poorly documented. *C. e. celebensis* is the widely distributed subspecies of *C. enca* on Sulawesi and some neighbouring islands, whilst *C. e. mangoli* has been little-studied and was described from just two specimens (Vaurie 1958). No other taxa of *C. enca* closely approach the Banggai Islands. Although birds assigned to *C. enca* now occur commonly on

the Banggai group, the lack of specimens means that we cannot yet definitively determine the subspecies there.

In addition to the free-living *C. unicolor* studied (Indrawan *et al.* 2010), we studied and measured four individuals in the hand. Here we show that these, and birds photographed and sound-recorded, unquestionably represent *C. unicolor*. As the original description (Rothschild & Hartert 1900) was brief and based on just two specimens, and subsequent descriptive notes have either not added much or have been contradictory, we provide additional descriptive details on the basis of our new material. We also re-evaluate the historical record of this species and its taxonomic status.

Methods

Because of their rarity, neither the AMNH nor MZB specimens could be borrowed for direct comparisons. Hence, PCR visited AMNH prior to her visit to MZB to photograph and measure the syntypes, and to determine which characters could be used to distinguish *C. unicolor* from the many races of *C. enca*, almost all of which are well represented at AMNH. Because only *C. e. celebensis* and *C. e. sulaensis* are known from the region, these two taxa were subject to the most detailed comparisons. At MZB, therefore, indirect comparisons could be made using the same methods and measurements taken by the same observer. Colour comparisons were made by PCR using designations in Smithe (1975) under fluorescent lighting at both AMNH and MZB. Colour comparisons with Smithe (1975) also made of the MZB birds, by MI, produced similar results, but those by PCR are used here because she studied both the AMNH and MZB specimens. Evidently because of the circumstances of capture, the new specimens are missing some feathers, particularly around the head; some plumage areas are soiled, some areas (e.g. the throat) have ruffled feathers; and the underparts of one of the new specimens are largely concealed by the wings, making colour comparisons of these plumage areas difficult.

Measurements were taken to the nearest 0.1 mm using digital callipers. Those of most specimens were taken by PCR, but a few *C. e. mangoli* specimens and two putative *C. unicolor* were measured by MI or, in the former case, taken from the literature (Vaurie 1958). Measurements taken included: longest rectal bristle; culmen from skull base; culmen ridge width, bill height, and bill width at distal edge of nares; gape width; wing (flattened); distance between tip of longest primary-covert and tip of primary 1 (p1; outermost); shortfalls from wingpoint of folded wing of each primary (pp1–10); tarsus; hindclaw (excluding scute); tail (from insertion point between central rectrices); and tail graduation (distance between tip of central rectrix and tip of outermost rectrix of folded tail). Univariate summary statistics and Principal Component Analysis were made using Systat 8.0. Principal Components Analysis (PCA) was used to determine which variables best explain variability in the data and which best separate the two species. For purposes of the PCA, specimens of *C. e. celebensis* and *C. e. mangoli* ($n=4$), as well as the two smallest races of *C. enca*, namely *C. e. pusillus* ($n=3$) and *C. e. samarensis* ($n=1$), were included in the analysis to determine if proportional differences exist in *C. unicolor* vs. disparate races of *C. enca*.

Field recordings were made by PV using an Edirol R-09HR field recorder with a Sennheiser ME-66 directional microphone, and sonograms were prepared using Raven Pro 1.3 (Cornell Laboratory of Ornithology). Field photographs were taken by PV using a Canon Eos 40D with a Canon EF 100–400 IS 4.5–5.6 telephoto lens.

Results

New specimens and records.—On 24 July 2007, two *C. unicolor* were taken alive at Bebe sub-village by Celebes Bird Club (CBC), but they perished on 16 and 22 August 2007 (an adult female and adult male respectively) and were then prepared as specimens. These were later donated by CBC through MI to MZB, so there are now four Banggai Crow specimens in museum collections worldwide (Table 1). Prior to the collection of the MZB specimens, a bird shot by a local hunter on 14 May 2007, in the vicinity of Amos village (Buko sub-district, 01°16'28.1"S, 122°53'33.7"E; 697 m) was measured and photographed by YM & F. Masala, but the bird could not be confiscated, and the measurements, which were made hurriedly, could not be double-checked. The wing measurement of this bird (which, as visible in photographs, is otherwise typical of *C. unicolor*) is so long that it must either have been measured or recorded erroneously. On 26 January 2008, another bird was caught, measured, photographed and released in the vicinity of Supit village (Buko sub-district), very near Amos.

While in the forested hills of western Peleng (in the vicinity of Tataba, on 22–31 March 2009 and 2–5 April), PV & F. Rheindt (during the former dates only) encountered several pairs and small groups of 2–4 birds at altitudes of 650–900 m.

Comparison of new specimens with syntypes of C. unicolor.—Colour comparisons of the MZB specimens with the AMNH syntypes are presented in Table 2. For those plumage areas in which comparisons were possible, colour differences were all minor. For soiled and / or ruffled plumage areas that did not lend themselves to close comparison, differences between the MZB and AMNH specimens were not apparent. Both of the new specimens show strongly grey feather bases, which in a few areas were judged to be of a slightly darker shade than in the syntypes (bearing in mind that direct comparisons were impossible). The two MZB Banggai Crow specimens from Peleng Island match the original description (Rothschild & Hartert 1900) in that the base of the feathers were strongly grey, rather than bright white as in *C. typicus*, *C. e. celebensis* and *C. e. mangoli*. The main colours of *C. unicolor* are Sepia (219), Sepia (119) and Dark Grayish Brown (20) (Smithe 1975), with a bluish sheen (Cyanine Blue 74) in more intense light (Table 3).

In measurements, the new MZB *C. unicolor* specimens clearly fit within the very limited range of variation of the two AMNH syntypes (Table 3). All the preserved specimens and the released individual share the diagnostically short wing; however, as mentioned above

TABLE 1
Specimens of Banggai Crow *Corvus unicolor* in existence in the world's museums as of 2009.

Museum	Number	Sex	Locality	Date	Elevation	Collector(s)	Field No.
AMNH	673966	?	Sula Islands (Banggai)	1900 or earlier	?	Unknown; sent by Duivenbode	None
AMNH	673967	?	(Banggai,) Sula Islands	1900 or earlier	?	Unknown; sent by Duivenbode	None
MZB	31.255	F	Bebe sub-village, Tombos village, Liang sub-district, Banggai Islands, Central Sulawesi (01°26'69.0"S, 123°12'36.27"E)	Captured 24 July 2007, died 16 August 2007	320 m	F. N. Mallo, D. Dwi Putra, Herlina, A. Rahman, I. N. Mallo	01
MZB	31.256	M	Bebe sub-village, Tombos village, Liang sub-district, Banggai Islands, Central Sulawesi (01°26'69.0"S, 123°12'36.27"E)	Captured 24 July 2007, died 22 August 2007	320 m	F. N. Mallo, D. Dwi Putra, Herlina, A. Rahman, I. N. Mallo	02

TABLE 2
Colour comparisons between syntypes and new specimens of Banggai Crow *Corvus unicolor*.
Colour names follow Smithe (1975).

Area	AMNH 673966	AMNH 673967	MZB 31.255	MZB 31.256
central crown	black with slight iridescence closest to Color 173, Indigo blue	black with slight iridescence closest to Color 173, Indigo blue	too many feathers missing to judge	too many feathers missing to judge
ear-coverts	slightly glossy Color 89, Jet Black	slightly glossy Color 89, Jet Black	slightly glossy Color 89, Jet Black	slightly glossy Color 89, Jet Black
throat	slightly glossy Color 89, Jet Black	slightly glossy Color 89, Jet Black	feathers too ruffled or missing to judge	feathers too ruffled or missing to judge
centre of nape	dark brown, Color 20, Dark Grayish Brown	dark brown, Color 20, Dark Grayish Brown	dark brownish black, Color 119, Sepia	dark brownish black, Color 119, Sepia
central mantle	slightly glossy black, closest to but slightly blacker than Color 82, Blackish Neutral Gray	browner than AMNH 673966, Color 119, Sepia	matte black, Color 89, Jet Black	matte black, Color 89, Jet Black
scapulars	black with slight iridescence closest to Color 173, Indigo Blue	slightly glossy Color 119, Sepia	left: Color 82, Blackish Neutral Gray; right: Color 119A, Hair Brown	Color 89, Jet Black
side of neck	between Color 119, Sepia and Color 219, Sepia; darker than 219 but warmer than 119	between Color 119, Sepia, and Color 219, Sepia; darker than 219 but warmer than 119	brownish black, Color 119, Sepia	black, between 82, Blackish Neutral Gray and 89, Jet Black
tertials	black with slight iridescence closest to Color 173, Indigo Blue	slightly glossy Color 119, Sepia	Color 82, Blackish Neutral Gray	Color 89, Jet Black
uppertail-coverts	closest to Color 20, Dark Grayish Brown	closest to Color 20, Dark Grayish Brown	black, between Color 82, Blackish Neutral Gray and Color 89, Jet Black	black, between Color 82, Blackish Neutral Gray and Color 89, Jet Black
uppertail surface	slightly glossy Color 82, Blackish Neutral Gray	slightly glossy Color 82, Blackish Neutral Gray	slightly glossy Color 82, Blackish Neutral Gray	between Color 82, Blackish Neutral Gray and 89, Jet Black
central breast	slightly glossy Color 82, Blackish Neutral Gray	Color 19, Dusky Brown	slightly glossy Color 82, Blackish Neutral Gray	not visible due to preparation style
central belly	slightly glossy Color 82, Blackish Neutral Gray	Color 19, Dusky Brown	black, between Color 82, Blackish Neutral Gray and 89, Jet Black	Color 89, Jet Black
undertail-coverts	Color 82, Blackish Neutral Gray	Color 82, Blackish Neutral Gray	Color 82, Blackish Neutral Gray	Color 89, Jet Black
nape feather bases	medium grey, Color 85, Light Neutral Gray	medium grey, Color 85, Light Neutral Gray	medium grey, Color 84, Medium Neutral Gray	medium grey, Color 84, Medium Neutral Gray
mantle feather bases	medium grey (darker than nape base colour) Color 84, Medium Neutral Gray	medium grey (darker than nape base colour) Color 84, Medium Neutral Gray	medium grey (same as nape base colour) Color 84, Medium Neutral Gray	medium grey (same as nape base colour) Color 84, Medium Neutral Gray
uppertail-coverts feather bases	medium brownish grey, Color 79, Glaucous	Color 84, Medium Neutral Gray	medium brownish grey, Color 79, Glaucous	medium brownish grey, Color 79, Glaucous
central breast feather bases	rather pale grey Color 86, Pale Neutral Gray	rather pale grey Color 86, Pale Neutral Gray	Color 85, Light Neutral Gray	not visible due to preparation style
central belly feather bases	medium grey, Color 85, Light Neutral Gray	medium grey, Color 85, Light Neutral Gray	Color 84, Medium Neutral Gray	Color 83, Dark Neutral Gray

TABLE 3

Measurements (mm) of all known and putative Banggai Crow *Corvus unicolor* individuals.

Measurement	AMNH 673966 (syntype)	AMNH 673967 (syntype)	YM* (Bobonggon, 14 May 2007); specimen not saved	MZB 31.255; CBC (Bebe, 16 August 2007)	MZB 31.256; CBC (Bebe, 22 August 2007)	YM* (Sapit, 26 January 2008); released
Longest rectal bristles	15.2	15.6	–	11.3	10.4	–
Culmen from skull base	46.1	46.2	–	45.4	48.0	–
Culmen ridge width at distal edge of nares	7.3	6.3	–	7.1	6.8	–
Gape width	20.6	18.5	–	c.21.5	20.1	–
Bill height at distal nares	17.7	17.0	15.0	16.3	17.4	–
Bill width at distal nares	13.9	12.9	–	13	12.2	–
Wing length (flattened)	205	210	270**	206	206	209
Longest primary-covert to P1 tip	70	76	–	74	77	–
P1 shortfall	76	75	–	72	72	–
P2 shortfall	30	26	–	28	27	–
P3 shortfall	7	5	–	7	6	–
P4 shortfall	2	0	–	3	2	–
P5 shortfall	0	0	–	0	0	–
P6 shortfall	7	9	–	9	11	–
P7 shortfall	26	26	–	28	28	–
P8 shortfall	44	37	–	40	40	–
P9 shortfall	54	51	–	48	49	–
P10 shortfall	59	56	–	58	55	–
Tarsus length	45.9	40.9	45.0	41.6	42.1	45.0
Hindclaw l	15.4	14.5	–	11.8 (very worn)	13.1	–
Tail (from insertion)	103	108	–	111	114	100
Tail graduation	6	5	–	6 (slightly worn)	9	–

*Specimen not measured by PCR

**Measurement almost certainly incorrect; see text

the hunter-killed bird that was not preserved was recorded as having a much longer wing. Photographs of the latter bird, however, show that it shares other attributes of *C. unicolor*, in particular the grey feather bases.

The irides of the living *C. unicolor* were greyish white, as clearly shown in photographs taken of them while alive. In strong contrast, adult specimens examined at MZB of *C. enca* subspecies for which label data were recorded had the irides brown (two *C. e. compiler*, six *C. e. celebensis*) or coffee-brown (one from Kalidupa Island, another from Buton Island); dark blue (one *C. e. compiler*), or blue-black (two *C. e. compiler*). A young juvenile *C. e. celebensis* had the irides grey. At AMNH, most *C. enca* labels with iris colour indicated they were dark brown, while two were grey-brown, one light reddish brown, and one red (perhaps in error).

As regards age categories, AMNH 673966 is an adult based on its rounded rectrices, with fault bars that do not line up, and its less pointed / acute outer primaries 2–3 (numbered from outside inwards) than AMNH 673967. The latter (AMNH 673967) may be an immature, as its posterior underparts are slightly browner than in AMNH 673966; its

TABLE 4

Measurements (mm) of specimens of Banggai Crow *Corvus unicolor* and geographically proximate races of Slender-billed Crow *C. enca*, presented as mean \pm SD (*n*). Primary shortfalls are tips of each primary (numbered ascendently) to wingpoint of folded wing.

Measurement	<i>C. unicolor</i> (all)	<i>C. enca celebensis</i>	<i>C. enca mangoli</i> *
Longest rectal bristles	13.1 \pm 2.6 (4)	21.5 \pm 2.0 (23)	—
Culmen from skull base	46.3 \pm 1.2 (4)	54.4 \pm 2.8 (17)	55.4 \pm 2.8 (7)
Culmen ridge width at distal edge of nares	6.9 \pm 0.4 (4)	7.0 \pm 0.5 (19)	6.6 \pm 0.5 (4)
Gape width	19.7 \pm 1.1 (3)	23.0 \pm 1.4 (19)	22.6 \pm 1.7 (4)
Bill height at distal nares	17.1 \pm 0.6 (4)	17.7 \pm 0.7 (16)	18.1 \pm 1.7 (2)
Bill width at distal nares	13.0 \pm 0.7 (4)	14.1 \pm 0.6 (19)	13.6 \pm 1.0 (4)
Wing length (flattened)	206.7 \pm 2.2 (4)	279.6 \pm 11.2 (18)	274.4 \pm 13.4 (7)
Longest primary-covert to P1 tip	74.2 \pm 3.1 (4)	114.5 \pm 6.0 (15)	101.8 \pm 4.8 (4)
P1 shortfall	66.2 \pm 14.2 (4)	93.6 \pm 6.6 (13)	99.0 \pm 9.9 (4)
P2 shortfall	27.8 \pm 1.7 (4)	29.1 \pm 3.8 (13)	37.7 \pm 2.6 (4)
P3 shortfall	6.3 \pm 0.9 (4)	4.4 \pm 2.3 (13)	8.8 \pm 2.6 (4)
P4 shortfall	1.8 \pm 1.3 (4)	0.3 \pm 0.8 (13)	1.2 \pm 2.5 (4)
P5 shortfall	0 (4)	1.3 \pm 1.2 (12)	1.8 \pm 1.3 (4)
P6 shortfall	9.0 \pm 1.6 (4)	13.1 \pm 4.0 (12)	14.8 \pm 2.8 (4)
P7 shortfall	27.0 \pm 1.2 (4)	41.2 \pm 6.3 (10)	44.0 \pm 5.4 (4)
P8 shortfall	40.2 \pm 2.9 (4)	61.3 \pm 8.6 (8)	58.5 \pm 6.4 (2)
P9 shortfall	50.5 \pm 2.6 (4)	75.0 \pm 9.7 (8)	71.0 \pm 7.1 (2)
P10 shortfall	57.0 \pm 1.8 (4)	85.0 \pm 9.9 (8)	82.5 \pm 10.6 (2)
Tarsus length	42.6 \pm 2.2 (4)	52.3 \pm 2.4 (17)	48.5 \pm 2.3 (4)
Hindclaw l	13.7 \pm 1.6 (4)	17.3 \pm 0.9 (18)	10.6 \pm 0.7 (4)
Tail (from insertion)	108.9 \pm 4.9 (4)	134.0 \pm 5.6 (19)	127.7 \pm 9.5 (7)
Tail graduation	6.0 \pm 2.2 (4)	8.2 \pm 5.1 (11)	5.8 \pm 2.8 (4)

*some measured by M. Indrawan and C. Vaurie; includes specimens from Taliabu Island.

tarsi, toes and claws are paler than in AMNH 673966, and the fault bars on its rectrices line up; however, its age class must be considered uncertain. MZB 31.255 is probably a full adult, although it has brownish patches in the right scapulars and inner base of the left central rectrices and associated coverts (possibly induced by chemical means). It lacks the brownish wash over the cape of the two AMNH specimens, which might be due to slight foxing (M. LeCroy *in litt.* 2009), a type of light-induced post-mortem change from black to reddish-brown; however, a brownish-tinged cape is apparent in some living birds photographed by PV. MZB 31.256 is clearly a full adult, lacking any

TABLE 5
Summary results from Principal Components Analysis of Banggai Crow *Corvus unicolor* and Slender-billed Crow *C. enca*.

Measurement	Loadings	
	Factor 1	Factor 2
Nasal feather length	0.86	0.03
Culmen length from skull	0.93	-0.12
Culmen ridge width from distal nares	0.39	0.70
Bill height from distal nares	0.61	0.44
Bill width from distal nares	0.67	0.42
Wing length	0.92	-0.28
Tarsus length	0.93	0.01
Hindclaw length	0.89	-0.12
Tail length	0.78	-0.49
Variance explained (eigenvalue)	5.65	1.21
% total variance explained	62.82	13.43

brownish areas, and with unworn, rounded rectrices and outer remiges. Neither MZB *C. unicolor* specimen shows evidence of typical juvenile *Corvus* characters such as fluffier-textured feathers on the nape, mantle and / or vent; brownish overall colour; or distinctly paler areas on the bill or tarsi.

The conspicuous, broad bare fleshy eye-ring of the two MZB specimens was dark greyish in life, and is blackish in the specimens. The bill, both in life and in the specimens, is completely black (Color 82, Blackish Neutral Gray; Smithe 1975). The rictal bristles are stiff and cover the base of the culmen and part of the nares. The feet are dark Blackish Neutral Gray, with a metallic sheen, both in life and in the specimens.

Comparisons with *Corvus enca celebensis* and *C. e. mangoli*.—Compared to *C. unicolor*, *C. enca celebensis* is distinctly larger and especially longer winged (Table 4, Fig. 2). The bill of *C. e. celebensis* is somewhat variable in length but is not as markedly different in size

and shape from that of *C. unicolor* as are some specimens of *C. e. mangoli*, as both the former have proportionately short, heavy bills. While *C. e. celebensis* and *C. e. mangoli* have long, bushy narial bristles and relatively well-developed throat hackles, the bristles are reduced (see Table 4) and the hackles are not evident in *C. unicolor*. In colour, *C. unicolor* specimens are much less purple-glossed above than on *C. e. celebensis*. The little gloss that *C. unicolor* has above is bluer than in *C. e. celebensis*. Differences in the shade of black on the underparts between *C. e. celebensis* and *C. unicolor* are not constant. The feather bases of *C. e. celebensis* are brilliant white over the entire body, while those of *C. unicolor* are strongly grey.

Compared to *C. unicolor*, *C. e. mangoli* is noticeably larger and the bill is relatively more slender and much longer (Table 4), although bill length is quite variable if birds from Taliabu are included. The plumage colour was strikingly different; compared to *C. unicolor*, *C. e. mangoli* has a paler, slatier tone vs. darker and blacker in *C. unicolor*. As in *C. e. celebensis* but very unlike *C. unicolor*, the bases of the blackish feathers in *C. e. mangoli* were white.

Compared to specimens of *C. e. celebensis* and *C. e. mangoli*, as well as the two smallest races of *C. enca*, *C. e. pusillus* and *C. e. samarensis*, it is clear that *C. unicolor* differs proportionally from these disparate taxa (Fig. 2, Table 5). It is smaller overall than any of the other taxa, with a relatively heavy, short bill.

Field identification.—Although specimens of *C. unicolor* do resemble small *C. enca*, and hence it might seem that field identification of these all-black birds would be difficult, this is not the case (see Fig. 3). The pale grey irides of *C. unicolor* had not previously been suspected, as the syntypes bear no information on soft-part colours. In photographs of live birds, Banggai Crows also appear very large-eyed, which in combination with the pale irides should aid field identification; while juvenile Slender-billed Crows may show a grey iris, this presumably is still distinctly darker than the iris of *C. unicolor*, although further substantiation is needed. Photographs in life also show that the Banggai Crow's massive

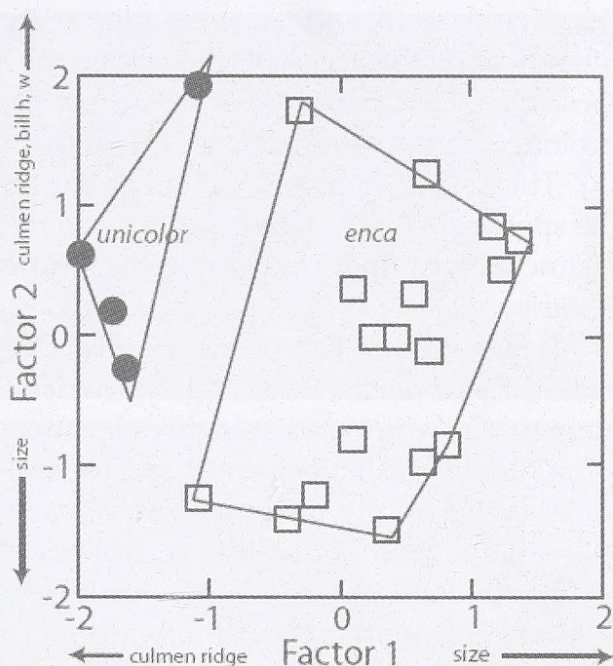


Figure 2. Plot of Banggai Crow *Corvus unicolor* and Slender-billed Crow *C. enca* specimen factor scores on Factors 1 and 2 from Principal Components Analysis. Factor 1 is a strong size axis, on which only culmen ridge width is negatively correlated, and Factor 2 is a shape axis, contrasting bill dimensions other than length with overall size.

(hardly 'insignificant', *contra* Madge & Burn 1994) but relatively short bill is an obvious identification feature, especially given the birds' small overall size. However, to appreciate these characters close views are necessary, and the species' nervous behaviour may make prolonged observation at close quarters difficult.

The very short wing and tail of Banggai Crow are also noticeable in the field and give the species a very different appearance in flight compared to *C. enca*. *C. unicolor* has a very distinctive fast fluttering flight which differs from the typically much slower wingbeats of *C. enca*.

Banggai Crow and Slender-billed Crow appear to have different habitat preferences. While *C. enca* seems to be largely restricted to open areas in coastal lowlands up to 300 m, Banggai Crow is found at higher elevations and in less-disturbed forest.

C. unicolor is a very vocal species and is often heard before being seen. While *C. enca* on Peleng typically utters a series of cawing notes (Fig. 4), the call of *C. unicolor* is much more reminiscent of the shrill screeches of *C. typicus*, being usually repeated 3–4 times, and sometimes followed by a loud whistle (Fig. 4). Therefore, when crows are heard on Peleng, field identification is straightforward.

Discussion

With these unequivocal specimens, photographs and recordings from Peleng Island, there can be no more doubt about the current survival and identity of the Banggai Crow.

Regarding the questionable nature of the locality data of the syntypes of *C. unicolor*, in the first place, the Banggai Islands are not now generally considered part of the Sula Islands. However, at least 24 of the specimens in the AMNH from the Banggai Islands are labeled as if the latter are a group within the Sula Islands, making it clear that this treatment is simply an historical artefact and should not be seen as casting doubt upon the provenance of the syntypes within the Banggai Islands. On the other hand, L. D. W. A. van Renesse van Duivenbode, a planter and merchant based on Ternate (near Halmahera) whose specimens are from various islands through Ternate in 1860–81, is not known to have personally collected in the Banggai Islands, and (as alluded to by Hartert 1919), his collection has been considered to contain unreliable records (see also White & Bruce 1986). Although Hartert (1919) stated that the locality in this case must have been correct, as shown by other species and subspecies, he did not indicate which other taxa these were and we have not been able to verify this based on listings of AMNH holdings. While Meinertzhagen (1926) identified the *C. unicolor* syntypes as probable trade skins, he provided no rationale for this and appears to have groundlessly equated the fact that these are native-prepared skins with their being trade skins. Some authors have indicated the Banggai Islands (the group as opposed to the island) as the provenance (Blake & Vaurie 1962, Goodwin 1976), but curiously none of the above suggested Peleng, the largest of the Banggai Islands, as the home of this species.

Other attempts to elucidate the circumstances of collection of *C. unicolor* have been inconclusive. Bruce (1986) stated that one of Rothschild's collectors, H. Kühn, worked in the Banggai Islands in 1884–85, and Coates & Bishop (1997) concluded, perhaps on this basis, that the species was known from 'two specimens from an unspecified island in the Banggai archipelago, collected during 1884–1885.' However, the AMNH collection (which now holds almost all of Rothschild's bird skins) appears to possess no Kühn specimens from the Banggai Islands. Collecting in the Banggai islands, including Peleng, was undertaken in c.1892 and in May–August 1895 by C. W. Cursham (Eck 1976, White & Bruce 1986), with c.400 of Cursham's specimens from the Banggai Islands held in Dresden at the Staatlichen Museums für Tierkunde (SMTD) (Eck 1976: 88); 84 Cursham specimens from Banggai Island and 72 from Peleng Island are at AMNH; and still others are in Berlin at the Museum für



Figure 3. Photographs of living Banggai Crows *Corvus unicolor* (left column) and Slender-billed Crows *C. enca* (right) from Peleng Island. All Banggai Crow photographs were taken in the hill forests of western Peleng (650–900 m) near Tataba town; upper left on 23 March 2009, middle left 4 April 2009, and bottom left 23 March 2009. All Slender-billed Crow photographs were taken in an agricultural area near Salakan town in eastern Peleng on 6 April 2009. All photographs by P. Verbelen.

Naturkunde. Thus, although Cursham was evidently the sole major collector in the Banggai Islands prior to the description of *C. unicolor*, it is unclear whether Duivenbode could have obtained the two syntypes from him, and it seems unlikely that Cursham would not have presented them directly to Rothschild rather than sending them to Duivenbode. Following the description of *C. unicolor*, a few specimens were collected in the Banggai Islands by W. Kaudern in 1920 and a Mr Van Den Bergh in 1932 (Bishop 1992). Finally, in July–August 1938, J. J. Menden collected birds on Peleng (Eck & Quaisser 2004). None of these collectors obtained any further crows in the Banggai Islands.

All this uncertainty has naturally given rise to the question of whether the syntypes of *C. unicolor* were actually collected in the Banggai Islands. Although the type locality of Banggai Crow will probably never be known with certainty, the rediscovery of Banggai Crow on Peleng Island confirms that this distinctive taxon does occur in the Banggai Islands, although perhaps not on Banggai Island itself. Of course, one possibility is that the syntypes did come from Banggai Island and that the species is now extirpated there. It

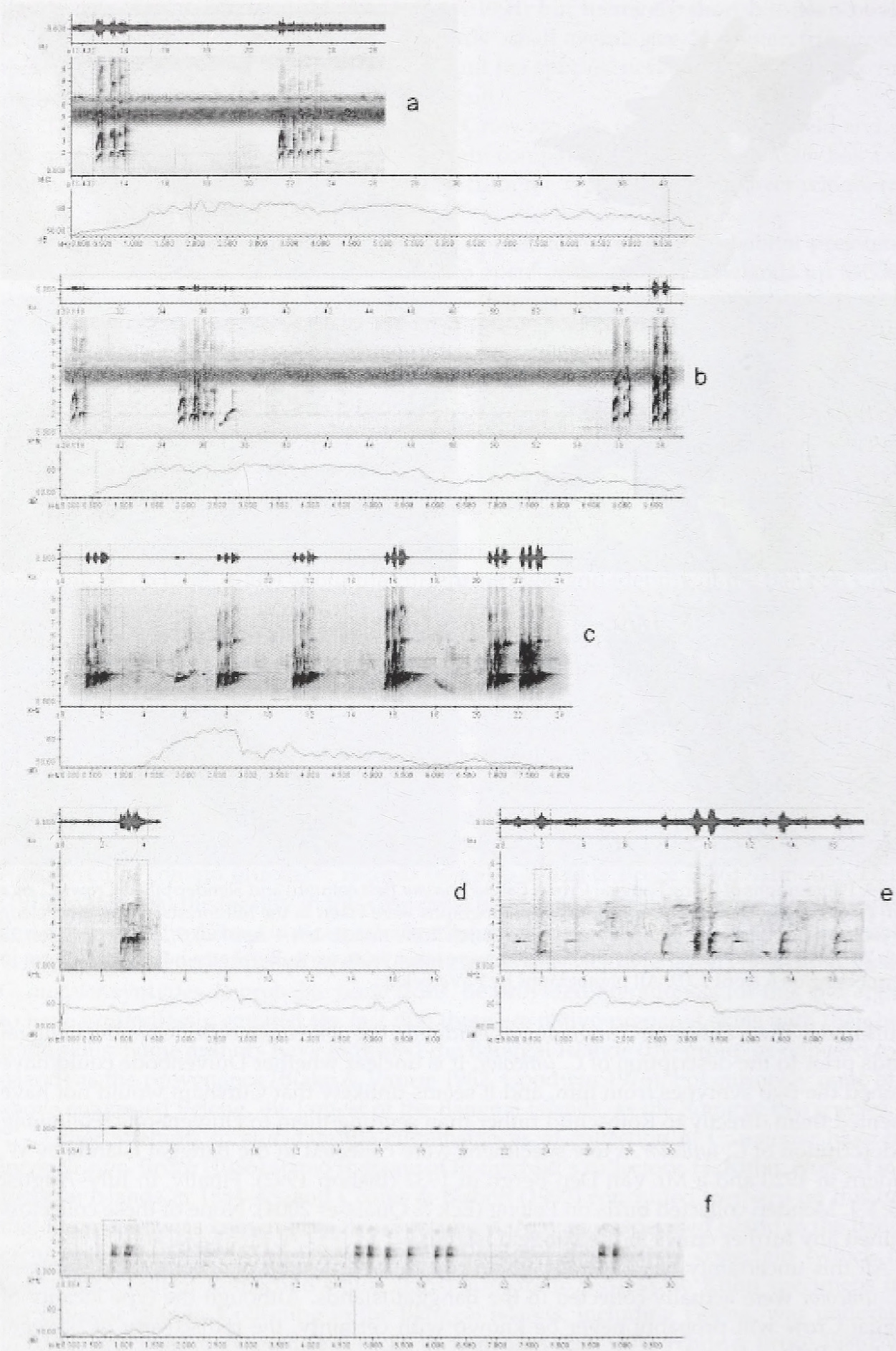


Figure 4. Sonograms of vocalisations of Banggai Crow *Corvus unicolor* (a, b), Piping Crow *C. typicus* (c–e) and Slender-billed Crow *C. enca* (f) on Peleng. All recordings made by F. Verbelen, other than c by D. Farrow (XC 19806), d, e by P. Noakes (XC 22446, 22447).

seems more likely that the type specimens came from Peleng Island, but further study of habitat and altitudinal requirements may provide evidence on the matter. There is no evidence that it occurs in the Sula Islands, so the original type locality was almost certainly due to prevailing usage and / or informal grouping of these two geographically close island groups.

Hartert (1919) did not distinguish between the two syntypes, but AMNH 673967 was clearly his intended type, as he affixed to it a Rothschild type label which now reads '{Syn}type of *Gazzola unicolor* R & H, (Banggai,) Sula Islands (Nat. Coll.)'. That specimen was therefore catalogued as the type when the Rothschild Collection came to AMNH, and was segregated with the type specimens, while the second syntype was only later added to the AMNH type collection (M. LeCroy *in litt.* 2009). The label of AMNH 673966, written by M. LeCroy, bears the data 'Syntype of *Gazzola unicolor* Rothschild and Hartert 1900, BBOC 11:29'. We hereby designate AMNH 673967 the lectotype of *Gazzola unicolor* in order to remove the ambiguity inherent in the original description. AMNH 673966 becomes the paralectotype.

The species-level taxonomy of the Banggai Crow has long required clarification. In the original description of *C. unicolor*, Rothschild & Hartert (1900) characterise the species as '[l]ike *Gazzola typica* from Celebes in structure, size, and form, but differing in its uniform blackish colour, and the bases of the black feathers not being white, but grey.

The upperside has a fine purplish-blue gloss, strongest on the wings and crown, while the hind-neck, chest, breast, and abdomen . . . are duller and more brownish slaty black. Wing 203 to 207 mm., tail 112 to 117, Culmen 47, metatarsus 40.' At that time, *C. enca* was unknown from the Banggai Islands, and Rothschild & Hartert (1900) did not explicitly compare *Gazzola* with *C. enca*. Meinertzhagen (1926) and Stresemann (1940) continued to treat *C. unicolor* as a species but both suggested it might be a race of *C. enca*. Dorst (1947), in contrast, treated *C. unicolor* as a race of *C. typicus*, but this was not widely followed. Instead, Vaurie's (1958) decision to treat *C. unicolor* as a subspecies of *C. enca* has been far more influential, although he did not mention the fact that *C. unicolor* differs strikingly from geographically proximate races of *C. enca* in having strongly grey, rather than bright white, bases to the feathers over the entire body. Eck (1975, 1976) followed Vaurie in treating *C. unicolor* as a race of *C. enca*, but he questioned



Figure 5. Banggai Crow *Corvus unicolor* (top) in comparison with two subspecies of Slender-billed Crow, *C. enca celebensis* (centre) and *C. e. mangoli* (bottom). Painting by Agus Prijono.

this assignment and stated that *C. unicolor* is the only strongly marked Banggai endemic bird taxon. More recently, *C. unicolor* has been said to differ from geographically adjacent races of Slender-billed Crow *C. enca* (*C. e. celebensis* of Sulawesi and some satellites, and *C. e. mangoli* of the Sula Islands) on the basis of its smaller size, comparatively 'insignificant' bill, more highly glossed plumage, and grey (vs. white) bases to neck feathers (Madge & Burn 1994). It has generally been afforded species status on the basis that it may be more closely related to *C. typicus* than to *C. enca* (Goodwin 1976, Madge & Burn 1994, Inskipp *et al.* 1996), and Sibley & Ahlquist (1990) treated the taxon as *C. (typicus) unicolor*. Madge & Burn (1994) also suggested that *C. unicolor* 'is very close to the Piping Crow and it could in fact be an isolated, wholly blackish form of this species'.

The new Banggai Crow specimens confirm the known characteristics of the species that were previously based solely on the two syntypes, in that all four have consistently short wings and tails, all are basically all black with strongly grey feather bases (very unlike the bright white feather bases of most races, including all the geographically proximate ones, of *C. enca*), and all four have deep, short bills. The revelation that the iris of Banggai Crow is pale strongly supports its specific distinctness, as adults of Slender-billed Crow have dark irides. Except for the wing measurement of the hunter-killed specimen that was not preserved, the other Banggai Crow specimens are very similar in shape and size, and show no approach to Slender-billed Crow (at least to *C. e. celebensis* and *C. e. mangoli*). On the other hand, *C. unicolor* and *C. typicus* are very similar in measurements (see Appendix). Past treatment of *C. unicolor* as conspecific with *C. enca* was based on the fact that some small taxa treated as races of *C. enca* (*C. e. pusillus* and especially *C. e. samarensis*) do occur in the Philippines, but these differ in several respects from *C. unicolor* and, given their geographical ranges, they are highly unlikely to have any close relationship to *C. unicolor*.

Compared with the taxon of *C. enca* that now inhabits Peleng Island (the subspecific identity of which is unresolved), Banggai Crow has different vocalisations, behaviour and ecology (e.g. preference for more closed canopies, whistled main call rather than simple cawing, and swifter flight; Indrawan *et al.* 2010). The behaviour, vocalisations and ecology of *C. unicolor* seem more similar to *C. typicus* of mainland Sulawesi, but the ranges of these two taxa are separated by a deep strait (>900 m), although at the narrowest point Sulawesi and Peleng are separated by only 14 km, and the landmasses either side had different tectonic origins (Banggai being part of the Sula spur; Hall 1998, 2001). In addition, although their vocalisations are remarkably similar (both being very different from *C. enca*), those of *C. unicolor* have stronger harmonics, which is reflected in its less pure and lower pitched sounding vocalisations than those of *C. typicus* (Fig. 4). Further study with a larger sample of homologous vocalisations of both taxa is required to establish whether they are consistently different, and controlled playback experiments could shed light on species recognition. Considering the obvious differences in morphology between *C. unicolor* (which is all black) and *C. typicus* (which is pied); apparent minor differences in vocalisations; and in comparison with accepted species limits in other *Corvus* species, we advocate treatment of *C. unicolor* as specifically distinct under the Biological Species Concept. We believe it highly likely that *C. unicolor* and *C. typicus* are sister species.

Further questions remain concerning the subspecific identity of the local congener of *C. unicolor* on Peleng Island. Although field observations indicate that *C. e. celebensis* (rather than the equally likely *C. e. mangoli*) is the local form on the Banggai Islands, specimen evidence is still needed. Judicious collection of voucher material of Slender-billed Crow in the Banggai Islands is possible because the bird is common. Anecdotal information suggests that *C. enca* may be a competitor for the Critically Endangered *C. unicolor* (BirdLife International 2001, 2005, 2007), especially where moist forests have been converted to

plantations. Whether *C. enca* poses a threat to *C. unicolor* via hybridisation at ecotones is unknown and requires study.

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References:

- BirdLife International. 2001. *Threatened birds of Asia: the BirdLife International Red Data book*. BirdLife International, Cambridge, UK.
- BirdLife International. 2005. *Corvus unicolor*. 2006 IUCN Red List of threatened species. www.iucnredlist.org (accessed 23 May 2007).
- BirdLife International 2007. *Corvus unicolor*. 2007 IUCN Red List of threatened species. www.iucnredlist.org (accessed 6 March 2008).
- Bishop, K. D. 1992. New and interesting records of birds in Wallacea. *Kukila* 6: 8–35.
- Blake, E. R. & Vaurie, C. 1962. Family Corvidae. Pp. 204–282 in Mayr, E. & Greenway, J. C. (eds.) *Check-list of birds of the world*, vol. 15. Mus. Comp. Zool., Cambridge, MA.
- Coates, B. J. & Bishop, K. D. 1997. *A guide to the birds of Wallacea: Sulawesi, the Moluccas and Lesser Sunda Islands, Indonesia*. Dove Publications, Alderley.
- Dickinson, E. C. (ed.) 2003. *The Howard and Moore complete checklist of the birds of the world*. Third edn. Christopher Helm, London.
- Dickinson, E. C., Dekker, R. W. R. J., Eck, S. & Somadikarta, S. 2004. Systematic notes on Asian birds. 45. Types of the Corvidae. *Zool. Verh. Leiden* 350: 111–148.
- Dorst, J. 1947. Révision systématique du genre *Corvus*. *Oiseaux et R.F.O.* 17: 44–86.
- Eck, S. 1975. Über die Sunda Krähe der Sula Inseln. *Beitr. Vogelkd.* 21: 477–479.
- Eck, S. 1976. Die Vögel der Banggai-Inseln, insbesondere Pelengs (Aves). *Zool. Abh. Staatl. Mus. Tierk. Dresden* 34: 53–100.
- Eck, S. 1977. Ergänzendes über die Vögel der Insel Taliabu, Sula-Inseln. *Zool. Abh. Staatl. Mus. Tierk. Dresden* 34: 127–133.
- Eck, S. & Quaisser, C. 2004. Verzeichnis der Typen der Vogelsammlung des Museums für Tierkunde in den Staatlichen Naturhistorischen Sammlungen Dresden. *Zool. Abh. Staatl. Mus. Tierk. Dresden* 54: 233–316.
- Goodwin, D. 1976. *Crows of the world*. Brit. Mus. (Nat. Hist.), London.
- Hartert, E. 1919. Types of birds in the Tring Museum: B. Types in the general collection. *Novit. Zool.* 26: 123–178.
- Hall, R. 1998. The plate tectonics of Cenozoic SE Asia and the distribution of land and sea. Pp. 99–131 in Hall, R. & Holloway, J. D. (eds.) *Biogeography and geological evolution of SE Asia*. Backhuys, The Netherlands.
- Hall, R. 2001. Cenozoic reconstructions of SE Asia and the SW Pacific: changing patterns of land and sea. Pp. 35–56 in Metcalfe, I., Smith, J., Morwood, M. & Davison, I. (eds.) *Faunal and floral migrations and evolutions in South Eastern Asia–Australia*. Swets & Zeitlinger, Lisse.
- Indrawan, M., Masala, Y. & Pesik, L. 1997. Recent bird observations from the Banggai Islands. *Kukila* 9: 61–70.
- Indrawan, M., Masala, Y., Dwiputra, D., Mallo, F. N., Maleso, A., Salim, A., Masala, F., Tinulele, I., Pesik, L., Katiandagho, D. S. & Sunosol. 2010. Rediscovery of the Critically Endangered Banggai Crow *Corvus unicolor* on Peleng Island, Indonesia, part 1: ecology. *Bull. Brit. Orn. Cl.* 130: 154–165.

Inskipp, T., Lindsey, N. & Duckworth, W. 1996. *An annotated checklist of the birds of the Oriental region*. Oriental Bird Club, Sandy.

Jollie, M. 1978. Phylogeny of the species of *Corvus*. *Biologist* 60: 73–108.

King, B. 2007. Tour news (updated 23 October 2007). www.kingbirdtours.com/news.html (accessed 28 February 2008).

Madge, S. & Burn, H. 1994. *Crows and jays: a guide to the crows, jays and magpies of the world*. Houghton Mifflin, Boston.

Masala, Y., Masala, F., Putra, D. D., Mallo, F. N., Herlina, Maleso, A., Mopook, L., Maddus, B., Katiandagho, S. & Indrawan, M. 2008. Erste Fotos der Banggai-Krahe. *Zool. Gesellschaft Arten Populationschutz Mitt.* 24(1): 17.

Meinertzhagen, R. 1926. Introduction to a review of the genus *Corvus*. *Novit. Zool.* 33: 57–121.

Rheindt, F. E., Verbelen, F., Putra, D. D., Rahman, A. & Indrawan, M. 2010. New biogeographic records in the avifauna of Peleng Island (Sulawesi, Indonesia), with taxonomic notes on some endemic taxa. *Bull. Brit. Orn. Cl.* 130: 181–207.

Rothschild, W. & Hartert, E. 1900. [A new species of crow.] *Bull. Brit. Orn. Cl.* 11: 29–30.

Smithe, F. B. 1975. *Naturalist's color guide*. Amer. Mus. Nat. Hist., New York.

Stresemann, E. 1940. Die Vögel von Celebes. Teil III, 1. *J. Orn.* 88: 1–135.

Vaurie, C. 1958. Remarks on some Corvidae of the Indo-Malaya and Australian region. *Amer. Mus. Novit.* 1915: 1–13.

White, C. M. N. & Bruce, M. D. 1986. *The birds of Wallacea (Sulawesi, the Moluccas and Lesser Sunda Islands, Indonesia): an annotated checklist*. BOU Checklist No. 7. British Ornithologists Union, London.

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APPENDIX

Measurements of adult males^a of the Slender-billed Crow *Corvus enca* species group (after Vaurie 1958).

Form	N	Wing length	Tail length	Bill length (measured from skull)	Bill length (measured from nostril)	Bill height ^b
<i>C. e. compiler</i>	5	316–343 (322)	160–70 (165)	65–69 (66.4)	46–49 (47)	14.0–15.5 (15)
<i>C. e. enca</i>	6	282–293 (287)	139–151 (143.5)	55–60 (58)	36–42 (39.5)	12.5–13.5 (13)
<i>C. e. celebensis</i>	10 ^c	255–298 (277)	127–147 (136)	53–58 (55)	35–40 (38)	12–15 (13.7)
<i>C. e. unicolor</i> ^d	2	210, 213	105, 111	46, 46	31, 32	12, 12
<i>C. e. mangoli</i>	2	260, 275 ^e	133, 134 ^e	59, 63 ^e	41, 43 ^e	13, 14 ^e
<i>C. e. violaceus</i>	3	236, 253 (245)	131–136 (134)	50–53 (51.3)	36–38 (36.7)	12.0–13.5 (13)
<i>C. e. pusilus</i>	2	255, 263	134, 136	51, 53	35, 38	13, 14
<i>C. e. samarensis</i>	3 ^f	215–225 (220.7)	102–113 (108)	50–53 (51)	35–37 (35.7)	all 13
<i>C. typicus</i>	6	203–214 (210)	108–117 (112)	45–47 (46)	32–34 (33)	11–13 (12.4)
<i>C. florensis</i>	1 ^g	226	164	48	31	12
<i>C. kubaryi</i>	6	225–242 (234.6)	150–162 (156.5)	53–57 (55.6)	38–42 (40)	11–14 (12.6)

^a Except for adult females or adult unsexed specimens mentioned in the footnotes

^b Upper half of the bill measured at the level of the nostril

^c The type of *C. e. celebensis*, an adult male, has the following measurements: wing, 280; tail, 135; bill from skull, 53; bill from the nostril, 36; height of bill, 15

^d Type of *C. unicolor*; both specimens are unsexed adults

^e Type of *C. e. mangoli*, adult male; the other specimen is an adult female

^f One male, one female, one unsexed, all adults

^g This taxon is known also from only two specimens, the one measured being an adult female



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