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Taxonomy and names of *Carpococcyx* cuckoos from the Greater Sundas

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The ground-dwelling forest cuckoo known as *Carpococcyx radiceus* has since 1923 been regarded as polytypic, with forms on Borneo (nominat race) and Sumatra (race *viridis*). Comparison of six available skins of *viridis* with 10 of the form from Borneo shows that Sumatran birds are 20% smaller, olive green rather than purplish-blue on the wings and tail, buff rather than off-white below, lack the hood of Bornean birds, and appear to have a different periorbital colour pattern (green in Bornean birds, green, pink and blue in Sumatran). Immatures also appear to differ, Bornean being unmarked whitish-buff below, purplish-blue above, Sumatran strongly barred brown and black both above and below. The two forms are thus better regarded as distinct species, to be known as Bornean and Sumatran Ground-cuckoo; the proper scientific name of the former is *Carpococcyx radiatus*. The Sumatran species, known only from the Barisan Range, has not been seen since 1916, and urgently needs to be searched for.

INTRODUCTION

The Sunda Ground-cuckoo *Carpococcyx "radiceus"*, known from the islands of Borneo and Sumatra, has been treated as a threatened species for some years (Collar and Andrew 1988, Collar *et al.* 1994); we maintain below that its specific name should be *radiatus*, and refer to it hereafter by that name. While documenting specimens of this bird at the Natuurhistorisch Museum (RMNH), Leiden, the Netherlands, in preparation for its full review in BirdLife's planned *Threatened birds of Asia*, one of us (NJC) was surprised at the degree of difference between three specimens from Sumatra (race *viridis*) and other material from Borneo (nominat *radiatus*), but had no time on that occasion to take measurements or draw up descriptions. It happened that, from a personal long-standing interest, AJL had already compiled a substantial body of information on the species, and consultation between us quickly revealed that specimens of birds from Sumatra are in fact very rare in collections, the only other material apparently being a fourth mounted specimen in RMNH, three specimens in Museo Civico di Storia Naturale "Giacomo Doria", Genoa (MSNG), Italy, and one in the Zoological Reference Collection of the National University of Singapore (ZRCNUS).

It seemed to us that this paucity of Sumatran material might have resulted in long-term neglect of its true taxonomic status. We duly assembled the three skins (one of which is juvenile) from Leiden and the three (one of which is also juvenile) from Genoa at the Natural History Museum (BMNH), Tring, U.K., for comparison with the series of 10 specimens (nine adult, one subadult) of nominat *radiatus* held there. We also sought to trace every relevant reference in the literature as well as every unpublished record from

fieldworkers, not only to help clarify the taxonomic status of *viridis* but also to establish the conservation status of both forms. A full review of the better known *radiatus* is scheduled (Long and Collar in prep.).

THE HISTORY AND DIAGNOSIS OF *CARPOCOCYX VIRIDIS*

The name *viridis* was proposed by Salvadori (1879) on the basis of the three skins in MSNG mentioned above, collected by the explorer Oduardo Beccari. Salvadori wrote, first quoting from Beccari's ["(B.)"] notes (our translation):

"Eyes blood red; naked skin around the eyes of various colours: green, blue and pale vinous-red; bill near the base blue, upper mandible blackish above, shading into greenish below and towards the tip, lower mandible greenish; feet greenish. - Lives on the ground in gallinaceous manner and was caught in a snare". (B.)

Two of the three specimens are not adult, and are in moult. They have the head, nape, interscapular region, wings and tail a dark shiny green, darker on the head; nowhere do they show the iridescent violet mentioned in the description of typical birds from Borneo. Moreover, they have notably smaller dimensions than those of birds from Borneo. It would be important to compare directly material from Sumatra and Borneo, and if, as is probable, they are recognised as specifically distinct, I propose to call the species from Sumatra *Carpococcyx viridis*.

The juvenile specimen is blackish-brown throughout, with chestnut-brown barring; head a darker blackish; flight and tail feathers greenish-black, edged with reddish-chestnut. I do not think the plumage of the young bird has previously been described.

As it happened, Schlegel (1864) had already had the chance to compare one bird each from the two islands, but only published their differences in size, perhaps assuming some sexual dimorphism (for some reason he decided that his specimen from Borneo, which was the type, was male, not female as reported in Temminck's original description). However, he evidently developed his thoughts on this, since Blasius (1884) published part of a letter from Jentink, written on behalf of Schlegel sometime after 1873 and before 1879, in which Schlegel was reported to have concluded - presumably from knowledge of further Bornean specimens - that the birds from Sumatra represented a variety which he treated under the name "*N. [=Neomorphyus] radiatus* var. *sumatranus*" (a point confirmed by Finsch 1898).

It was in fact this latter author (Finsch 1898) who had the first real opportunity to compare several specimens of birds from both islands and reach a judgement. In a paper so neglected that it does not feature in the bibliographies of major syntheses like Smythies (1981) or van Marle and

Voous (1988) (if it did, there would doubtless be no need for our present paper), Finsch decided that *viridis* "is indeed an excellent species", and furnished redescriptions and measurements of both forms that support his view and considerably extend the information contained in Salvadori's more speculative and rudimentary account (which did not take note of several differences, most notably the extent of the hood in *radiatus*).

However, the evidence provided by Salvadori (1879) and Finsch (1898) was either missed or dismissed by Robinson and Kloss (1923, 1924), who, having earlier readily accepted the separateness of *viridis* (Robinson and Kloss 1918), combined *viridis* as a subspecies of *radiatus*, despite having had access to material of both forms for simultaneous comparison. Since their work, all subsequent authors have accepted subspecific rank for *viridis*, clearly assuming that such an arrangement was appropriate (as so many did with the merging of Javan and Sumatran Cochoas *Cochoa azurea* and *C. beccarii*: see Collar and Andrew 1987) and in most cases lacking access to the evidence that points to the contrary.

THE EVIDENCE FROM MUSEUM MATERIAL

To our knowledge, the number of preserved specimens of *Carpococcyx viridis* is eight (see Table 1). There are two additional possible skins. Blasius (1884) judged that a specimen of a young bird in Göttingen represented a female *C. viridis*, although it is not clear that he could even have been certain it was a Sundaic ground-cuckoo; we have not attempted to trace this skin. Also, a bird dissected by Beddard (1901), which had lived in London Zoo for 18 years, was reported as coming from Sumatra (Sclater 1882). It appears that the skin of this specimen was not preserved (S. Tonge *in litt.* 1995), but in any case it seems likely that there was some confusion over its origins (perhaps it was just the *ship* that came from Sumatra), since Sclater would be expected to have commented on the bird's distinctiveness, given that *viridis* had only three years before been described as a separate species and that this would presumably have been the first specimen, alive or dead, in Britain.

We compared the first six of the birds in Table 1 with the 10 specimens of *C. radiatus* held in BMNH. The mounted specimen (bird 7 in Table 1) was compared by R. W. R. J. Dekker (*in litt.* 1995) with our photographs of the other non-juvenile material, and no difference was detected. The Singapore specimen (bird 8 in Table 1), measured and photographed by Mrs Yang Chang Man (*in litt.* 1995), conforms entirely with specimens 1, 2, 4 and 5 in Table 1. The following descriptions synthesise our notes on the sixteen specimens we personally reviewed, supplemented by data on immature nominate *radiatus* in Bogor (MZB) and New York (AMNH) supplied by S. van Balen and M. LeCroy respectively.

specimen/museum	collector	label sex/age	bill	wing	tail	tarsus
1. MSNG (CE9144)	O. Beccari	"juvenile" ¹	38.3	196	239	68.5
2. MSNG (CE9145)	O. Beccari	unsexed	38.3	225	261	69.4
3. MSNG (CE9146)	O. Beccari	juvenile*	31.6	191	210	65.5
4. RMNH (4)	E. Jacobson	male	42.8	209	267	69.6
5. RMNH (3)	E. Jacobson	imm. female ²	38.5	181	285	64.8
6. RMNH (2)	van Hasselt	juvenile*	39.5	194	250	68.9
7. RMNH (1) ³	S. Müller	adult female	42.4	201	266	73.3
8. ZRCNUS (3.7668) ⁴	E. Jacobson	male	44	210	245	70

Table 1. Measurements of *Carpococcyx viridis*. The two immature/juvenile birds described in the text and analysed separately in Table 2 are marked with an asterisk (*). ¹It is not clear why this bird should have been considered juvenile; Salvadori (1879) regarded it as subadult. The plumage is similar to that of other birds labelled as adults. ²This bird is listed as an immature male in Robinson and Kloss (1924). ³Measurements of this mount were provided by R. W. R. J. Dekker (*in litt.* 1995). Numbers in parentheses after RMNH refer to the catalogued order of these specimens (no other registration numbers exist for them). ⁴This bird is mentioned in Robinson and Kloss (1924), and was traced with the help of D. R. Wells (*in litt.* 1995) to ZRCNUS. Measurements, date of collection and a set of colour photographs were supplied by Mrs Yang Chang Man.

Carpococcyx (radiatus) radiatus

Adult only Crown to nape purplish-black; bare periorbital skin (colour discussed in separate section below) from base of bill extending round and well behind eye; chin and throat matt black extending into purplish-black of the crown behind bare periorbital skin, thus forming distinctive dark hood. Mantle and upper back dull oil green with purplish iridescence, shading to dull coppery purplish-blue on the wing-coverts and flight feathers. Lower back dull chestnut with indistinct dark green barring (visible in Plates 1 and 4). Tail (above) an iridescent purplish-blue, (below) glossy grey-black. Breast and sides of neck pale grey shading on hindneck into dull green of mantle. Lower breast and rest of underparts dull whitish with some buffy tinging (shading into dull chestnut on upper flanks; see also Plate 2), all barred with greenish-grey (dull brown in some specimens); bar widths narrower in ventral region, broader and hence denser on flanks. Lesser underwing-coverts dull chestnut with vague barring.

Bare part coloration: the label of one specimen (BMNH 88.12.10.816) reports "legs, cere and bill green, eyes bright brown"; that of another, collected by A. R. Wallace (BMNH 73.5.12.1791), likewise indicates "iris brown, bill, orbits and feet green". Periorbital colour is discussed separately below; but the foregoing information on the colour of this feature, eyes and legs is confirmed by notes on the original labels of seven of 11 specimens in MZB (an eighth noting eye colour as grey), the other three being unannotated (S. van Balen *in litt.* 1995). Photographs of a live bird (Plates 1-3) also generally confirm these colours, although the iris is brown centrally and grey at the outer edge.

Immature (two females, MZB 17981 and 27716) Upperparts as adult, except for dark greenish-brown crown (one bird showing slight purple gloss), clearly darker than mantle; rusty brown fringes to lower back feathers and greater wing-coverts. Breast (one bird) unmarked rusty brown, belly slightly lighter with some barring on flanks and breast, throat greyish-buff with some bluish-grey feathers emerging; (other bird) as adult, but with less extensive grey, a buff throat with some rusty feathers, and buff tinges towards the vent.

A male (AMNH 628443; Plates 11-12), judged by M. LeCroy to be moulting into adult plumage, has forehead blackish, back of head and nape deep iridescent blue with flashes of oil green, back oil green (centres of feathers deep turquoise), lower back brown and downy, upper tail blackish with purple iridescence. The flight feathers and wing-coverts are purple (distally) and green narrowly bordered tan. Lores, throat, neck and sides of neck are light tan, the upper breast darker (brownish), gradually fading into a lighter, buffier belly with scattered barred feathers, flanks rufous and barred, undertail-coverts rufous with some barring. Another specimen (AMNH 628444) is very similar except that the lower breast and belly, flanks and undertail-coverts are barred as in the adult, while the throat and neck are a darker tan (almost as dark as the upper breast). A bird in BMNH (89.1.17.12), judged immature by Shelley (in Sclater and Shelley 1891), is very close to adult plumage, but has a slight buff tinging to the off-white of its barred underparts, and the chin and throat are part black and part whitish-buff, giving an irregular blotchy effect.

Carpococcyx (radiatus) viridis

Adult (specimens 1, 2, 4 and 5 in Table 1; Plates 4-8) Forecrown blackish shading through blackish-green on middle crown to bottle green on hind-crown; bare periorbital skin (colour discussed below) from base of lower mandible extending behind and around eye. Chin matt black extending as a thin line below eye bordering bare skin. Mantle and upper back dull oil green (slightly paler than the bottle green of the nape) extending onto wing-coverts and into secondaries; primaries glossy greenish-black, showing cobalt in some light. Lower back dull chestnut with broad greenish-brown bars. Tail dull oil green, similar in shade to mantle but glossier, and thus looking grey-black in some lights. Throat and upper breast dull pale greyish-green shading on side of neck into green of mantle. Rest of underparts pale cinnamon-buff becoming more rufous on flanks, rather finely barred with brownish-green on lower breast and with brown on belly and flanks.

Bare part coloration, apart from periorbital skin and what was reported by Beccari (above), is noted on the two Jacobson specimens from 1916: iris raspberry red (RMNH 4), dark reddish-brown (ZRCNUS); upper mandible dark green (RMNH 4) or greenish-black (ZRCNUS), edged with light

Measurements (in mm)	Bill length	Wing	Tail	Tarsus
<i>Carpococcyx viridis</i> (ad)	40.72 ± 2.63	203.7 ± 14.85	260.5 ± 16.59	69.26 ± 2.74
<i>Carpococcyx viridis</i> (juv)	35.0	186	247	65.1
<i>Carpococcyx radiatus</i>	50.8 ± 2.22	255 ± 12.96	305 ± 11.02	84.0 ± 2.34

Table 2. Average measurements of 10 specimens of *Carpococcyx (r.) radiatus*, four apparently adult *C. (r.) viridis* (birds 1, 2, 4 and 5 in Table 1), and two juvenile *C. (r.) viridis* (birds 3 and 6 in Table 1; where individual measurements for these six last are given), with standard deviation.

green, lower mandible pale green or greenish (RMNH 4, ZRCNUS); legs light green (RMNH), grey-green (ZRCNUS), nails pale greenish-grey (RMNH, ZRCNUS).

Immature (specimens 3 and 6 in Table 1; Plates 9–10) Overall rich chestnut with indistinct brown barring on both upper- and underparts, although on area of chin and upper breast the effect is more mottled than barred owing to individual feathers with dark bases and paler edges. Some feathers of wing-coverts show dull oil green suffusion. Tail almost devoid of dark barring; in the RMNH specimen it is chestnut with traces of green suffusion, while in the MSNG bird it is dull iridescent green with chestnut tinging. Flight feathers similar to tail but more obviously suffused green with chestnut edges. The chestnut on the underparts shades into rufous buff on the belly and vent. The area of bare skin round the eye is much reduced.

Distinguishing features

It was immediately apparent from our inspection of the above material that *radiatus* and *viridis* represent levels of divergence not normally embraced by trinomial combination. Bornean birds are larger than those from Sumatra (20–25% so, according to the figures in Table 2); our measurements of Bornean birds conform very well with the smaller samples of different birds given by Finsch (1901), Mayr (1938), Voous (1963) and Davison (1979). Bornean birds are also generally more brightly and contrastingly patterned, their chief colours being black, grey, purplish-blue and off-white, as against the dull merging greens and buff of Sumatran birds. The bare skin around the eye is apparently more extensive in Bornean birds, and may be different-coloured (see next section).

In plumage *radiatus* and *viridis* differ most markedly in head pattern, with *radiatus* possessing a distinctive all-dark hood sharply defined between throat and breast, while *viridis* lacks the hooded appearance owing (first) to the black being confined to the chin, where in any case it offers a less obvious contrast with the grey-green of throat (Plates 6 and 7), and (second) to the dark forecrown shading into green on the centre- and hind-crown (Plate 4). The upperparts of *radiatus* are generally bluish-purple with some green on the back and green tinging of flight feathers, whereas *viridis* is dull oil green

Specimen	Date	Locality	Altitude
1. MSNG (CE9144)	18.7.1878	Mt Singalan a Bella Vista [=Gunung Singgalan], 0°24'S 100°21'E	
2. MSNG (CE9145)	1878	Sumatra	
3. MSNG (CE9146)	1878	Sumatra	
4. RMNH	10.8.1916	Air Njuruk (Pasemah), Palembang, Dempu, 4°0'S 103°10'E	1,400 m
5. RMNH	28.9.1915	Muara Sako (Korintji), 2°5'S 101°16'E	300 m
6. RMNH	1880	Padang Highlands, 0°27'S 100°25'E	
7. RMNH mounted ³	undated [1833-1835]	Sumatra	
8. ZRCNUS (3.7668) ⁴	26.6.1916	Rimbo Pengadang, Lebong Bencoolen [=Bengkulu], 3°18'S 102°25'E	1,000 m

Table 3. Museum specimens of *Carpococcyx viridis*, with their date, locality and altitude information. Collectors are given in Table 1. Co-ordinates are from Van Marle and Voous (1981) and the Birdlife Biodiversity project database.

(Plates 4 and 8). On the underparts *radiatus* is pale grey on the breast where *viridis* is dull pale green, while from the lower breast backwards the base colour of *radiatus* is off-white where that of *viridis* is pale cinnamon-buff (Plate 5). The barring on these base colours is slightly broader and more obvious in *radiatus*, usually with a more clear-cut break at the grey of the upper breast (the white line marking this break can appear conspicuous); in *viridis* the bars become denser and finer on the lower breast, resulting in a less obvious transition to the dull pale green on the upper breast. Furthermore in *radiatus* the area of the upper flanks (hidden by the folded wing) and the adjacent feathering of the lesser coverts is a strong, mostly unbarred cinnamon-chestnut, in marked contrast to the off-white of the normally visible underparts; in *viridis* there is no such patch of richer chestnut on either the upper flanks or the lesser underwing-coverts.

Young *radiatus* superficially resemble adult *viridis*, lacking black on the throat and having buffy undersides. However, at first they evidently lack barring on their underparts - a point also made by Smythies (1981), illustrated in MacKinnon and Phillipps (1993) and depicted in Plates 11–12 - and always possess purplish-blue flight and tail feathers - a point also made in Sclater and Shelley (1891) - whereas young *viridis* apparently always show ventral barring and possess at first brown and then green flight and tail feathers.

A note on periorbital skin colour

The variability Beccari (1878) reported in the colours of the bare periorbital skin of Sumatran birds might yet prove a further diagnostic feature. From context it is impossible to be sure if Beccari meant that the colours occurred

as simultaneous constants in each bird, or in single succession in each bird, or as single constants in different birds. However, Robinson and Kloss (1924) reported the "orbital skin at the lores and above the eye verditer green, behind the eye pale lilac, cheek pale indigo blue", clearly taking this from the labels of the two 1916 specimens in Table 1, whose inscriptions are identical except for using "indigo" (RMNH) and "blue" (ZRCNUS) for cheek colour. Even in the skins themselves there is blue before and red behind the eye (see Plates 6 and 7).

The accounts of Bornean birds in this regard are confusing, but apart from one mention –Ussher's– of two colours being simultaneously present (and even this is a tinge of one over the other) they indicate only a single colour at a time. This is most often "sea" or "olive" green (e.g. Sharpe 1876–1879, Büttikofer 1899; also the Wallace and seven MZB specimens mentioned in our description above). Minor exceptions are Ussher (in Sharpe 1876–1979), who referred to "cobalt, shaded with light green" skin and Grabowsky (in Blasius 1884), who reported it pale grey, although Blasius himself detected green on all bare parts of the same specimen (perhaps he had misread a manuscript "grün" as "grau"). Most puzzlingly, the original collector, Diard, reported the colour around the eye as red, and thus it was depicted in Temminck's (1832) original plate; and Nieuwenhuis, having earlier reported green periorbital skin, later obtained two birds in which the colour was judged (by Finsch 1901) to have been reddish or red in life (although their RMNH labels say nothing on this point). Noting these conflicting reports, Blasius (1884) speculated whether perhaps the colour changes were the product of particular food, or of physical or psychological condition.

Recent observers have all reported green periorbital skin in *radiatus*. Davison (1979) trapped two birds, one male and one unsexed, in which "the bill, bare facial skin, legs, toes and claws were pale hoary green"; M. I. Evans (*in litt.* 1995) glimpsed green around the eye in a bird he fleetingly saw; and J. R. Howes (*in litt.* 1995) discovered and photographed a captive bird whose skin colour remained green both when tranquil and when in aggressive posture (Plates 1–2), as evidently was the case with Davison's birds (it is, however, noteworthy that the area of bare skin below the eye is slightly tinged blue). It would appear, then, that a possible explanation for skin colour variation in *radiatus* is sexual condition or diet, although plain error cannot be ruled out.

On balance, it seems likely that there is a real difference in periorbital skin colour between *radiatus* and *viridis*, the former normally being green and the latter green, blue and pink. However, this is clearly an area for further investigation in the field.

NOMENCLATURE AND NAMES

Temminck (1832) published the first description of a ground-cuckoo from the Sunda islands. Opposite the plate above his text the name "*Calobates radiceus*" appears, but the subsequent index (Temminck 1838) identified the bird as "*Calobates radiatus*". The Latin *radiatus* means "barred", clearly referring to the pattern on the underparts of the bird, while *radiceus* has no contextual meaning (it might be translated as "pertaining to the roots") and was evidently an error for *radiatus*, probably caused by the convergent French name appearing above it: "Calobate radieux". Almost all nineteenth century authors recognised the index name as valid, and indeed *radiatus* was commonly used for a century after its first appearance. However, after Peters (1940) drew attention to the fact that the original spelling had been *radiceus*, the modern but evidently mistaken tendency among authors has been to accept this name. Mees (1964) argued for the correction of Temminck's 1824 name *Columba* (= *Reinwardtoena reinwardtsi* to *reinwardtii* in part because a later index (1839) gave the latter spelling, confirming other evidence that the former was a misprint. On the same principle, given the evident error in the 1832 name and the clear intention of the author to correct it, we submit that *radiatus* represents a justified emendation as expounded in Article 33 of the *International Code of Zoological Nomenclature*, and should formally hereafter stand as the correct name.

Carpococcyx was once thought to be related to Neotropical ground-cuckoos – Schlegel (1864) actually used the genus *Neomorphus*, while Smythies (1981) followed Delacour (1947) in placing it in the Neomorphinae – but any similarities must now be reckoned the product of convergence; in one recent list (Sibley and Monroe 1990), *Carpococcyx* is placed between the malkohas *Phaenicophaeus* and the couas *Coua*, at considerable phylogenetic distance from the New World species. To emphasise this different lineage, a new generic English name for *Carpococcyx* might help. Various observers over time have referred to the pheasant-like behaviour of these birds (see Long and Collar *in prep.*), so that there might have been some logic in reviving Chasen's (1935) "Pheasant Cuckoo", were it not for this name now being taken by the Neotropical *Dromococcyx phasianellus*. Another previously coined name, Sclater (1882) and Beddard's (1901) "fruit-cuckoo", is interesting, but clear evidence of *Carpococcyx* exploiting fruit (a rare circumstance in cuckoos, chiefly shown by the Couinae, Channel-billed Cuckoo *Scythrops novaehollandiae* and Asian Koel *Eudynamis scolopacea*: Payne 1985) is needed before the term could be considered. We therefore suggest continuing with "ground-cuckoo" at least for the moment, with "Bornean" being the epithet for *radiatus* and "Sumatran" for *viridis*.

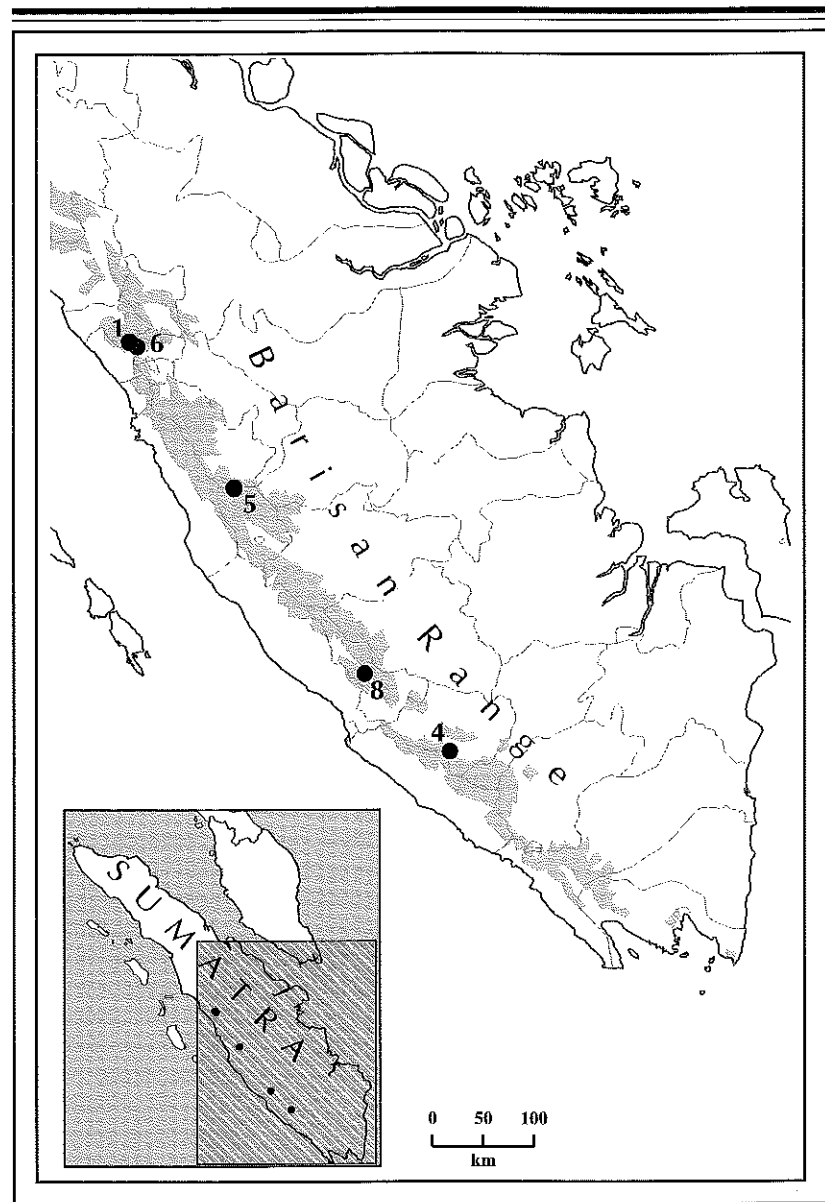


Figure 1. The location of past records of *Carpodoccyx viridis* in Sumatra. The numbers refer to the specimens in Tables 1 and 3, the locality names being: 1, Gunung Singgalang; 4, Air Njuruk; 5, Muara Sako, Gunung Kerinci; 6, Padang highlands; 8, Rimbo Pengadang.

CONSERVATION

We plot the distribution of *Carpodoccyx viridis* in Figure 1. Although it is conceivable that the species has been missed elsewhere in Sumatra, this seems somewhat improbable, and the limited evidence clearly points to it being confined to hilly areas; indeed, Beccari (1878) described it as such. Jacobson's three specimens (specimens 4, 5 and 8 in Table 3) were labelled with their altitudes (300, 1,000 and 1,400 m); and the only two others with specific localities were also from upland areas. This stands in marked contrast to the bird's congener on Borneo, which is widely known from lowland areas close to sea-level, although it also penetrates hill regions (Long and Collar in prep.).

Confinement to the Barisan Range locates *viridis* within the centre of avian endemism labelled the "Sumatra and Peninsular Malaysia Endemic Bird Area" (ICBP 1992). Altogether 36 restricted-range bird species share this EBA, 16 of them being found exclusively within it, and 12 being exclusively Sumatran (Stattersfield *et al.* in prep.). However, at least one-third of the area of montane forest on Sumatra has already been lost, and two-thirds to four-fifths of the lowland forest; moreover, forest loss is probably proceeding faster on this island than anywhere else in Indonesia (Stattersfield *et al.* in prep.).

Carpodoccyx viridis itself has not to our knowledge been recorded since 1916, and must now be one of the longest missing elements of the Sumatran and indeed Oriental avifauna. Given the highly unobtrusive nature of its Bornean congener (see Long and Collar in prep.), it seems unlikely that the species's situation is as bad as this statistic might indicate, especially considering the relative ornithological neglect of Sumatra which (until recently) allowed smaller birds like Schneider's *Pitta pitta schneideri* and Sumatran Cochoa to go unrecorded for many decades. Nevertheless, it is time this bird was rediscovered and learnt about. The Barisan Range is a major repository of biological value, and we strongly recommend new initiatives to catalogue and study the avifauna of the region, with particular reference to its endemic and threatened birds and to the adequacy of the long-term conservation provided for them by existing protected areas.

ACKNOWLEDGEMENTS

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Plates 1-3.
Captive live
Carpococcyx
radiatus,
Brunei,
October 1986.
Photos: J. R.
Howes.

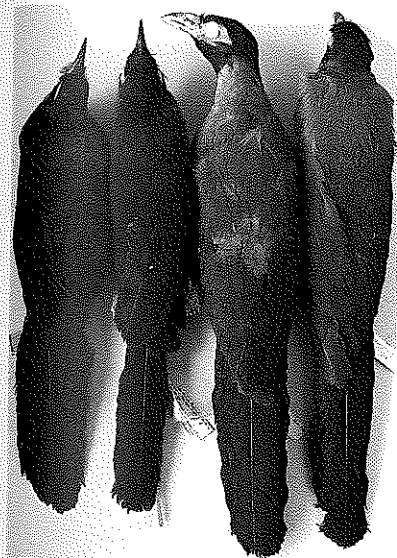


Plate 4.
Dorsal view of
two adult
Carpococcyx
viridis (left)
and two *C.*
radiatus
(right). Photo:
authors.

Plate 5.
Ventral view
of specimens
in Plate 1.
Photo:
authors.

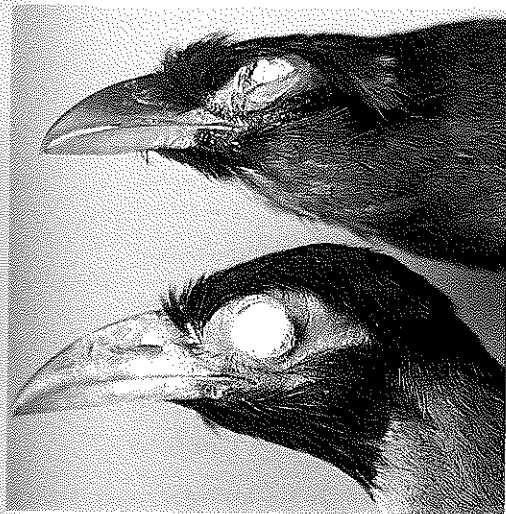
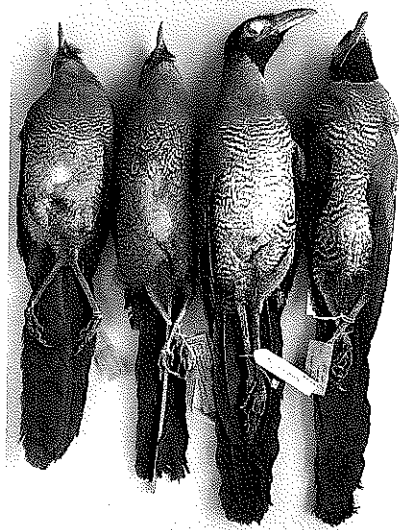


Plate 7. Heads and upper bodies of
Carpococcyx viridis (above) and *C.*
radiatus (below) (different specimens
from those in Plate 6). Photo: authors.

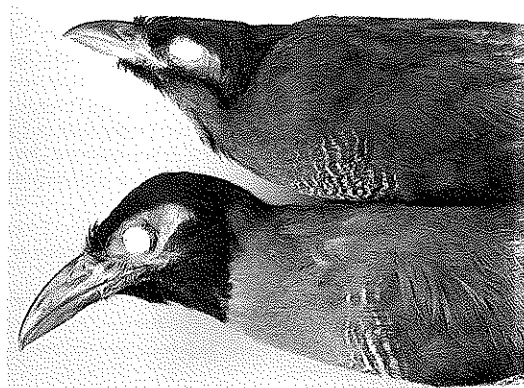


Plate 6. Heads of
Carpococcyx viridis
(above) and *C.*
radiatus (below).
Photo: authors.

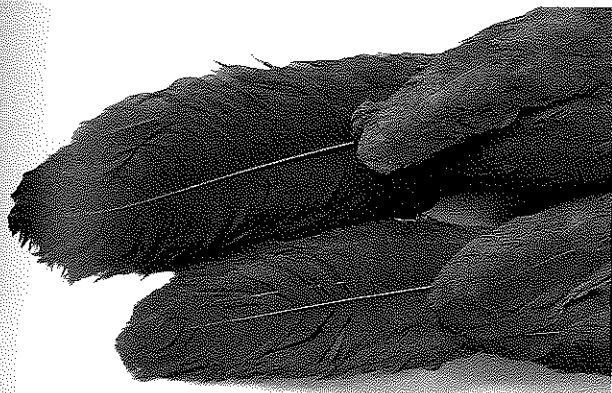


Plate 8. Primaries and
tails of *Carpococcyx viridis*
(lower) and *C. radiatus*
(upper). Photo: authors.

of birds in MZB, AMNH and ZRCNUS respectively. Michael Walters of BMNH kindly acted on our behalf in receiving the RMNH material; we express our thanks to him, Robert Prys-Jones and Effie Warr for their help while working in the BMNH collection. Tim Inskipp was invaluable when A.J.L. was assembling literature on Sundaic *Carpococcyx*, and also provided information on designated names. Jonathan Eames, Mike Evans, John Howes and Dennis Yong kindly made relevant information available to us, and we are most grateful to John Howes for the use of his photographs. N.J.C.'s part in this paper is a contribution from the BirdLife Asian Red Data Book programme, funded by the Japanese Environment Agency through the Wild Bird Society of Japan.

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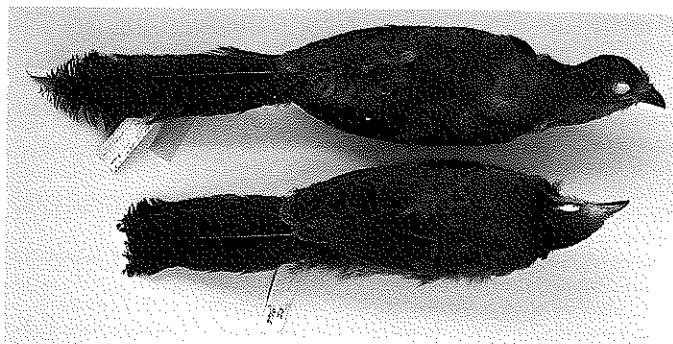


Plate 9.
Dorsal view of
two immature
Carpacoccyx
viridis. Photo:
authors.

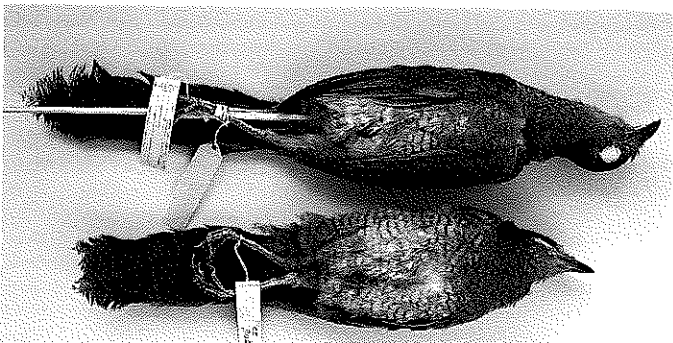


Plate 10.
Ventral view
of specimens
in Plate 9.
Photo:
authors.

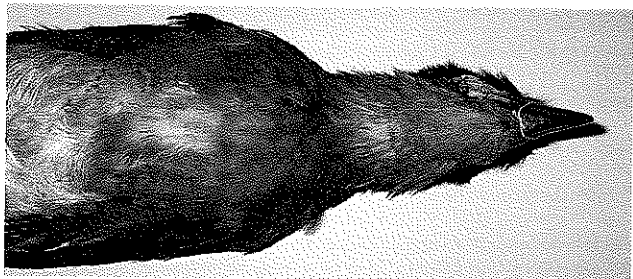


Plate 11.
Ventral view
of upper body
of an
immature
Carpacoccyx
radiatus.
Photo: M.
LeCroy.



Plate 12.
Ventral view
of lower body
of the
specimen in
Plate 11.
Photo: M.
LeCroy.

The habitat, status, vocalizations and breeding biology of Blue-rumped Pitta *Pitta soror annamensis* in central Vietnam

FRANK R. LAMBERT, JONATHAN C. EAMES and NGUYEN CU

The Blue-rumped Pitta *Pitta soror* is a poorly-known Indochinese endemic that also occurs on Hainan. Within this rather limited range, six subspecies are described (Lambert and Woodcock in press). Size and the colour of the crown and nape are the main features used to separate these. During six weeks fieldwork as part of a BirdLife International/IUCN Species Survival Commission survey for Vietnamese *Lophura hatinhensis* and Imperial Pheasants *L. imperialis* in 1994 (Lambert *et al.* 1994, Eames *et al.* in press) and follow-up work by BirdLife International in 1995, new data were collected on *P. s. annamensis*, the subspecies occurring in central Annam and southern Laos. Fieldwork was conducted in June and July 1994 and in June 1995. The observations documented below refer to birds observed in the lowlands of Ha Tinh and Quang Binh provinces, Vietnam.

HABITAT and STATUS

Observations in the Annamese lowlands indicate that Blue-rumped Pittas are tolerant of a wide range of habitat types. Two nests were found in 1994 in dark, damp flat areas of primary riverine forest with a dense understorey dominated by saplings of broad-leaved trees. In the Vu Quang Nature Reserve, Ha Tinh Province (18°20'N 105°20'E), this species was regularly observed in this habitat. In contrast, adults with dependent young were also observed on very steep, dry slopes dominated by fan palms *Licuala* in the understorey, and amongst tangles of vines in dark areas of primary and secondary forest on jagged limestone outcrops in Phong Nha Historical and Cultural Reserve, Quang Binh Province (17°25'N 106°15'E). In all of these areas, Blue-rumped Pitta was found to occur sympatrically with Bar-bellied Pitta *Pitta elliotii*. The incidence of calling and of observations suggested that both these species were common in forested habitats. However, few Blue-rumped Pittas were observed in the bamboo-dominated secondary forests around Ho Ke Go lake, Ha Tinh Province (18°06'N 105°56'E), and in this area Blue-rumped Pittas were observed most commonly on the slopes and valleys on which more closed-canopy forest was present: in 1995, a third nest was discovered in Ky Anh District (by J.C.E. and N.C.) on an east-west ridge at 350 m in logged forest.