

**PROLEGOMENON TO FURTHER STUDIES IN THE  
CHRYSOCOCCYX 'MALAYANUS' GROUP  
(AVES, CUCULIDAE)**

by

**S. A. PARKER**

South Australian Museum, Adelaide

With 2 plates and 2 text-figures

CONTENTS

Abstract . . . . .	3
I. Introduction . . . . .	4
II. Results . . . . .	5
A. Contact and overlap of certain forms . . . . .	5
B. Taxonomy and nomenclature . . . . .	17
C. Annotated checklist . . . . .	26
III. Discussion and conclusions . . . . .	48
IV. Acknowledgements . . . . .	53
V. References . . . . .	53

ABSTRACT

In its present state, the corpus of knowledge constituting our understanding of the *Chrysococcyx 'malayanus'* group is too unorganized to be used directly as the foundation for a modern systematic appraisal. An attempt is here made to rectify this by overhauling the available facts. Stemming from this exercise, a few simple preliminary adjustments to the nomenclature and taxonomy of the group are suggested.

The taxa here recognized are *C. minutillus* (with subspecies *peninsularis* subsp. nov., *albifrons*, *cleis* subsp. nov., *minutillus* and *barnardi*), *C. russatus* (subspecies *aheneus*, *jungei*, *misoriensis* and *russatus*), *C. rufomerus*, *C. crassirostris* and *C. ruficollis*. The type description of *Cuculus malayanus* Raffles, 1822 being recognizable as a female-phase *Chrysococcyx x. xanthorhynchus* (Horsfield, 1821), *C. 'malayanus'* becomes known as *C. minutillus* Gould, 1859, the next available name. *Chalcococcyx niewenhuisi* Vorderman, 1898 is transferred from the synonymy of *C. crassirostris* to that of *C. minutillus*. *Chalcococcyx poecilurus* Gray, 1862 is disassociated from the populations currently under this name (hereafter called *C. russatus misoriensis*) and held in abeyance as a nominal taxon whose reality and relationship to *misoriensis* require further investigation.

The records of *'malayanus'* from Cambodia and Cochinchina are questioned. Those from the Philippines are also examined: whereas the extant specimens are all referable to the Bornean form *C. russatus aheneus*, most of the unsupported records are judged from their descriptions to have been based on female-phase *C. xanthorhynchus amethystinus*. An *aheneus*-like individual netted on the crest of the Main Range in Malaya indicates a situation requiring further study.

*C. m. minutillus* is not known to breed outside northern Australia. Records of this form from the Lesser Sundas, the Moluccas, Celebes (Peleng I.) and southern New Guinea (Utanata R.) are here regarded as being of non-breeding visitors; the holotype of *niewenhuisi* from Halmahera is presumed to have been one such. *C. m. barnardi* and the southern populations of *C. r. russatus* are also migratory; one specimen of the former

and several of the latter are here reported from southern New Guinea, to which region they are doubtless non-breeding visitors. A *russatus*-like form from Timor requires further study.

The ranges of *C. rufomerus* and *C. crassirostris* are possibly largely governed by the distribution of their putative host *Gerygone dorsalis*; old, poorly documented records of *crassirostris* from Sorong, Halmahera, Ternate, Ambon and Gorong, whence no species of *Gerygone* has been reported, are considered to require confirmation.

Attention is drawn to the interesting relationship between *C. minutillus* and *C. russatus* as these species are here construed. In Borneo they appear to enjoy breeding sympatry without hybridizing (*C. m. cleis*, *C. r. aheneus*), whereas in Australia they appear to be hybridizing on secondary contact (*C. m. minutillus*, *C. r. russatus*). Such a situation has parallels elsewhere in zoology. Finally, it is suggested that the colour of the bare periophthalmic ring or eyerim of adult females is of taxonomic significance within the group; however, for females of several forms the colour of this character remains unrecorded.

#### I. INTRODUCTION

The *Chrysococcyx* 'malayanus' group is here taken to consist of the currently recognized forms 'malayanus', *albifrons*, *aheneus*, *jungei*, *rufomerus*, *salvadorii*, *crassirostris*, *poecilurus*, *misoriensis*, *russatus*, *ruficollis*, *minutillus* and *barnardi*. A distinguishing feature of this assemblage is the bright red or orange-red bare periophthalmic ring of adult males (*C. meyerii* of New Guinea, recorded as having an orange periophthalmic ring in the male, is markedly different in plumage from any of the above forms, and is excluded from the present study). This assemblage was last fully revised by Hartert & Stresemann (1925), who tentatively recognized two species — *C. ruficollis* for the form *ruficollis*, and *C. malayanus* for the rest. Their arrangement, modified by Junge (1938), forms the basis of modern treatments (Peters, 1940; Friedmann, 1968).

Many problems remain to be resolved before we can achieve a full understanding of the distribution and taxonomy of these forms, however. The present study is principally an examination of our current sources of knowledge. Based on its conclusions, a revised taxonomic arrangement is offered, together with brief remarks on the characters and distribution of the forms recognized. The statistical analysis that Selander (1971: 75) reasonably expects to accompany a modern taxonomic revision is not attempted here (though some basic statistical values are given in table 2 a-d and fig. 1). Nor will the reader find another feature to which modern revisions may have accustomed him, namely a speculative reconstruction of the group's evolutionary history; in this regard, however, I would point out that the conclusions presented below modify the taxonomy (ex Peters, 1940; Friedmann, 1968) upon which Marchant (1972) and Harrison (1973) based their hypotheses on the evolution and zoogeographic dispersal of *Chrysococcyx*.

Indonesian place names from specimen labels and the literature have, except in original citations, been modernized in their spelling. The changes oe to u, j to y and dj to j have been made without comment. Changes such as Romah to Romang and Goram to Gorong are noted where they first appear. For the larger, better known islands of New Guinea (Irian), Celebes (Sulawesi), Borneo (Kalimantan), Java (Jawa) and Sumatra (Sumatera), however, the English form of the name has been preferred. Measurements of specimens are given in millimetres.

This study has suffered from having been drawn out over nine years (1971-1980) and from the lack of opportunity to examine all, or even the greater part, of the material simultaneously. Contributing to this less than ideal situation were the delays experienced in receiving critical material from certain institutions (two and four years in two cases). Nevertheless, I present here what conclusions I was able to form, in the hope that they will be of some use to others.

Abbreviations of institutions. — AM: Australian Museum, Sydney; AMNH: American Museum of Natural History, New York; ANWC: Australian National Wildlife Collections, CSIRO Division of Wildlife Research, Canberra; BBM: Bernice Bishop Museum, Honolulu; BMNH: British Museum (Natural History), Subdepartment of Ornithology, Tring; CAS: California Academy of Sciences, San Francisco; CMNH: Carnegie Museum of Natural History, Pittsburgh; DMNH: Delaware Museum of Natural History, Greenville; FMNH: Field Museum of Natural History, Chicago; HLW: H.L. White Collection, National Museum of Victoria; MCZ: Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts; MGD: Museo Civico di Storia Naturale 'Giacomo Doria', Genova; MMS: Macleay Museum, Sydney; MNHN: Muséum National d'Histoire Naturelle, Paris; MZB: Museum Zoologicum Bogoriense, Bogor; NLA: National Library of Australia, Canberra; NMNH: National Museum of Natural History, Smithsonian Institution, Washington DC (formerly USNM, United States National Museum); NMV: National Museum of Victoria, Melbourne; PNG: Papua New Guinea Public Museum and Art Gallery, Port Moresby; QM: Queensland Museum, Brisbane; RAOU: Royal Australasian Ornithologists' Union; RMNH: Rijksmuseum van Natuurlijke Historie, Leiden; SAM: South Australian Museum, Adelaide; SMNH: Swedish Museum of Natural History, Stockholm; SMT: Staatliches Museum für Tierkunde, Dresden; UCB: University of California, Berkeley; UMKL: University of Malaya, Kuala Lumpur; USS: University of Singapore (including Raffles Museum bird collection); UZM: Universitetets Zoologiske Museum, Copenhagen; WAM: Western Australian Museum, Perth; ZMA: Zoological Museum, University of Amsterdam; ZMB: Museum für Naturkunde der Humboldt-Universität, East Berlin.

## II. RESULTS

### A. CONTACT AND OVERLAP OF CERTAIN FORMS

Under this heading is discussed not the distribution of each form, but situations within the group involving apparent geographical overlap or

secondary intergradation. The results of these investigations will be considered in the later section on taxonomy and nomenclature.

Overlap or secondary intergradation among forms appears to occur in four regions: Borneo, New Guinea, Australia and the Banda Sea.

#### Borneo

Describing the Bornean populations as a new subspecies *C. malayanus aheneus*, Junge (1938) excluded a specimen from Mount Kinabalu: 'It differs from the (10; S.A.P.) others in having the head much darker (bluish green) and the rest of the upperparts greener, though of a much darker colour than in Malayan specimens (*C. m. malayanus*; S.A.P.). It may be that the northern mountains of Borneo are inhabited by a separate race, but more material is necessary to make this certain.'

Deignan (in Deignan & Amos, 1950) pursued this matter further: 'The senior author has before him nine adults ... from north-eastern Borneo. Three females and three of the males belong to the form called *C. m. aheneus* Junge ... three other males are of the type mentioned by Junge from Mount Kinabalu ... These three might be considered mere colour variants of *aheneus*, if their bills were not distinctly smaller, less robust, and decidedly narrower when viewed from above. They cannot represent a race of the northern Bornean mountains, since an immature from Kinabalu agrees with *aheneus* in size and shape of bill, and one of the three was collected at Abai on 29 June, while *aheneus* was taken at Abai on 27, 29 and 30 June. It is possible that here again we are concerned with two very similar sympatric species.' Deignan was right in his general perception, but wrong in some particulars. The nine specimens before him were presumably the nine Bornean skins held in the MCZ, all but the first below obtained on the Harvard Primate Expedition of 1937 (Coolidge, 1940):

Broad-billed specimens (*aheneus*). — MCZ 236128, ad. ♂, Berau, Jan.-Feb. 1926, coll. E. Mjoberg, pres. T. Barbour; MCZ 197192, ad. ♂ (eyerim coral red), Morutai Besar, 27 June 1937, coll. H. G. Deignan; MCZ 197195, ad. ♀ (eyerim pale yellowish), Morutai Besar, 30 June 1937, coll. Deignan; MCZ 197197, ad. ♂ (eyerim coral red), Abai, 28 July 1937, coll. Deignan; MCZ 197198, ad. ♀ (eyerim pale yellowish), Abai, 29 July 1937, coll. Deignan; MCZ 197663, imm. ♂, Kiau, 3100', Mount Kinabalu, 26 Aug. 1937, coll. Griswold.

Narrow-billed specimens. — MCZ 197193, ad. ♂ (eyerim coral red), Morutai Besar, 29 June 1937, coll. Deignan; MCZ 197194, ad. ♀ (eyerim pale yellowish), Morutai Besar, 29 June 1937, coll. Deignan; MCZ 197196, ad. ♂ (eyerim coral red), Morutai Besar, 3 July 1937, coll. Deignan.

Deignan wrote of three narrow-billed males among these nine specimens. Certainly three are narrow-billed, but only two are males, MCZ 197194 having been sexed as a female. And although this last specimen does have a narrow bill, it agrees in other dimensions and in plumage coloration with specimens of the broad-billed form *aheneus*. Furthermore, its bill width is 5.0, closer to the range of *aheneus* (5.1-6.3) than to that of the narrow-billed form (4.1-4.7). Finally, its eyerim colour, pale yellowish, is that of female *aheneus* and not that predicted below (p. 50) for females of the narrow-billed form, greyish green. I regard MCZ 197194 as a rather narrow-billed example of *aheneus*, rather than as a hybrid between the two forms.

Correcting Deignan's text from the details of the nine specimens listed above, we must write that none of the narrow-billed birds was collected at Abai, while *aheneus* was collected at Morutai Besar on 27, 29 and 30 June and at Abai on 28 and 29 July. Point sympatry among Deignan's records is preserved, but it was at Morutai Besar, not Abai.

Besides examining the narrow-billed specimen from Mount Kinabalu mentioned by Junge (BMNH 1895.11.19.49, ad. ♂, coll. A. Everett), I discovered during the course of the present study three more specimens of this form:

MZB 24739, ad. ♂, Karang Asam, Samarinda, 14 Dec. 1956, coll. A. M. R. Wegner; NMNH 182298, ad. ♂, Pulau Panjang, off east coast of Borneo, 2 May 1913, coll. H. C. Raven; NMNH 182299, ad. ♂, Pulau Panjang, as above.

Riley (1930), under *C. m. malayanus*, listed the last two specimens as from the Maratua Islands, which are actually a little to the east of Pulau Panjang. Peter's (1940) tentative inclusion of the Maratua Islands in the range of *C. m. malayanus* was presumably based upon Riley's action.

#### New Guinea

In New Guinea, the form currently known as *poecilurus* has been recorded throughout the lowlands (chiefly coastal and riverine, rarely up to 150 m, once at ca. 700 m) and on the nearby islands of Daru, Fergusson, Goodenough, Vulcan, Dampier, Tarawai, Waigeu, Misol, Batanta and Aru; the population of Biak (Misori) in Geelvink Bay is known as *misoriensis* (Hartert & Stresemann, 1925; Mayr, 1941; Rand & Gilliard, 1967).

However, there is a so-far unrecognized problem involving these populations, the first glimmer of which appeared in Ogilvie-Grant's (1915) report on material collected by the British Ornithologists' Union and Wollaston expeditions. One should state here that individuals from the resident populations of the New Guinea lowlands and islands are mostly small:

15 adult males from throughout the range have wings of 88-95 and tails of 59-65, and three adult females 88-93.5 and 56.8-62.3 (of numerous subadults and unsexed adults measured, none yielded measurements greater than these). Ogilvie-Grant's remarks being important, I quote them in full. Under *Chalcococcyx poecilurus* he wrote:

'a-c. ♂♀. Mouth of the Mimika River, 14th & 23rd March, 1911. [Nos. 1149, 1244, 1247, C.H.B.G.]

d. ♂ juv. Parimàu, Mimika River, 24th Dec. 1910 [No. 811, C.H.B.G.]

e. ♀. Launch Camp, Setakwa River, 7th Oct. 1912. [C.B.K.]

Adult. Iris rich brown; orbital skin pale greenish; bill black, lower mandible horn-colour; feet dark slate-colour.

These specimens agree well with the type-specimen of *C. poecilurus* Gray, procured by Wallace on Misol; it is marked female and the wing measures 99 mm. Our specimens measure: ♂ 101, ♀ 102, ♀ 100, ♀ 95.

"This Glossy Cuckoo was a tolerably common species on the coast and had much the same habits as *Cacomantis assimilis*" (*variolosus*; S.A.P.). — C.H.B.G.'

TABLE I

Specimens referred to *Chrysococcyx poecilurus*

BMNH reg.no./ Ogilvie-Grant's (1915) list (a-e)	Sex	Wing	Tail	Bill	
				length from skull/ length from feathers/ width	
1873.5.12.381 <sup>1)</sup>	♀	100+	66	18.8/14.9/6	
1911.12.20.981/a	"♀" (?♂)	101	70	19/16.8/6.4	
1911.12.20.982/b <sup>2)</sup>	♀	100	70	22/19.3/7	
1911.12.20.983/c <sup>3)</sup>	♂	101	65	-/-/6	
1911.12.20.985/e <sup>2)</sup>	♀	96.5	64	17/14/6	

<sup>1)</sup> Holotype of *Chalcococcyx poecilurus* Gray. Colour of periophthalmic ring as noted on labels; <sup>2)</sup> pale greenish white; <sup>3)</sup> tomato-red.

In 1974 and 1975 I was able to examine these specimens on loan from the BMNH. The juvenile from Parimau proved to belong to *C. meyerii*. Details of the other five specimens are given in table I. They are similar to specimens of the widespread lowland form, but differ in being greener above without the pronounced purplish or rufescent iridescences of the latter, and in having longer wings and on average longer tails and bills. In addition, putative adult ♂ a has the crown distinctly dark green, contrasting with the

mid-green of the dorsum, and *a* and *b* have a conspicuous unbarred white, wedge-shaped area along the midline of the lower abdomen. In some of these features, and in the greenish white periophthalmic ring of the females (see below, p. 52), they resemble the Australian form *minutillus*, though they are on average substantially larger. Unfortunately I did not at the time make direct comparisons between these skins and skins of *minutillus*, a comparison that would now be of great value.

Local sympatry between the larger and the smaller form may occur. A specimen of each, for instance, has been collected on Misol — the holotype of *poecilurus*, adult ♀, wing 100+, tail 66, and AMNH 627038, adult ♂, wing 88, tail 61, coll. H. Kühn, 13 January 1900. In the much-needed re-examination of this situation, two specimens from Merauke should also be included. These are ZMB 34.2767, with wing 100 and tail 65.5, collected by Dr H. Nevermann on 15 December 1933 (Stresemann & Paludan, 1935) and RMNH 30094, with wing 100 and tail 65.2, collected by A. J. M. Montsanto on 6 May 1959 (Mees, 1964). The latter is of particular interest. Though no sex has been noted on the label, the red paint around the eyes may, if meant to represent the original colour, indicate that the bird was a male. Because the specimen has a faint rufous wash across the breast and a somewhat rufescent tail, it is easy to understand why my friend Dr G. F. Mees, with no comparative Australian material, referred this to *russatus*. However, it lacks the strong rufescent and purpurascens glosses of *C. russatus*. By the colour of its dorsum and the rufous wash across the breast, it could be either a subadult *minutillus* or a *poecilurus*. Until simultaneous comparisons are made, however, its identity, and that of ZMB 34.2767, will remain an open question.

For the present I prefer to associate the specimens from the Mimika and Setakwa rivers at least with the holotype of *Chalcococcyx poecilurus* Gray, in the nominal taxon *Chrysococcyx poecilurus*.

#### Australia

In most popular works, two forms are listed for Australia — *russatus* (Rufous-breasted, now Gould's<sup>1</sup>), Bronze-Cuckoo) and *minutillus* (Little Bronze-Cuckoo). It was the possible existence of a third Australian form that in 1971 prompted me to begin the present study. Hartert & Stresemann (1925) gave the range of *russatus* as Cape York Peninsula, and of

---

<sup>1</sup> See Emu, 78: 270, 298 for English names of Australian forms. In the present paper, Lesser Sunda Bronze-Cuckoo is coined for *C. rufomerus* and Pied Bronze-Cuckoo for *C. crassirostris*.

*minutillus* as the Kimberley, Arnhem Land, Melville Island and north Queensland south of the Cape York Peninsula. This distribution was repeated by Peters (1940) and Friedmann (1968). It occurred to me that the range of *minutillus* could thus well be disjunct. On the present evidence, this does appear to be the case: *minutillus* proper occurs in northern coastal and subcoastal districts from the Kimberley to the Carpentarian drainage of Cape York Peninsula, while 'south of the Cape York Peninsula', in south-eastern Queensland and north-eastern New South Wales, there exists a similar but separate form. Examination of material showed that the latter differed sufficiently from true *minutillus* (see below) to warrant recognition as a separate subspecies, an available name being *Chrysococcyx barnardi* Mathews, 1912, with type locality Coomoooolaroo, Dawson River, Queensland. Analysis of available records showed that *barnardi* was at least partly migratory, appearing in south-eastern Queensland and north-eastern N.S.W. in October-January (occasionally as early as August), and breeding there in October-November. That at least some individuals wintered to the north of these breeding grounds was demonstrated by my discovery in collections of specimens of *barnardi* from Rockingham Bay, Cairns, Utingu and the Hann River, northern Queensland, and the Port Moresby district, New Guinea. Independently, Storr (1973: 65) had, by an exhaustive analysis of the literature, reached conclusions very similar to mine (see also McGill & Goddard, 1979).

There appears to be some interbreeding between *russatus* and one or both of the other Australian forms, judging by a small number of specimens that I could not assign with confidence to any of the three forms (see below under *C. russatus*). Because of the factor of migration, the provenance of these specimens cannot be taken with certainty as their place of hatching.

Although at least some individuals of *barnardi* winter within the range of *russatus*, breeding contact between these two forms is as yet unknown, the gap between their known breeding ranges being from Bowen to Byfield. Hybridization between *minutillus* and *russatus*, however, is at least equally likely, judging by their apparent contact in the breeding season in the Carpentarian drainage of the Cape York Peninsula (see fig. 2). Finally, although the northern populations of *russatus* appear to be sedentary, the southern ones (which have longer wings), may be north-south migrants, as evinced by long-winged *russatus* collected on the northern Cape York Peninsula<sup>1)</sup> and along the southern coast of New Guinea in the non-breeding season.

---

<sup>1)</sup> Specimens in QM; see Table 2a and Broadbent, 1885.



## The Banda Sea (Lesser Sundas — Moluccas)

The problems associated with the populations of this region stem mainly from the identity of individuals possessing a good deal of rufous in the tail. In some early papers (e.g. Stresemann, 1914) these were regarded as examples of '*poecilurus*' sensu lato. Hartert & Stresemann (1925), however, suggested that they were immatures of the local forms *crassirostris* and *rufomerus*, and that the usual dark-tailed individuals from this region were the adults of these.

Mayr (1939) identified these rufous-tailed birds as *minutillus* of northern Australia. In suggesting this, however, he did not make clear that he was not referring to all such individuals. *Minutillus* does indeed have a good deal of rufous in the tail, but — and this is what Mayr failed to point out — so do immatures of *crassirostris*. The tails of young *crassirostris*, in fact, closely resemble the tails of *C. russatus*, whereas those of immature *rufomerus* resemble those of adults in lacking rufous (see below, pp. 21-22).

Mayr stated that it would be logical to consider *minutillus* as a winter visitor to the Banda Sea were it not for the fact that six of the thirteen specimens he examined were taken during November, December and February — the breeding season of *minutillus* in Australia. Deignan & Amos (1950), responding to Mayr's request for information on the migratory movements of *minutillus*, showed that the latter had been recorded in the northern Northern Territory in all months except August and September. They concluded that *minutillus* was either only partly migratory, or that its populations in the Banda Sea were resident. Friedmann (1968: 29), after noting cases of partial migration in other species of cuckoos, suggested that the first alternative was the more likely.

Before commenting on these ideas, it will be necessary to assess the information upon which they have been based. To this end I have examined the sources of the records of *minutillus*, *rufomerus* and *crassirostris* from the Lesser Sundas, the Moluccas and Celebes, a lengthy but essential procedure.

1. — Specimens of *minutillus* (examined by Mayr, 1939 and/or me): Wetar, 25 Feb. 1898 (RMNH, coll. C. Schädler), 18 April 1901, 30 Sept. 1902 (2; these and the following six are in the AMNH, coll. H. Kühn); Romang (Romah), 5 Aug. 1902; Leti, 4 and 12 Nov., 21 Dec. 1902; Moa, 8 Dec. 1902; Add, northern Great Kai, 1 Aug. 1900; Seran (Ceram), 14 May 1911 (AMNH, coll. E. Stresemann); Gorong (Goram), no data (RMNH); Buru (spelt Baru in Mayr), 3 Nov. 1864 (RMNH, coll. C. Hoedt); Ambon (Amboina), no data (RMNH); Waai, Ambon, 25 July 1959 (MZB, coll. A. M. R. Wegner, not previously published).

Besides the specimen from Waai, there are three others here referred to *minutillus* for the first time:

a) Peleng I., off eastern arm of Celebes, SMT C45647, collected 29 July 1938 by J. J. Menden. Eck (1976: 66) listed this under the Celebes form *jungei*, though with misgivings: 'Wenn die Peleng-Vögel wirklich zu *jungei* gehören, was nach 1 Ex. schwer zu beurteilen ist, dann hat diese (offensichtlich) im Norden und Osten von Sulawesi fehlende Subspezies eine zerrissene Verbreitung. Gewiss ist aber die Peleng-Population westlicher Herkunft.'

I have examined this specimen on loan. Although sexed as female by the collector, it is noted by the latter as having the eyerim red, which is a male character; it also has the contrasting bottle-green cap of the adult male.

b) Gani, Halmahera, holotype of *Chalcococcyx niewwenhuisi* Vorderman, 1898. The specimen is now lost, but judging from its original description (see below) it was an individual of *C. minutillus* and not, as has been considered lately, of *C. crassirostris*.

c) Utanata River, southwestern New Guinea. RMNH 1, collected June 1828 by S. Müller; listed by Müller (1845) as *Cuc. lucidus*. There are no previous records of *minutillus* from New Guinea, and this specimen (a sub-adult with a rufous wash on the breast) is only tentatively referred to this form.

2. — Specimens of *rufomerus* (all collected by H. Kühn and in the AMNH unless otherwise stated): Moa, 20 (2) and 30 Nov., 8, 11 and 12 Dec. 1902; Leti, 3 and 4 Nov., 12, 20, 21 (2), 22 and 27 Dec. 1902; Romang, 13 July, 1, 3, 5, 15 and 25 Aug. 1902; Sermata, 18 June 1906; Kisar, June 1866 (RMNH, coll. C. Hoedt, holotype of *Chalcococcyx innominatus* Finsch, 1900); Batu Onerah, Damar Is., 9 Nov. 1898; Wulur, Damar I., 24 Nov., 1, 11, 18, 21 Dec. 1898 (AMNH), Dec. 1898 (ZMB), 10 Dec. 1898 (SMT); Kuway, Damar Is., 12 Nov. 1898.

The specimen from Kisar was inadvertently listed by Junge (1938) as *crassirostris*, which is presumably why Peters (1940: 33-34) listed both *rufomerus* and *crassirostris* from this island.

I have examined the specimen in the RMNH from Wetar collected by C. Schädler on 17 Feb. 1898 and listed by Mayr (1939) as *rufomerus*. It is in fact an immature *C. lucidus plagosus*.

3. — Specimens of *crassirostris* (\* denotes syntypes of *Lamprococcyx crassirostris* Salvadori, 1878): \* Tual, Little Kai, Aug. 1873 (MGD, coll. O. Beccari; selected as 'type' by Salvadori, 1880: 355; \* Little Kai (RMNH 2, ex C. von Rosenberg); Tual, Little Kai, 2 Sept. 1897, 19 Feb. and 22 April 1898, 15 and 20 Sept. 1899 (AMNH, coll. H. Kühn); Rumadan, Little Kai,

9 April 1898 (AMNH, coll. H. Kühn); Kilsuin, Kur Is., 21 June, 14 July 1899 (AMNH, coll. H. Kühn); Taam, 28 July 1899 (AMNH, coll. H. Kühn); Larat, Tanimbar Is., 18 Feb. 1901 (AMNH, coll. H. Kühn).

The occurrence of *crassirostris* on the above islands is placed beyond reasonable doubt by Kühn's specimens alone, which bear his original labels. No such reassuring circumstances surround the specimens upon which rest the records of this form from Gorong, Ternate, Ambon, Halmahera and Sorong:

a) Gorong. — \* RMNH 6, second-phase ♀, ex C. von Rosenberg No. 1670. No original label.

Kühn collected on Gorong for at least five days in November 1899 without obtaining *crassirostris* (Hartert, 1901). However, this may signify nothing more than its temporary absence from the island (see below).

b) Ternate. — \* RMNH 7, second-phase, ♂, ex C. von Rosenberg, 1872. No original label. MZB 2646, first-phase, labelled '♀ ex Vorderman, NT (= Natuurk. Tijdschr. Ned.-Indië; S.A.P.) Vol. 58 p. 195.'

Ternate was once an important centre of the feather trade. Bird skins bought at Ternate, and labelled accordingly, often came from other Moluccan islands, even from New Guinea (Vorderman, 1898: 169-170; Van Bemmelen, 1948: 328). This should be borne in mind when considering the authenticity of Von Rosenberg's specimen RMNH 7. Furthermore, there is the probability of error relating to information on the labels of old RMNH specimens, stemming from the relabelling that went on during the directorates of Schlegel and Finsch (Mees, in litt. 21 March 1973). A specific irregularity concerning RMNH 7 is that, although it bears the date 1872, Von Rosenberg returned to Europe in 1871 and never went back to the tropics (Mees, in litt. 26 March 1979).

MZB 2646 is less easy to discredit. It was allegedly obtained on Ternate by Vorderman during his expedition to Celebes and the Moluccas, and was described by him in detail (Vorderman, 1898: 195). Vorderman used a hunter to collect for him, and on Ternate the hunting excursions extended to the surroundings of the capital (Vorderman, 1898: 169). Although Vorderman did not state explicitly that this specimen was taken in the wild by his hunter rather than obtained from the Ternate bird skin trade referred to, the latter possibility cannot be ruled out, especially as the occurrence of *C. crassirostris* on Ternate has not been otherwise validated. On the other hand, Vorderman's specimen bears on its label details of sex (♀) and colour of eyerim (orange), details that might not have been present on a trade skin.

Curiously, Vorderman seems not to have given any dates for his specimens or itinerary on Celebes and in the Moluccas; the only indication I have

found of the time of his trip is the dateline of his paper on the birds he obtained on the first leg, 30 September 1897 (Natuurk. Tijdschr. Ned.-Indië, 58: 121).

c) Ambon. — \* RMNH 1, moulting from rufescent (first-phase) juvenile plumage directly into ? subadult plumage; label (not the original) inscribed: 'Amboina, ♂, chang., 1828, S. Müller.'

Müller (1845: 234) wrote: '*Cuc. lucidus*, welken wij te Amboina en aan de westkust van Nieuw-Guinea opmerkten.' Presumably a specimen of *minutillus* in the RMNH collected on the Utanata River by Müller in June 1828 is the basis of the latter's report of '*lucidus*' from the west coast of New Guinea. But is the present skin the basis of his record from Ambon? Although the concept of '*lucidus*' was in Müller's time quite broad, and took in specimens subsequently identified as *C. basalis* and *C. malayanus*, one may doubt whether Müller would have stretched it to include a bird of the appearance of RMNH 1, or listed this and the Utanata River skin under the same name without comment. For RMNH 1 is quite different from the Utanata River bird, indeed from any phase of *C. lucidus*, *C. basalis* or *C. malayanus*, being a rufescent (first-phase) juvenile with a few dark feathers of a later plumage coming through (see pp. 20-21). What seems more likely is that the basis of Müller's record of '*lucidus*' from Ambon was RMNH 4, a specimen of *minutillus* currently labelled merely 'Amboina' and lacking its collector's name. The details currently accompanying RMNH 1 ('Amboina, 1828, Müller'), could have been added by mistake during the extensive recopying of labels that went on in the RMNH in its early days.

Pfeffer collected on Ambon between 15 October and 30 November 1961 without obtaining any specimens of *crassirostris* or *minutillus* (Berlioz & Pfeffer, 1966). Nor did McKean (1980 and in litt., April 1980) record these or any other bronze-cuckoos on Ambon during a brief ornithological survey 14-17 March 1980.

d) Halmahera. — i) Holotype of *Chalcococcyx nieuwenhuisi* Vorderman, 1898, collected by Vorderman at Gani, Halmahera, date unknown.

As early as 1900, Finch had to report that this specimen was missing; certainly it is not in the RMNH or the MZB. Stresemann (1914) had no doubt that Vorderman's description referred to a specimen of '*poecilurus*' (i.e. the New Guinea population as then construed). Hartert & Stresemann (1925), however, placed *nieuwenhuisi* in the synonymy of *crassirostris* without comment. Vorderman's description is of a bird with rufous in the tail and with all the underside, the sides of the head and the underwing coverts marked with glossy green-black transverse bars. This description rules out a second-phase immature *crassirostris*, which would have rufous

in the tail but only faint dull brown bars at most on the underside; it fits very well, however, an adult *minutillus*. I therefore transfer the name *Chalcococcyx nieuwenhuisi* Vorderman to the synonymy of *C. m. minutillus* Gould.

ii) \*RMNH 5, ? ad. ♀ (labelled ad. ♂), Von Rosenberg, 17 June 1876 (on label; June 1874 fide Finsch, 1900: 99).

Finsch (1900) regarded this specimen as differing very greatly from *crassirostris* and referred it instead to *nieuwenhuisi*. Why he did this, when it has no rufous in the tail and no glossy green-black ventral barring, is not clear. RMNH 5 bears no original label. In view of the date on the museum label, 17 June 1876, it must again be pointed out that Von Rosenberg returned to Europe in 1871.

iii) Shelley (1891: 301-302) listed only one specimen of *crassirostris* in the BMNH, an adult from Halmahera in the Tweeddale Collection. This specimen cannot now be found, nor is there any reference to it in the register entries for the Tweeddale Collection (C. J. O. Harrison, in litt. 5 May 1980). On the other hand, there is in the Tweeddale Collection a specimen of *crassirostris*, BMNH 1888.12.10.354, labelled 'Java'; this, an individual in the putative adult female phase, was not mentioned by Shelley. It is possible that Shelley muddled the localities, writing Halmahera for Java, itself an erroneous locality.

It remains to note here that among the more than 350 specimens collected by De Haan on Halmahera and Morotai there are no specimens of *crassirostris* (G. F. Mees, in litt. 1 April 1980), nor apparently did Bernstein obtain this form during his visit to Halmahera in 1861.

e) Sorong. — \*RMNH 3, adult female; Bernstein, 1865. No original label. \*RMNH 4, rufescent (first-phase) juvenile moulting directly into ? sub-adult plumage; Bernstein, 1864. No original label.

Hartert & Stresemann (1925) were the first to snipe, albeit inaccurately, at this record: 'Sorong. ... Von der gleichen Insel stammt der Typus von *Lamprococcyx poeciluroides* Salvadori.' Gilliard omitted this record from Rand & Gilliard (1967) on the personal advice of Professor Stresemann (M. LeCroy, in litt. 25 May 1972). Mees (in litt. 21 March 1973) had this to say:

'The two specimens of *C. crassirostris* from Sorong are undoubtedly referable to that species, as they should be as they are syntypes of it. Both Salvadori and Finsch have mentioned Bernstein as collector. One is labelled Sorong, 1864, and one Sorong, 1865. From Bernstein's published diaries it is known that he stayed at Sorong from 21 November 1864 to 14 February 1865. However, the specimens in question have been mounted. This was the

usual procedure under Schlegel's directorate: when specimens came in they were mounted, the original labels were immediately destroyed, and such information as was considered important (and that appears to have been very little), was written in pencil under the soles. Later, about 1900, Finsch has relaxed the mounts and made them back to study-skins, the pedestals were thrown away, and Finsch copied the notes written on them on the labels they have now. Thus, there must have been ample opportunity for errors in copying. Also, I have read Bernstein's *Dagboek*, and found no mention anywhere of bronze-cuckoos during his stay at Sorong. This, however, is inconclusive, as he did evidently not mention all birds collected in his notes (many of his specimens were brought in by native hunters). To summarize: the authenticity of provenance cannot be disproved, but sufficient doubt is attached to the specimens for you to query or dismiss the locality if you find it geographically unacceptable. On the same journey Bernstein visited Ternate and Halmahera.'

From the above remarks, it might be concluded that the records of *crassirostris* from Sorong, Halmahera, Ternate, Ambon and Gorong require confirmation. It must be admitted, however, that the above evidence for the rejection of these records could be stronger. We shall now note two hitherto unremarked factors, possibly related, that may exert a fundamental influence on *crassirostris* and *rufomerus*, and which thus may be used to test the restrictions we have imposed above upon the current interpretation of data concerning their distribution and occurrence.

The first factor is that of topography. Gorong, Ternate, Ambon, Halmahera and Sorong are high, mainly large islands, and thus differ from the islands on which *crassirostris* has been authentically recorded, which are all small, low and coralline. Wetar, removed above from the distribution of *rufomerus*, differs from the authenticated localities of the latter in the same way.

The second factor, possibly the more fundamental, is that of the cuckoos' hosts. The main hosts of forms of the '*malayanus*' group are species of *Gerygone*; in Australia these cuckoos parasitize these little warbler-like birds almost exclusively. In the Lesser Sundas and the Moluccas, the authenticated ranges of *crassirostris*, *rufomerus* and the related *salvadorii* (Babar) coincide very closely with the range of the similarly endemic *Gerygone dorsalis*, which is known from Kisar, Moea, Leti, Romang, Damar Is. (Wulur, Kuway, Batu Merah), Babar, Tanimbar Is. (Larat, Lutu, Molu, Yamdena, Selaru; see Parker, ms. 1961) and Kur, Manggur, Tajandu, Taam and Little Kai (Van Bemmelen, 1948). No *Gerygone* has been recorded from Gorong, Ambon, Seran, Buru, Ternate or Halmahera, or any other island

in the Moluccas north of the Kur group. Thus, it is possible that the distribution of *crassirostris* and *rufomerus* is influenced by that of *Gerygone dorsalis*, in which case its correlation with small low coral islands may be secondary.

Having played devil's advocate with the poorly substantiated and unconfirmed records of *crassirostris* from Gorong, Ternate, Ambon, Halma-hera and Sorong, one is now bound to remark a circumstance that may point to *crassirostris* being at least partly migratory and therefore conceivably occurring on islands other than those on which *Gerygone dorsalis* breeds. Although both *crassirostris* and *G. dorsalis* were collected on Taam by Kühn in July 1899, neither species was encountered there during a recent survey from 19 April to 22 May 1971 (Schodde & Mathews, 1977). If their recent absence is not due to local extinction, it is possible that both species are migratory or at least undergo limited post-breeding dispersal. If this is the case, then the failure of Kühn to obtain *crassirostris* on Gorong in November 1899 need not be an obstacle to accepting Von Rosenberg's earlier record from Gorong (RMNH 6), which may have been of a non-breeding visitor.

But if the records of *crassirostris* from the large high islands of the Moluccas can be questioned in any way, what of the records of *minutillus* from these islands? Some at least are beyond reasonable doubt, such as the specimen collected by Stresemann on Seran in May 1911, and the one secured by Wegner on Ambon in July 1959. *Gerygone* being absent, it is likely that *minutillus* is a non-breeding visitor. If this is so, it may well be a non-breeding visitor to the whole Banda Sea region, even to those islands on which *G. dorsalis* does occur; this interpretation would remove the difficulty of explaining how *minutillus* and *crassirostris-rufomerus* could co-exist in breeding sympatry on such small islands. Possibly *minutillus* is a partial migrant, with both its breeding range (northern Australia) and non-breeding range (Lesser Sundas, Moluccas, Peleng I., ? southern New Guinea) occupied by some individuals all year round; perhaps most of the individuals overwintering beyond Australia are youngish birds not yet ready to breed.

#### B. TAXONOMY AND NOMENCLATURE

The following remarks on the taxonomy and nomenclature of the '*malayanus*' group, which stem in part from the above investigation into the distribution and interaction of various forms, provide the basis of the proposed systematic list later in this paper.

*Chrysococcyx ruficollis*

*C. ruficollis*, of the mountains of New Guinea, is without doubt a distinct species. Shelley (1891: 300) suggested that the holotype may only have been an abnormal specimen of '*poecilurus*' (with which he included *russatus*). Further material, however, showed that this was not the case (Hartert & Stresemann, 1925). *C. ruficollis* differs from the New Guinea populations at present grouped under *poecilurus* by its tail pattern, sexual dimorphism, altitudinal range and habitat (montane rain forest between 1600 m and 2600 m vs. mainly riverine and coastal lowland forest and mangroves) and apparently also by its call (Stein, 1936).

The '*poecilurus*' forms of New Guinea

As noted above, there appear to be two forms in New Guinea, a large local one and a smaller widespread one, apparently sympatric on Misol. This situation, one of the most intriguing in the whole *malayanus* group, richly deserves further attention, though the possibility of obtaining more specimens and field observations is at present remote. In the meantime, I prefer to segregate the larger specimens (Misol, Mimika R., Setakwa R.) in the nominal taxon *Chrysococcyx poecilurus* Gray. This commitment of the name *poecilurus* raises the question of the name of the small form. Available names are:

*Lamprococcyx misoriensis* Salvadori, 1875, Annal. Mus. Civ. Stor. Nat. Giacomo Doria, 7: 914 (Korido, Biak, Geelvink Bay; based on a single specimen collected on 19 May 1875 by Beccari).

*Lamprococcyx poeciluroides* Salvadori, 1878, Annal. Mus. Civ. Stor. Nat. Giacomo Doria, 13: 460 (Samson River, northern Vogelkop, and Tarawai (Bertrand) I. off north coast between Mamberano R. and Humboldt Bay; both specimens collected by or for Bruijn, that from the Vogelkop on 28 June 1875).

The holotype of *misoriensis* and the Samson River syntype of *poeciluroides* (subsequently selected as 'type' by Salvadori) have recently come to light again at Genova (Arbocco et al., 1979: 201), an earlier search there on my behalf having been unsuccessful. Eventually, they will need to be examined in connexion with the present problem. However, nothing in Salvadori's descriptions (1875, 1878, 1880) precludes their identification as the small widespread lowland form, except at first glance the following: 'tectricibus alarum inferioribus albis unicoloribus' (*misoriensis*) and 'subalaribus albidis paullum rufescentibus, minime transfasciatis' (*poeciluroides*). But as Shelley (1891: 300) pointed out (and Hartert & Stresemann failed



to note), unbarred or hardly barred underwing coverts are in the '*malayanus*' group a character of immature birds — indeed, Salvadori stated that one of the two specimens of *poeciluroides* was not completely adult, while the other was even younger. It is strange then that Hartert & Stresemann (1925) and all subsequent authors have used *misoriensis* for a subspecies on Biak supposed to differ from other New Guinea populations by its unbarred underwing coverts, and yet placed *poeciluroides* in the synonymy of the latter populations. Pending an examination of the types, I consider it reasonable to use *misoriensis* (syn. *poeciluroides*) for the small widespread form on New Guinea and offshore islands. Biak and other islands in Geelvink Bay having a significant degree of endemism, however (Mayr & Meyer de Schauensee, 1940), further specimens from there may show that the island is indeed inhabited by a distinct form.

The *crassirostris-rufomerus* group

*Crassirostris* and *rufomerus* were tentatively regarded by Hartert & Stresemann (1925) and Mayr (1939) as conspecific with *malayanus*. Even though I suggest above that there is no breeding sympatry between these forms and *minutillus*, I agree with Deignan & Amos (1950) that they should be withdrawn from *C. 'malayanus'*. The latter authors argued that *crassirostris* and *rufomerus* resembled each other, and differed from the other forms in the group, in the colour and patterning of the tail, which in the adult is mainly blackish blue (*crassirostris*) or blackish green (*rufomerus*) with white spots on the outer rectrices. To this can be added the likelihood that *crassirostris* and *rufomerus* differ in their ecology from the other forms, in that they are apparently confined to small low islands within the range of *Gerygone dorsalis*. However, we shall not be in a position to consider whether *crassirostris* and *rufomerus* are conspecific (as Deignan & Amos considered them) until we have determined their plumage phases, and investigated the equivocal indications of hybridization and introgression between the two forms. So far there is almost no material available fit for such a study, but we can at least attempt a brief survey of the problem.

a) *Crassirostris*. — Concerning the plumage of the adult male of this form there need be little conjecture, for several specimens of this phase are available from the generally reliable Kühn. The upperparts, lores and face are a shining blackish blue, the underparts whitish with a few short weak brown bars on the flanks, and the tail blackish, with white spots on the outer rectrices. There is a white wing patch formed by the upper secondary coverts, which Salvadori (1880) incorrectly regarded as an immature character lost in the adult.

Leaving for a moment the question of the plumage of the adult female, we pass to the immature plumages. Hartert & Stresemann recognized two, which they called the first (juvenile) and the second (transitional) plumages. Both have the rufous, blackish and white tail pattern of *russatus* and *minutillus*, a similarity that gave rise to the early confusion between specimens of the latter and *crassirostris* in the transitional phase.

i) First (juvenile) plumage. Two specimens examined: AMNH 627132, ♀, Tual, Little Kai, 22 April 1898. Upperparts and face dull rufous, faintly tinged greenish; primaries and primary coverts blackish brown; underparts whitish with a few extremely faint fuscous bars on breast and flanks. Rectrices: outermost pair whitish barred black and rufous, the rest rufous with dark subterminal smudges, the pair next to the outermost also with faint blackish barring.

MZB 2646, 'Ternate'. Similar to AMNH 627132 but green tint of upperparts slightly more pronounced and with cinnamon wash across breast. Rectrices: outermost three pairs in moult, from vaguely banded or unbanded rectrices of first plumage to more strongly marked rectrices of second plumage. This is the specimen described by Vorderman (1898: 195).

This rufous plumage appears to be unique in the '*malayanus*' group. In other forms for which the first plumage is known, such as *rufomerus*, *minutillus*, *russatus* and *misoriensis*, the upperparts are much greener.

ii) Second (transitional) plumage. Specimens examined: AMNH 627130, ♀, Tual, Little Kai, 2 Sept. 1897; AMNH 627131, ♀, Tual, 20 Sept. 1899; RMNH 6, ♀, 'Gorong'; RMNH 7, ♂, 'Ternate'.

These four specimens are similar to one another, having the upperparts brownish with a dull green gloss, pronounced rufous edges to the upper secondary coverts, underparts whitish with faint dull-brown glossless barring mainly on breast and flanks, and the tail pattern of *minutillus* (from which they differ in being brownish green, not greyish green, above).

Clues to the plumage of the adult female may be provided by the following specimens: AMNH 627128, Tual, 29 Sept. 1897, '♂' (Kühn); AMNH 627129, Tual, 19 Feb. 1898, '♀' (Kühn); AMNH 627135, Taam, 28 July 1899, '♀' (Kühn); ZMA 32.799, no data; RMNH 3, 'Sorong, ♀ ad.' (Bernstein); RMNH 5, 'Halmahera, ♂ ad.' (Von Rosenberg); BMNH 88.12.10.354, 'Java' (Tweeddale Coll.).

These are very similar to one another; they resemble the adult male in patterning but have the upperparts a dark oil-green, the face dark brown tinged to varying degrees with dark green.

There remain to be discussed three anomalous specimens: RMNH 1, '♂ chang., Amboina'; RMNH 2, '♀ jun.', Little Kai; RMNH 4, '♀ chang., Sorong'.

These three are moulting straight from the rufescent first plumage into one beyond the second phase. The upperparts are a patchwork of rufous juvenile and dark adult-type feathers. What is especially interesting, however, is that whereas the new feathers of the wing, dorsum and tail are dark oil-green, those of the crown are violet-black. Thus, the definitive state of this plumage could be expected to resemble that of neither the adult male nor the putative adult female. Possibly it represents a subadult phase.

A point concerning the white wing patch of the adult (and ? subadult) phases is that both its presence and its variability (individual and asymmetrical) could well be attributable to incipient leucism ('partial albinism'), which may arise in small inbred populations, e.g. some forms of *Acrocephalus* in the Central Pacific.

b) *Rufomerus*. — Adults of this form differ at a glance from those of *crassirostris* in having the underparts strongly barred glossy greenish brown, and in having the white wing patch reduced to white fringes (sometimes absent through wear). The rectrices are mainly blackish green with white markings. Adult males have the upperparts dark bronze-green, the crown slightly greener than the back in specimens from Romang, Leti and Moa, and with a distinct bluish iridescence in some specimens from the Damar Is. Adult females differ from adult males in having the contrast between crown and back reduced.

Four preadult specimens of *rufomerus* are known, and these fall into three groups, the first two of which appear to correspond to the first (juvenile) and second (immature or transitional) plumages of *crassirostris*:

i) First plumage. AMNH 626988, ♂, Wulur, Damar I., 18 Dec. 1898 (Kühn); AMNH 626990, ♀, Wulur, 24 Nov. 1898.

These two are an iridescent but dull brownish green above, with a pale ashy brown throat and breast, whitish belly, and some faint flecking on the flanks.

ii) Second plumage. AMNH 626989, ♂, Wulur, 21 Dec. 1898.

Similar to the first, but with pronounced barring on the flanks.

iii) Moulting from second to adult plumage. AMNH 626982, ♂, Sermata, 18 June 1906.

Similar to the second plumage but with dark green feathers appearing on the forecrown and dark-barred feathers on the breast (in contrast to the light-barred immature feathers of the flanks).

As noted by Mayr (1939), the tails of these preadult birds resemble those of their adults in the almost complete lack of rufous, this being confined to an inconspicuous pale rufous or greyish rufous wash on the inner webs

of the second or second and third retrices from the outside. They thus differ from the heavily rufous tails of preadult *C. crassirostris*.

Indications of hybridization between *crassirostris* and *rufomerus*

The holotype and unique specimen of *Chalcites malayanus salvadorii* Hartert & Stresemann, 1925 was collected on Babar I. on 15 September 1905 by H. Kühn. To judge from its original description and from photographs (pl. 2) and notes kindly supplied by Mrs M. LeCroy (in litt 9 Oct. 1974), this specimen, AMNH 627136, is similar in general appearance to an adult male *crassirostris*, but the back is a dark metallic green, light barring occurs over the whole of the undersurface, and the white wing patch is reduced. As in adult male *crassirostris*, the lores, face and crown are an iridescent steel-blue.

This specimen has previously been regarded as representing a distinct subspecies, *C. m. salvadorii* (Hartert & Stresemann, 1925; Peters, 1940). A second interpretation is that, with its phenetic and geographic intermediacy, it is a hybrid between *rufomerus* and *crassirostris*. A third is that it is merely an aberrant specimen of one of these two. To interpret it as representing a distinct subspecies is to suppose that Babar is occupied by an autochthonously intermediate population, which of course is possible.

There is a second point somewhat suggestive of hybridization. Of the five adult males of *rufomerus* in the AMNH from Damar I., three have a bluish sheen to the crown (M. LeCroy, in litt. 6 Sept. 1979). This could be due to introgression through *salvadorii*-like hybrids of *crassirostris* genes, or merely to localized individual variation.

More material is needed to investigate whether *crassirostris* and *rufomerus* hybridize. The evidence of a single intermediate specimen (*salvadorii*) is hardly enough to regard them as conspecific. In the meantime, noting that the differences between each apparently corresponding phase of *crassirostris* and *rufomerus* are trenchant, and that each form has several features unique in the '*malayanus*' group, I regard them as separate species, with *salvadorii* of indeterminate status.

#### Alignment and nomenclature of remaining forms

We come now to the arrangement of the remaining forms. Clues to the solution of this problem are provided by the situations in Borneo and Australia, discussed above. In Borneo, two forms overlap widely with no definite evidence of interbreeding; in Australia, two forms appear to be hybridizing following secondary contact. In both situations, the forms in each interacting pair are of one or other of two phenetic types:

Type 1. — Adult males with dark bottle-green caps contrasting sharply with the white frosting on the forecrown, and with the lighter tones of the dorsum; upper surface iridescent green with rufescent or purplish gloss reduced or absent; bills tending to be narrow, noticeably so in some forms.

Type 2. — Adult males lacking contrasting caps, the forecrown generally dull grey- or brownish green, the white frosting duller and less contrasting; crown more or less concolorous with dorsum or only slightly and gradually greener; upper surface usually with strong rufescent or purplish gloss; bills tending to be broader.

Of the first type are *minutillus*, *barnardi* and the narrow-billed Bornean form described below as a new subspecies, *cleis*; of the second type are *russatus* and *aheneus*. Surmising that the two sets of situations between forms of the two types might indicate the existence of two species, I then attempted to align the remaining forms. The final alignment was:

Type 1: 'malayanus', *albifrons*, *cleis*, *minutillus*, *barnardi*.

Type 2: *aheneus*, *jungei*, *misoriensis*, *russatus*.

I consider that these two groups should be regarded as two species, which overlap apparently without interbreeding in Borneo (*cleis*, *aheneus*) and which enjoy secondary contact with some hybridization in Australia (*minutillus*, *russatus*, ? *barnardi*). The phenomenon of two species behaving differently towards each other in different areas is not unknown. An excellent example occurs in the salamander genus *Plethodon* (Highton & Henry, 1970). In birds it has been noted between the towhees *Pipilo erythrophthalmus* and *P. ocai* (Sibley, 1950), between the sparrows *Passer domesticus* and *P. hispaniolensis* (Vaurie, 1956) and between the honey-eaters *Melidectes rufocrissalis* and *M. belfordi* (Gilliard, 1959; Diamond, 1972: 392-396).

The situations in Borneo and Australia are particularly interesting with regard to bill width. In Australia, where reproductive isolation between *minutillus* and *russatus* may have broken down, there is some overlap in width between the broadest bills of the former and the narrowest bills of the latter. In Borneo, where reproductive isolation seems to have been maintained, the bill of *cleis* is absolutely narrower than that of *aheneus* (fig. 1, pl. 1, table 2d), and has a pronouncedly sharper ridge to the culmen. It is possible that in Borneo earlier interaction between *cleis* and *aheneus* led to character displacement with regard to bill width and shape, arising from pressure for each form to prey on different quarry. Whereas the bill of *aheneus* differs little from those of other forms of Type 2, the bill of *cleis* is the narrowest and most sharply-ridged of those of Type 1 forms, which suggests that if character displacement did occur it affected *cleis* more than *aheneus*.

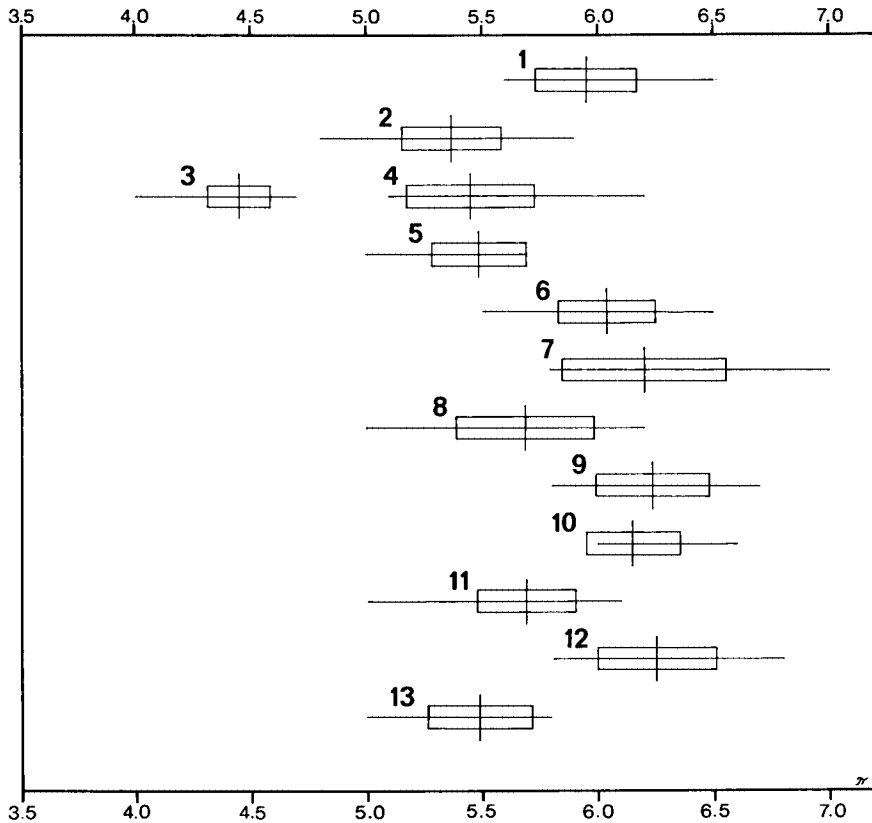


Fig. 1. Bill width at nostrils (in mm). The vertical line represents the mean, the horizontal line the range, and the rectangle the standard deviation  $\times 1.3$  (the area within which 90% of the population may be expected to occur). Forms are grouped in approximate geographic sequence, which in particular highlights the distance in this character between the sympatric forms *C. m. cleis* and *C. r. aheneus*. Samples are of adult males unless otherwise stated. 1. *C. m. peninsularis*, 2. *C. m. albifrons*, 3. *C. m. cleis*, 4. *C. r. aheneus*, 5. *C. r. jungei* (lowlands), 6. *C. r. misoriensis*, 7. *C. poecilurus* (adult ♀♀ only), 8. *C. m. minutillus* (Australian population), 9. *C. r. russatus* (southern Queensland), 10. *C. m. barnardi*, 11. *C. rufomerus*, 12. *C. crassirostris* (putative adult ♀♀ only), 13. *C. ruficollis*.

The oldest available name for the Type 2 group is *Chrysococcyx russatus* Gould, 1868. The oldest name in the Type 1 group is *Cuculus malayanus* Raffles, 1822, but as shown below this has been misapplied. Its present unchallenged currency can be traced through Friedmann (1968) and Peters (1940) to the opinion of Hartert & Stresemann (1925).

Raffles described *Cuculus malayanus* as follows: 'This species has some affinity to the *C. lucidus*. It is about seven inches in length; brown above,

with a greenish gloss, particularly on the scapulars. The whole under-parts are transversely barred with white and brown undulations. The wings are long, extending to about the middle of the tail; the coverts edged with ferruginous. The tail consists of ten feathers, of which the upper are greenish-brown, and the lower barred with brown, black and white. The bill is somewhat compressed at the base, and the nostrils are prominent. There is a row of white dots above the eyes. Native of the Malay Peninsula.'

Both Salvadori (1880: 349) and Gray (1870: 218) listed *Cuculus malayanus* Raffles as a synonym of *Chrysococcyx basalis* (Horsfield, 1821), Salvadori with a question mark and Gray without comment. Mathews (1912) discussed the case in some detail. He concluded that by no means could Malayan birds of the 'malayanus' group be identified with Raffles's *Cuculus malayanus*, and suggested the acceptance of Salvadori's action. Hartert & Stresemann (1925), however, thought otherwise: 'Nach erneuten Erwägungen scheint uns kein Bedenken vorzuliegen, den Namen *Cuculus malayanus* auf diese Art (*C. 'malayanus'*; S.A.P.) anzuwenden. Die Beschreibung trifft ausgezeichnet zu, nur die Grösse (about seven inches in length) ist von Raffles falsch angegeben worden. Dagegen, dass Raffles eine *Ch. basalis* vor sich hatte (cf. Mathews, Austr. Av. Record, i 1912, p. 18) spricht neben vielem anderen der Umstand, dass diese Art auf der malayischen Halbinsel, wenn überhaupt, so nur als ganz grosse Seltenheit vorgekommen ist.'

Contrary to Hartert & Stresemann's belief, Raffles's description does not fit perfectly the form currently construed as *malayanus*. I agree with those authors in questioning the size given by Raffles (7 inches), for this is greater than the length of any of the local bronze-cuckoos. But Raffles's bird cannot have been 'malayanus', for the latter is not 'brown above, with a greenish gloss, particularly on the scapulars.' On the contrary, 'malayanus' is wholly green above, any intensification of that colour being on the crown, not the scapulars. On the other hand, I disagree with Salvadori, Gray and Mathews that Raffles's bird may have been *C. basalis*. The latter does not have 'the whole underparts transversely barred ...': its barring is confined to the flanks and breast, with the centre of the belly an unbarred white and the throat generally bearing some obscure streaks only. Nor does it have 'a row of white dots above the eyes', but instead a fairly well-defined whitish superciliary stripe. Nor again are its wing coverts 'edged with ferruginous', but with very pale cinnamon to whitish.

Whereas Raffles's description fits neither 'malayanus' nor *basalis*, it fits very well indeed (given that the quoted size is an error) a female *C. x. xanthorhynchus*, a resident form of the Malay Peninsula. I therefore place *Cuculus malayanus* Raffles, 1822 in the synonymy of *Chrysococcyx x. xan-*

*thorhynchus* (Horsfield, 1821). By this action, the name of the Type 1 species referred to above becomes *C. minutillus* Gould, 1859. This also leaves the populations of the Malay Peninsula without a name; I redescribe them below as *C. minutillus peninsularis*.

C. ANNOTATED CHECKLIST

***Chrysococcyx minutillus* Gould — Little Bronze-Cuckoo**

***Chrysococcyx minutillus peninsularis* subsp. nov.**

*Cuculus malayanus* of authors, but not of Raffles, 1822, Trans. Linn. Soc. Lond., 12: 286, here identified as *Chrysococcyx x. xanthorhynchus* (Horsfield, 1821).

Characters. — Adult male: upperparts iridescent bronze-green, sometimes with slight purplish sheen, crown not concolorous with dorsum but a darker, contrasting bottle-green, with conspicuous white frosting on lores, brows and forecrown (on the last extending back to mid- or hind-level of eye); underparts, including underwing coverts, white with moderately heavy transverse barring. Rectrices: outermost pair with broad blackish and white bands, the next pair with outer webs fuscous green, inner webs mainly rufous with or without black and white markings in the rufous field and with (as in all other pairs except the central pair) a blackish subterminal band and a white or pale apical spot, the next two pairs fuscous with or without a rufous wash on the inner webs, the central pair bronze-green; outer webs of the outermost upper tail coverts fringed white. Female similar but greener, with less bronze or purplish iridescence on dorsum, crown concolorous with dorsum, and frosting on head less pronounced. Colour of bare eyerim: ad. ♂ vermilion, ad. ♀ not recorded. (For measurements of this and other forms, see Tables 2a-d).

Distribution. — Malay Peninsula: Malaya (states of Kedah, Penang, Perak, Pahang, Selangor, Negri Sembilan, Malacca, Johore, Singapore), and mid-eastern and extreme south-eastern peninsular Thailand (Surat Thani, Yala, Patani, Muang Narathiwat); ? Cambodia; ? southernmost Vietnam ('Cochinchine').

Affects lowland habitats: mangroves, forest edge, gardens and open scrub, but not dense primary forest. For a discussion of the records of '*malayanus*' from Fraser's Hill, 4250 ft (1296 m), Malaya, and also those from Cambodia and Vietnam, see below under 'Remarks'.

Specimens examined. — Holotype: BMNH 1955.1.1726, ad. ♂, Muang Narathiwat, Thailand, 8 July 1916, coll. C. Chunggat no. 426, ex Sir W. J. F. Williamson. Paratypes: BMNH 1955.1.1727, ad. ♀, Muang Narathiwat, 11 July 1916, coll. C. Chunggat no. 451,



ex Williamson; UZM 38.853, ad. ♀, Muang Narathiwat, 7 Nov. 1915, Christiani Coll. no. 967; UZM 38.854, imm. ♂, Muang Narathiwat, [Christiani Coll.] no. 968; UZM 38.852, ad. ♂, Surat Thani, Thailand, 10 March 1910, 'Edw. Bay.'; NMNH 330211, ad. ♂, Yala, Thailand, 1 Feb. 1931; BMNH 1936.4.12.367, ad. ♂, Kuala Rompin, Pahang, Malaya, 1 Sept. 1919, ex Raffles Museum; BMNH 1936.4.12.365, ad. ♀, Lenggong, Perak, 20 Jan. 1912, ex Raffles Museum; USS unregistered, ad. ♂, Lenggong, 22 Jan. 1912, ex Raffles Museum; USS 276, ad. ♂, Teriang, Pahang, 11 Sept. 1912, ex Raffles Museum; BMNH 1888.12.10.349, ad. ♂, Malacca, 16 Aug. 1873, coll. R. G. Wardlaw Ramsay, ex Tweeddale Coll.; BMNH 1888.12.10.350, ad. ♂, Malacca, 1856, coll. Dr Maingay, ex Tweeddale Coll.; MNHN 1881.426, ad. ♂, Malacca, coll. M. Rolland; MNHN 1881.427, ad. ♂, Malacca, coll. Rolland; MNHN 1878.85, ad. ♂, Cochinchine, coll. M. Pierre.

Remarks. — King, Woodcock & Dickinson (1975: 186) listed Cochinchina (the southernmost province of Vietnam) and Cambodia (Kampuchea) among the south-east Asian regions from which '*malayanus*' has been recorded. This listing was based on the remarks of Delacour (1951: 19): '*Chrysococcyx m. malayanus* ... Un exemplaire de la collection du Muséum de Paris a été pris par Germain en Cochinchine. Signalé aussi au Cambodge par Engelbach.' The Germain specimen referred to by Delacour is still in the MNHN, registered as 1882 no. 279. I have examined it and find it to be a very young individual of *C. lucidus plagosus*; indeed, to judge from its labels, it was first identified as this form, and only later, in another hand, as '*malayanus*?'. There being no other records of *C. l. plagosus* from south-east Asia (including the Malay Peninsula), its provenance of Cochinchina may be questioned.

The record from Cambodia may be equally dubious. E. C. Dickinson (in litt. 19 Sept. 1979) informs me that he has been unable to trace its source among Engelbach's publications. Nor is any such specimen in the MNHN. It is entirely possible, therefore, that the record is no more than a lapsus calami on the part of Delacour himself, perhaps for Engelbach's record of *C. maculatus*.

Finally to be mentioned in this connexion is an apparently unreported specimen in the MNHN, 1878 no. 85, labelled '*Chrysococcyx Schomburgki*/Cochinchine/M. Pierre.' This appears to be an adult male *C. m. peninsularis*. An old, poorly documented specimen, it is the sole evidence for the occurrence of this form on the south-east Asian mainland beyond the Malay Peninsula.

The Thai localities require comment. The place name Muang Narathiwat, new to the literature of this group, is the modern name for the more familiar 'Bang Nara' (on labels of UZM 38.853, 854), in Narathiwat Province at 6°25'N, 101°50'E (fide Deignan, 1963: 62). Similarly, Surat Thani is the modern name for 'Bandon' (on label of UZM 38.852). Yala, at 6°33'N,

101°18'E, sometimes given as being in Pattani Province, is now in its own eponymous province. Finally, 'Malacca' was formerly often used to denote not the present-day locality but the whole of the Malay Peninsula (q.v. Rolland's specimens MNHN 1881.426, 427), and is actually used in this sense on the label of the Thai specimen UZM 38.852, 'Bandon, Malacca'.

The reports of '*malayanus*' netted at Fraser's Hill, 4250 ft, on the crest of the Main Range, Malaya, also require comment. They are: specimen netted in daytime 17 December 1969 (Wells, 1972; Medway & Wells, 1976: 186), and individuals netted at night on 8 October 1972 (Wells, 1975: 207) and 6 September, 1 October and 5 November 1975 (Wells, in litt. 21 July 1979). Those netted at night were taken with individuals of many known migratory species, and were therefore also assumed to be on passage. Of those netted at night, only that taken on 6 September was retained (rather than ringed and released) and is now lodged as a study skin with the Malayan Game Department. I have examined this skin, and find it to be a *C. xanthorhynchus* in the adult female phase. The specimen netted in the daytime on 17 December was also retained as a study skin, UMKL M.01244. This skin is of singular interest. It appears not to be of the resident form of the Malay Peninsula lowlands, *C. minutillus peninsularis*, but to show similarities to the Bornean *C. russatus aheneus*, and is discussed in the checklist section immediately after that form. Suffice it to say under this head that there are now no unequivocal records of *C. m. peninsularis* from Fraser's Hill.

Junge (1938) wrote: 'At the moment I consider the Sumatra birds as belonging to the typical race ('*malayanus*'; S.A.P.) too. The upper- and underparts correspond with those of Malayan birds, though in 2 of the 3 Sumatra birds the white on the forehead extends slightly further back than in the birds from the Malay Peninsula.' Three Sumatran specimens I have examined from the MZB are almost certainly the ones referred to by Junge. An adult male and two adult females, they all fall within the variation exhibited by *albifrons* of Java, and I have included them with the latter.

### ***Chrysococcyx minutillus albifrons* (Junge)**

*Chalcites malayanus albifrons* Junge, 1938, Zool. Meded., 20: 237 — Batavia.

Characters. — Similar to *C. m. peninsularis* but white frosting on forehead of adult male much heavier, sometimes more or less solid, and usually much more extensive, often reaching back to the level of the posterior commissure of the eye, and also more pronounced on brows and face; adult female with frosting correspondingly more extensive, but generally duller than in adult male. Ventral barring less pronounced than in any other sub-

species of *C. minutillus*. Colour of bare eyerim: ad. ♂ red, ad. ♀ 'green-yellow'.

Distribution. — Northern Sumatra: Tanjung Kassau, Deli (sea level) and the vicinity of the Gunung Leuser at ca. 500 and ca. 1000 m; Java: north coast of west Java, mainly in swampy riverine forest, from Muara Ancol (near Jakarta) east to Sungai Buntu (specimens in MZB and RMNH; Bartels in Hartert & Stresemann, 1925), unconfirmed inland reports from Bogor and Mount Salak (Hoogerwerf, 1948: 126).

Specimens examined. — Sumatra: Tanjung Kassau 1, Gunung Leuser district 2 (MZB). Java: Batavia 4 (NMNH, MZB, RMNH); Muara Ancol 1, Muara Gembong 1, Muara Bungin 2, Kali Tji Lesung 3, Sedari 1 (RMNH); Sungai Buntu 1 (MZB); 'Java' 3 (MZB).

Remarks. — The locality Muara Ancol was formerly spelt Moeara Antjol (as on the label of RMNH 1085). The name Kedasie Laoet, which appears to qualify the locality Batavia (= Jakarta) on the label of NMNH 21884, is actually a local name for a *Chrysococcyx* sp. (S. Somadikarta, in litt. 27 Aug. 1979). The record from Mount Salak was reported by Hoogerwerf as being from the altitudinal zone 500-2300 m; possibly it was from the lower slopes. If a sight record (I cannot trace a specimen), it should perhaps be held in abeyance.

#### ***Chrysococcyx minutillus cleis* subsp. nov.**

Characters. — Adult male only (female unknown): similar to adult male *C. m. peninsularis* but bill narrower and culmen more sharply ridged (more so than in any other subspecies), wing shorter, and white frosting on forehead more conspicuous because bottle-green of crown darker; dorsum also darker green than in *C. m. peninsularis*, but likewise with slight purplish sheen in some lights (though not as pronounced as in the sympatric *C. rus-satus aheneus*), and ventral barring heavier (heavier than in any other subspecies of *C. minutillus*). Similar to adult male *C. m. minutillus* in intensity of bottle-green of crown, but latter has the white frosting of the head more or less restricted to lores and brows, and is duller green on the dorsum with virtually no purple iridescence. Colour of bare eyerim: ad. ♂ coral red.

Distribution. — Borneo (northern and eastern).

Specimens examined. — Ad. ♂♂ only: Holotype: NMNH 182298, Pulau Panjang, 2 May 1913, coll. H. C. Raven no. 605. Paratypes: NMNH 182299, ditto, Raven no. 606; BMNH 1895.11.19.49, Mount Kinabalu, coll. A. H. Everett; MCZ 197193, Morutai Besar, 29 June 1937, coll. H. G. Deignan; MCZ 197196, Morutai Besar, 3 July 1937, coll. Deignan; MZB 24739, Karang Asam, Samarinda, 14 Dec. 1956, coll. A. M. R. Wegner.

Remarks. — Pulau Panjang is described by Raven in Riley (1930): '... seven nautical miles from the nearest point on the (Bornean mainland; S.A.P.). ... It is two and one-half miles in length by about a mile in width and was owned by a Frenchman who had cleared all the forests in order to plant coconuts. In some places along the shore there still remains a fringe of mangroves. The surface of the island is slightly undulating, though the altitude above high tide is probably nowhere more than 30 feet.'

Etymology. — *Cleis*, noun in apposition, latinized from Greek κλείσ, a key, here used figuratively in commemoration of the rôle of this form in the taxonomic interpretation presented in this study.

### ***Chrysococcyx minutillus minutillus* Gould**

*Chrysococcyx minutillus* Gould, 1859, Proc. Zool. Soc. Lond. for 1859: 128 — Port Essington.

*Chalcococcyx Nieuwenhuisi* Vorderman, 1898, Natuurk. Tijdschr. Ned.-Indië, 58: 196 — Gani, Halmahera (transferred from synonymy of *C. crassirostris*).

*Chrysococcyx minutillus perplexus* Mathews, 1912, Aust. Av. Rec., 1: 38 — Parry's Creek, Western Australia.

*Chrysococcyx minutillus melvillensis* F. R. Zietz, 1914, S. Aust. Orn., 1 (1): 14 — Melville I. (holotype SAM B1288).

Characters. — Adult male: similar to adult males of *C. m. peninsularis*, *C. m. albifrons* and *C. m. cleis* in having bottle-green cap contrasting with lighter green dorsum, and conspicuous white frosting on head; dorsum more bronze-green than in other forms, more or less lacking the purplish gloss; white frosting on head less extensive than in *peninsularis*, *albifrons* and *cleis*, more or less confined to lores and brows. Ventral barring similar to that of *peninsularis*, not as heavy or broad as in *cleis* but more pronounced than in *albifrons*. Adult female similar but duller above, lacking the contrasting bottle-green cap and with the frosting on lores and brows duller, less noticeable. Rectrices of both sexes as in other subspecies of *minutillus*, but greater tendency for some rufous banding to occur among the black and white bands of the inner web of the outermost rectrices, especially in subadults. Colour of bare eyerim: ad. ♂ bright red, ad. ♀ grey to olive- or greenish-grey (once 'pale sulphurous', in AMNH 626967 from Leti, Lesser Sundas).

Birds with the transverse barring of the underwing coverts reduced or absent (q.v. Shelley, 1891: 300) and a faint pinkish orange wash on the upper breast appear to be subadult.

Distribution. — Northern Australia from the Broome district, Kimberley Division, east to the Cape York Peninsula (Moreton, Chester R.), also Melville I., Sir Edward Pellew Group (Centre I.); Lesser Sundas: Wetar, Romang, Leti, Moa; Moluccas: Great Kai, Gorong, Seran, Buru, Ambon,

Halmahera; Celebes: Peleng I.; New Guinea: Utanata R. Apparently hybridizing with *C. r. russatus* in eastern part of range (see below under latter).

In Australia at least, occurs mainly in coastal, subcoastal and riverine mangroves and tropical woodland. Recorded all months of year in Australia (pace Deignan & Amos, 1950); records from the islands north of Australia (February, April, May, June, July, August, September, November, December) may be of non-breeding migrants (see Mayr, 1939 and above).

Specimens examined. — Western Australia: 4 km S of Cape Bertholet 1, Kalumburu 1, Cygnet Bay 1 (WAM); Derby 2 (AMNH); Point Torment district 3 (BMNH, WAM); Kimbolton district 2 (WAM); Parry's Ck. near Wyndham 1 (AMNH). Northern Territory: Darwin district 4 (SAM, AMNH); King R. 3 (HLW); Melville I. 10 (AMNH, ZMB, NMV); Cobourg Pen. 1 (ANWC); Roper R. 1 (HLW); Sir Edward Pellew Group 1 (ANWC). Queensland: mouth of Moonlight Ck. 1 (BMNH); Nornanton 3 (AMNH); 40 km S of Glenore HS 1, Moreton 1, Chester R. 1 (BMNH). Lesser Sundas: Leti 1 (AMNH); Wetar 3 (AMNH, RMNH). Moluccas: Great Kai 1 (AMNH); Gorong 1, Ambon 2 (RMNH, MZB); Buru 1 (RMNH). Celebes: Peleng 1 (SMT). New Guinea: Utanata R. 1 (RMNH).

Remarks. — For the identification of A. S. Meek's locality 'Cape York' as the Chester River, see Parker (1966).

### **Chrysococcyx minutillus barnardi** Mathews

*Chrysococcyx barnardi* Mathews, 1912, Aust. Av. Rec., 1: 20 — Coomoooolaroo, Dawson R., Queensland.

Characters. — Adult male similar to that of *C. m. minutillus*, but longer-winged, dorsum duller (the iridescent sheen less), and the white fringes of the outer upper tail coverts broader and more pronounced (more so than in any other subspecies of *C. minutillus*). Rectrices similar to those of *C. m. minutillus* but greenish areas duller. Adult female similar to adult female *C. m. minutillus* above, but duller, less iridescent green. Colour of bare eyerim: ad. ♂ bright red, ad. ♀ deep yellow (?).

Distribution. — Breeding or present in breeding season (October-January) in north-eastern New South Wales (Clarence R.; 48 km west of Tenterfield; ? Richmond R. district) and south-eastern Queensland west to Chinchilla and north to Yamala and Byfield. Apparently leaves this area February-August (see McGill & Goddard, 1979), presumably to winter further north, within the range of *C. russatus* (specimens from Rockingham Bay, Cairns, Hann, R., Utingu and 'New Guinea').

Specimens examined. — 'New South Wales' 2 (WAM); near Tucabia, Clarence R., NSW 1 (AM); Yamala, 14 km east of Emerald 1, Tarangabar near Cawarral 1 (AMNH); Rockingham Bay 1, Cairns 1 (AMNH); Hann R. 1 (AM); Utingu 1 (AMNH); 'New Guinea' 1 (NMV).

Remarks. — The specimen labelled 'New Guinea' (NMV B10950) was collected by A. Morton in 1897; most if not all of Morton's New Guinea material came from the Port Moresby-Astrolabe Mountains region. The two specimens from 'New South Wales' (WAM A12295-6) were collected by R. Helms, and possibly came from the Richmond River district, which he visited in about 1890 (Hedley, 1915: 13). The significance of the notations 'BM 1719, 1894' (WAM A12295) and 'BM 1720, 1894' (WAM A12296) on the labels of these specimens is not known to me.

Storr (1973: 65) listed records from Richmond, the lower Norman R. and (tentatively) Bushy I., the Sir Charles Hardy Group, Coconut I. and Booby I. under *C. m. barnardi*. Three specimens from Normanton and one from 40 km south of Glenore HS are here referred to *C. m. minutillus*, though a second specimen from the latter locality may be intermediate between *C. m. minutillus* and *C. r. russatus* (see below). The record from the Richmond district (Berney, 1906), published without details, should perhaps be disregarded: the area worked by Berney was largely grassland and tree savannah, unlikely habitats for any form of this group. The records from Bushy I. and the Sir Charles Hardy Group (MacGillivray, 1914) of birds seen by W. McLennan in June and July 1911, could equally be of wintering *C. m. barnardi* or southern *C. r. russatus* (see under *russatus*). The record from Coconut I., reported by Masters (1876) under *Lamprococcyx minutillus*, turns out to be based on a specimen of *C. lucidus plagosus* (specimen in MMS, coll. G. Masters 29 July 1875). Finally, Storr's listing of Booby I. is now considered by Storr (in litt. 15 Jan. 1973) to be an error.

### **Chrysococcyx poecilurus** (G. R. Gray)

*Chalcococcyx poecilurus* G. R. Gray, 1862, Proc. Zool. Soc. Lond. for 1861: 431 — Misol.

Characters. — Putative adult male (specimen a of table 1, BMNH 1911.12.20.981, labelled female but suspected to be male by colour of crown): crown glossy dark green; dorsum, wing coverts and tail coverts glossy mid-green, lacking the rufescent or purplish bronze iridescence of *C. r. misoriensis*. Ventral barring similar to that of *misoriensis*, though not as dark as in some specimens of the latter, and middle of lower belly without bars; sides of breast tinged pale brownish rufous. White frosting present on lores, forehead and brow, similar to specimens of *misoriensis* from southern New Guinea. Rectrices: I (central pair): outer web light green edged rufous, inner web green, rufescent towards base; darker subterminal area on both webs; II: outer web dull green, with brownish subterminal area, inner web rufous with black subterminal band and small white apical spot; III: as II,

but with two black bands in rufous field of inner web (as well as black subterminal band), and white apical spot larger; IV: as III, but the rufous compartments formed by the black bands of the inner web each contain a white band or spot; V (outermost): outer web with grey and white bands at base, the last two or three grey bands run together to form a dusky, rufous-tinged area that reaches the tip and edge, inner web with black and white bands and white apical spot. Outer webs of I-IV edged pale rufous towards base. Colour of periophthalmic ring not noted, but this is 'tomato-red' in ♂ c, BMNH 1911.12.20.983.

Adult female (specimen b, BMNH 1911.12.20.982): similar to preceding, but crown mid-green, more or less concolorous with dorsum; white frosting on head with faint rufous tinge on some feathers; pale rufous tinge on breast, palest in centre. Periophthalmic ring of this and of ♀ e, BMNH 1911.12.20.985 is pale greenish white.

Distribution. — Western and south-western New Guinea: Misol, Mimika R., Setakwa R., ? Merauke.

Specimens examined. — Misol 1, Mimika R. 3, Setakwa R. 1 (BMNH, see table 1).

Remarks. — As noted above, the material referred to this taxon, together with ZMB 34.2767 and RMNH 30094 from Merauke, is urgently in need of re-examination, and comparison with specimens of *minutillus*.

### **Chrysococcyx russatus** Gould — Gould's Bronze-Cuckoo

#### **Chrysococcyx russatus aheneus** (Junge)

*Chalcites malayanus aheneus* Junge, 1938, Zool. Meded., 20: 238 — Bandjermasin, southern Borneo.

Characters. — Adult male: upperparts bronze-green with pronounced purplish iridescence (more pronounced than in any other subspecies of *C. russatus*). Crown green, but not the contrasting deep bottle-green of *C. minutillus*, and not or only slightly darker than dorsum. White frosting on head duller, less contrasting than in *C. minutillus*, but more extensive than in any other subspecies of *C. russatus*, extending backwards on crown to level of anterior commissure of eye, and pronounced on brows. Rectrices: outermost pair having outer web fuscous green tinged rufous, inner web banded black and white, often with rufous bands against the black in the distal portions of the white compartments; next pair having outer web purplish fuscous, inner web mainly rufous with (as in all other pairs except the central pair) blackish subterminal bar and white or pale terminal spot

(though sometimes with little or no rufous and sometimes with incomplete black bars before the subterminal one); the remaining three pairs mainly fuscous with greenish or purplish reflections, the third and fourth inner pairs tinged very faintly rufous. Underparts and underwing coverts whitish with pronounced transverse barring, no rufous wash on throat or breast. Adult female similar but duller above, white frosting on head less pronounced or contrasting, and no darker green tinge on crown. Colour of bare eyerim: ad. ♂ bright red, ad. ♀ pale or ochraceous yellow.

Distribution. — Borneo (eastern and northern), southern Sulu Archipelago (Tawi Tawi Group), and the southern Philippines (Basilan, Mindanao). The record from Negros requires confirmation; certain other records from Basilan and Mindanao are almost certainly based on adult females of *C. xanthorhynchus amethystinus* (see below).

Specimens examined. — Borneo: Quoin Hill, Tawau, 750 ft (229 m) 4 (BBM, AMNH); Mount Kinabalu, 3100 ft (945 m) 1, Abai 2, Morutai Besar 3, Berau 1 (MCZ); Lumbidan 1, Sarawak 1, Purukjau 1 (BMNH); Banjermassin 2 (RMNH); Telen R. 1, Tabang 1 (MZB). Sulu Archipelago: Tawi Tawi Group: Bongao 1 (AMNH); Sanga Sanga 1 (DMNH); Tawi Tawi 2 (DMNH, AMNH). Philippines: Basilan 1, Mindanao (Zamboanga) 1 (BMNH).

Remarks. — The populations of the Sulu Archipelago and the Philippines proper were previously referred to '*C. malayanus malayanus*' (e.g. by Peters, 1940; DuPont, 1971; DuPont & Rabor, 1973), not through any taxonomic conviction, but simply because the material and records from these areas were not considered when *aheneus* Junge, 1938 and *jungei* Stresemann, 1938 were withdrawn from '*C. malayanus*' sensu Hartert & Stresemann (1925). Specimens from the Tawi Tawi Group, Sulu Archipelago, are, I find, referable to the Bornean form *C. r. aheneus*. The status of the records from the Philippines proper, however, is problematic. In the following discussion I have relied heavily on the review of the relevant literature so promptly and generously undertaken at my request by Dr K. C. Parkes (in litt. 17 March & 12 April 1979).

Peters (1940) and DuPont (1971) listed *malayanus* from the Philippine islands of Basilan, Mindanao and Negros. These records originate from the writings of McGregor, Sharpe, Shelley and Tweeddale. In the original reference to his Basilan record, McGregor (1907: 285) listed an immature male and a female, describing the latter as having the 'throat, breast, and sides of neck heavily washed with rusty-brown.' Whereas this description does not fit any phase of *C. r. aheneus*, it fits very well the female of *Chrysococcyx xanthorhynchus amethystinus*, of which form McGregor collected an adult male on Basilan. Of this record of '*malayanus*' from Mindanao, McGregor



(1909a: 72) wrote: 'A female taken by Celestino at Butuan, September 25 (1907; S.A.P.), is in every respect similar to a female taken in Basilan.' Thus, he identified his Mindanao specimen by comparing it with the female from Basilan, which was almost certainly an example of *C. x. amethystinus*. Unfortunately, those of McGregor's collections not previously scattered by sale or exchange were destroyed with the National Museum of the Philippines during the retaking of Manila from the Japanese in 1945.

McGregor (1909b) also listed '*malayanus*' from Mindanao and Negros on the basis of specimens collected by Steere. Where this material is now is not known, for Steere's collections also suffered wide dispersal. His Negros record, however, was earlier listed by Sharpe (1877: 320) under *Chrysococcyx basalis*: 'Agrees with a Flores specimen collected by Mr. Wallace. Total length 5.7 inches, culmen 0.55, wing 3.7 (94 mm; S.A.P.), tail 2.6, tarsus 0.6.' The Flores specimen may have been the one I have identified below as *C. russatus jungei*; alternatively, it could have been a specimen of *C. lucidus plagosus*, also collected on Flores by Wallace. Understanding of the salient characters of these and related species was at that time too poor for unsubstantiated identifications made then to be accepted now without question. The Negros specimen may well have been of '*malayanus*', but in its absence there must always be doubt.

In the BMNH there are a further four specimens from the Philippines labelled '*malayanus*': three from Zamboanga, westernmost Mindanao, collected by A. Everett in April-May 1878, and a female from Basilan collected by Steere on '21 Nov.' and received in 1896 (Tweeddale, 1879: 945-946; Shelley, 1891: 299; D. Goodwin, in litt. 11 Jan. 1972). In March 1980, after a postal delay of two years, I received on loan the specimen from Basilan (BMNH 1896.6.6.963) and one of the three from Zamboanga (BMNH 1888.12.10.352). Both are referable to *aheneus*. Both are in the adult female phase, though on the label of the Zamboanga skin, which is sexed as a female, the eyerim is noted as 'pink', which might indicate that the individual was in fact a subadult male. During a visit to Tring in September 1979, Dr David Wells, of the University of Malaya, kindly examined the two remaining Zamboanga skins and wrote (in litt. 30 Sept. 1979) that these two fitted my description of *aheneus*.

It thus seems that of the Philippine records of '*malayanus*', only those based on the four specimens in the BMNH can be confidently accepted, and these are referable to *aheneus*. Of interest in this respect is specimen NMNH 578678, an adult female collected on Mount Matutum, Mindanao, on 14 January 1964 by Dr D. S. Rabor. Labelled '*malayanus*', it is in fact referable to *C. xanthorhynchus amethystinus*. It is thus an example of the difficulties of identification discussed above.

**Chrysococcyx russatus** subsp. cf. **aheneus**

An unsexed adult, UMKL M.01244, netted at 4250 ft (1296 m), Fraser's Hill, Malaya, on 17 December 1969, and listed under *C. malayanus* by Wells (1972) and Medway & Wells (1976), seems not to be referable to the local lowland form *C. minutillus peninsularis* but to *C. russatus* (see p. 28). It is closest in general appearance to an adult female *C. r. aheneus*, but differs in the more pronounced frosting on the forecrown, the slightly lesser degree of purpurascence of the dorsum, and the reduced amount of rufous in the tail. That these differences are individual, however, cannot be discounted.

Whichever way it is considered, this specimen is problematic. Possibilities it may point to include the following:

a) It is referable to *C. r. aheneus*, which at present is known only from Borneo and the southernmost Philippines. Analysis of the dates of specimens of *aheneus* revealed that although there was a scattering throughout the year, most records fell in the period June-September. Scanning of the dates of other populations assumed to be resident, however, also gave strong seasonal biases. All dated specimens of *C. r. jungei* of Celebes were taken in May-November, and most specimens of *C. r. misoriensis* of New Guinea in April-August. These results might suggest that not only the Bornean populations but also those of Celebes and New Guinea are migratory. A more likely answer is that they are all more or less resident, but call seasonally (thus making themselves more obvious to collectors), or that collectors themselves are, through the vicissitudes of the climate, more able to get about in certain seasons. Thus, the seasonality of such records is not necessarily an argument for considering the populations involved to be migratory.

But, assuming for the sake of argument that *aheneus* is indeed migratory, is Borneo its breeding or non-breeding area? The principal breeding season for insectivorous birds in Borneo is January-June (Wells, in litt. 10 Oct. 1979), which suggests that if *aheneus* were migratory, then its peak in June-September would indicate that it was a non-breeding visitor. Thus, if the Fraser's Hill specimen were relevant here, it could signify very late autumn passage from unknown breeding grounds somewhere on the Asian mainland (q.v. the thrushes *Zoothera sibirica*, *Z. citrina* and *Turdus obscurus*, in Medway & Wells, 1976). Alternatively, if it is referable to *aheneus*, it could merely be a vagrant bird well out of its normal range.

b) It represents a distinct unrecognized subspecies of *C. russatus* that breeds somewhere on the Asian mainland and winters on the Malay Peninsula (the specimen was netted in the daytime, so need not have been on passage). If this were the situation, then it might parallel that of the Rufous-headed Robin *Erithacus ruficeps*, known only from three specimens taken on the

presumed breeding grounds in Shensi, China, and one presumed migrant netted on 15 March 1963 at 6600 ft (2012 m) in the Cameron Highlands, Malaya (Medway & Wells, 1976). Alternatively, again, it may represent an undetected local form resident in the Malayan highlands.

One can foresee objections to these suggestions, and doubtless there are further possibilities that could be mooted. What is crystal clear is that more specimens need to be collected.

### ***Chrysococcyx russatus jungei*** (Stresemann)

*Chalcites malayanus jungei* Stresemann, 1938, Ornith. Monatsber., 46: 148 — Oeroe, Latimodjong Mountains, Celebes.

Characters. — Similar to *C. r. aheneus* though duller above, white frosting of forehead and brows much less extensive or contrasting, crown concolorous with back, forecrown in ad. ♂ not darker green, but grey-brown with only a slight gloss; barring of underparts much narrower and sparser (more so than in any other subspecies of *C. russatus*). Rectrices: outermost pair broadly banded black and white, usually with no trace of rufous (a very little in a few specimens), next pair having inner web rufous with white apical spot and black subterminal band, next two pairs varying, from having little or no rufous wash to having on third and to lesser extent fourth inner pairs pronounced rufous wash on inner webs. Colour of bare eyerim: ad. ♂ red, ad. ♀ unrecorded.

Distribution. — Celebes (southwest and central north to the base of the north arm), Madu and Flores.

Specimens examined. — Latimodjong Mts., 600-840 m (Uru, Pasin) 5, Makassar 3 (ZMB, SMT); Batubassi 1 (ZMB); Boni (= modern Watampone) 5 (MZB); Tawaya 1, Indrulaman 1 (AMNH); Parigi 1, Toboli 1 (NMNH); Madu 1 (ZMB); Flores 1 (BMNH).

Remarks. — It will be noted from table 2b that the four adults examined from the Latimodjong Mountains (the type locality of *jungei*) have shorter tails than the others. The bill width of some Latimodjong examples was not measured where it was obvious that the bill had been pinched in by having been tied too tightly.

The specimens from Flores (BMNH 1873.5.12.384, coll. Allen 1862) and Madu (ZMB 28.741, coll. Baron V. von Plessen 17 May 1927) have not previously been referred to *jungei*. The former was mentioned by Wallace (1864) under *Chalcites chalcites* (= *Chrysococcyx lucidus plagosus*), and the latter identified by Meise (1929) as *Chalcites m. malayanus*, at a time when the populations of Celebes and the Bornean region were still included

under that name. Contrary to Meise's remarks, I find that the specimen from Madu, like the one from Flores, resembles specimens from Celebes in colour and markings, though having a slightly longer tail.

I remarked above, in discussing the distribution of *Chrysococcyx crassirostris*, that the chief hosts of the 'malayanus' group were species of *Gerygone*. Madu and Flores being the only islands in the Flores Sea from which a member of this group (*C. russatus jungei*) is known, it is therefore of interest that in the same area *Gerygone* is known only from Madu and neighbouring Kalao tua (*G. dorsalis senex*) and Flores (*G. sulphurea tenkatei*) (Meise, 1929). Hellebrekers & Hoogerwerf (1967) reported an egg of 'malayanus' from a nest of *G. sulphurea* on Flores.

### ***Chrysococcyx russatus misoriensis* (Salvadori)**

*Lamprococcyx misoriensis* Salvadori, 1875, Annal. Mus. Civ. Stor. Nat. Giacomo Doria, 7: 914 — Misori (= Korido, Misori [Biak], fide Salvadori, 1880, Orn. Pap. Molucc., 1: 355; S.A.P.).

*Lamprococcyx poeciluroides* Salvadori, 1878, Annal. Mus. Civ. Stor. Nat. Giacomo Doria, 13: 460 — Nova Guinea, propre Sorong (= Warmon, fide Salvadori, 1880, Orn. Pap. Molucc., 1: 353, here identified with War Samson or Samson R. on the northern Vogelkop; see Gilliard, 1969, Birds of paradise & bower birds: 425; S.A.P.); in Insula Taravai (= Bertrand I.; S.A.P.).

Characters. — Adult male similar to adult male of *C. r. aheneus*, but upperparts more rufescent bronze, less purplish bronze; rectrices more rufescent, the rufous bands among the black and white bands of the outermost pair generally broader; the white frosting of lores, forehead and brows present but reduced in populations to the south of the central cordillera (Aru Islands to Port Moresby district), and obsolescent to obsolete in those to the north (including Batanta and Fergusson Is.); forehead greyish; crown greener, slightly less rufescent than dorsum. Ventral barring similar to that in *aheneus*, perhaps a little more pronounced, and in most specimens a faint rufous wash on the sides of the breast. Adult female similar but crown duller, browner, and ventral barring less pronounced. Colour of bare eyerim: ad. ♂ red, often orange-red, ad. ♀ unrecorded.

Distribution. — Lowlands of New Guinea (once ca. 700 m) and neighbouring islands: Misol, Batanta, Waigeu, Biak, Tarawai, Manam, Karkar, Goodenough, Fergusson, Aru, Daru. Mainly mangroves, coastal and riverine forest.

Specimens examined. — Mainland: Bernhard Camp, 50 m, Idenburg R. 1 (FMNH); Cyclops Mountains, 150 m 1, Kararau, 200 ft (61 m), middle Sepik district 1 (AMNH); Hunsteinspitze 1, Ramu R. 1 (ZMB); 3 miles (4.8 km) NNW of Bulolo, 2300 ft (701.5 m) 1 (MVZ); Kumusi R. 2 (AMNH); Lolorua, Galley Reach 1 (FMNH);

Port Moresby district 4 (BMNH, PNGM, AM); Kurik 1 (RMNH). Islands: Misol 1, Batanta 1, Manam 1, Karkar 2, Goodenough 1, Fergusson 2, Daru 2 (AMNH); Aru 2 (RMNH, AMNH).

Remarks. — I was unable to trace the source of Mayr's (1941) information that this form had been recorded from the Trobriand Is. and from an altitude of 1400 m on the mainland of New Guinea. Professor Mayr (in litt. 19 March 1980) has suggested that the Trobriands were listed in error. Of the record from 1400 m he wrote: 'it is based on a specimen collected by the Sepik Expedition at a camp on the top of the Hunsteinspitze, which is 1500 meters. It is of course possible, if not probable, that the collector actually obtained the specimen from a lower altitude ...' The specimen is possibly ZMB 73.21, collected by Dr Bürger of the Sepik Expedition on 9 August 1912 (see also Stresemann, 1923). I had examined this skin some years previously, and recorded that it was a juvenile female, unbarred below, with no altitude noted on the label. It is possible, in view of the fact that the next highest recorded altitude for *misoriensis* is 700 m (and even this seems exceptionally high), that the specimen in question was taken much lower than the base camp at 1500 m. Alternatively the specimen may be a fledgling of *C. ruficollis* or *C. meyerii*, both of which could be expected at 1500 m, and should be re-examined with this possibility in mind.

The specimens examined from the Aru Islands are ZMB 25024, coll. A. P. Goodwin (no date) and AMNH 627037, coll. H. Kühn on Kobror, 29 Aug. 1900. A specimen from the RMNH labelled 'Mysol, von Rosenberg 1865' may also be from the Aru Islands, fide Mees, 1965: 197.

The difference between northern and southern populations in the degree of frosting on the head is probably related to the effect of the central cordillera on gene flow in this lowland subspecies.

### ***Chrysococcyx russatus russatus* Gould**

*Chrysococcyx russata* Gould, 1868, Proc. Zool. Soc. Lond. for 1868: 76 — Cape York Peninsula, here restricted to Somerset.

Characters. — Similar to *C. r. misoriensis* (including forehead greyish with little or no frosting) but rectrices usually even more rufescent, rufous wash on breast usually more pronounced and extensive, and ventral barring on average less pronounced. Colour of bare eyerim: ad. ♂ red or orange-red, ad. ♀ yellow (once greenish yellow).

Distribution. — Coastal and subcoastal north-eastern Queensland from Cape York south to Bowen; also Hinchinbrook I., ? Bushy I. and Sir Charles Hardy Group (see under *C. m. barnardi*). Some specimens from the Cape York Peninsula, the Torres Strait, and Norman R. and Groote Eylandt

I cannot assign with confidence to *russatus*, *minutillus* or *barnardi*; these may be hybrids (see below under 'Remarks', and also Goodwin, 1974). At least part of the southernmost populations apparently winter on northern Cape York Peninsula (see p. 10 and table 2a) and in southern New Guinea (south coast from Merauke to Port Moresby district, Daru I., Fergusson I.).

Specimens examined. — i) Cape York Peninsula: Cape York district 21 (AMNH, SAM, NMV, AM, QM, BMNH); Claudie R. 3 (NMV, HLW, AMNH); Chester R. 2 (AMNH); Hann R. 1 (AM).

ii) Atherton bloc — Bowen: Granite Ck. near Ayton 2 (BMNH); Cairns 7 (HLW, AMNH); Hinchinbrook I. 1, Clump Point near Tully 1 (QM); Herbert R. 1 (AM); Cardwell district 5 (HLW); 'Port Denison' (= Bowen) 1 (AM).

iii) Southern New Guinea, wintering birds 4 Feb. — 26 June: Merauke 1 (ZMA); Daru I. 2 (AMNH); Apiopoe, mouth of Purari R. 1 (ANWC); Aleya 1 (BMNH); Port Moresby district 1 (AM); Fergusson I. 1 (FMNH).

Remarks. — As mentioned earlier, whereas in Borneo *C. minutillus* and *C. russatus* appear to overlap without interbreeding, there are indications that in Australia they hybridize. Because of the migratory disposition of the populations involved in the latter region, it is not clear at this stage whether such interbreeding arises from a hybrid zone or a zone of overlap with hybridization (see Short, 1969a, b). Specimens apparently intermediate between *C. minutillus* and *C. russatus*, and thus possibly of hybrid origin, are:

HLW 6114, ad. ♂, Groote Eylandt, coll. W. R. McLennan, 31 May 1921. HLW 6379, ad. ♂, Banks (= Moa) I., Torres Strait, coll. W. R. McLennan, 17 Dec. 1919. HLW 6344, ad. ♂, Banks I., coll. W. R. McLennan, 22 Nov. 1919. CAS 24355, ad. ♂, Prince of Wales I., Torres Strait, coll. J. A. Kutsche, 29 July 1920. CAS 24356, ad. ♂, Prince of Wales I., coll. J. A. Kutsche, 25 July 1920. SAM B21051, ad. ♂, Cape York, coll. H.S. Vidgen, 16 July 1916. SAM B21053, ad. ♂, Watson R., western Cape York Peninsula, coll. W. R. McLennan, 23 June 1914. BMNH 1964.60.133, ad. ♀, Reed Bed Well, 12.8 km south of Inkerman HS, western Cape York Peninsula, coll. Hall Expedition, 8 June 1964. BMNH 1964.60.132, ad. ♂, Norman R., 40 km south of Glenore HS, coll. Hall Expedition, 23 April 1964 (this and the previous specimen were among several in the BMNH considered by Goodwin (1974) to be intergrades between *russatus* and *minutillus*).

The four syntypes of *Chrysococcyx russata* Gould in the BMNH (three of which were examined on loan) were probably collected by J. Jardine at Somerset near the tip of the Cape York Peninsula. Gould described the form in 1867; Jardine settled at Somerset in 1864.

Finally, a word needs to be said about the date of the specimen from Bowen, AM 0.23729, collected by J. Rainbird. On its original label appears '8/12/63'. A secondary museum label is inscribed '12.8./63'. Furthermore, North (1911: 27) gave the date of this specimen as 12 September 1863. It would be helpful to know whether Rainbird used the English or the American way of writing the date.

**Chrysococcyx russatus** subsp.

*Chalcites malayanus* subsp.? Hartert & Stresemann, 1925, Novit. Zool., 32: 162 — Timor.

Hartert & Stresemann (1925) wrote: '2 Exemplare von *Timor* gleichen vollkommen extrem röstlichen Stücken von *Ch. m. russatus* mit rostfarbenem Brustton, sind aber grösser (Flügel 99-100 mm). Vermutlich eine endemische Form?' In the absence of further details, it is likely that both specimens were in the Rothschild Collection, now in the AMNH. Only one such can now be traced there, however, AMNH 627051, a bird in the adult female phase collected by Everett at Atapupu. Certainly it is very similar to *C. r. russatus*, having much rufous on the breast and tail, but differs from individuals of that form so far examined in having a longer wing and tail (99.3 and 68.2 respectively, vs. 92.0-98.0 and 60.0-66.5 for both sexes combined of the largest *russatus*, from south-eastern Queensland), and in having the upperparts not bronze-green with strong rufescent lights, but dull green with a curious dull greyish purple tone. The primaries are also different, with a pronounced purplish gloss instead of the greenish caste shown in the same light by *C. r. russatus*. Further specimens may show that this is an undescribed endemic form.

Shelley (1891: 299) listed under *C. malayanus* a juvenile female from East Timor. I have examined this specimen (BMNH 1873.5.12.383) on loan; collected by Wallace in 1861, it is in fact an immature *C. lucidus plagosus*.

**Chrysococcyx rufomerus** Hartert — Lesser Sundan Bronze-Cuckoo

*Chrysococcyx rufomerus* Hartert, 1900 (March), Novit. Zool., 7: 21 — Damar I.  
*Chalcococcyx innominatus* Finsch, 1900 (July), Notes Leyd. Mus., 22: 94 — Kisar I.

Characters. — Adult male: upper surface dark bronze-green (darker than in any other form except *crassirostris* and *salvadorii*), crown slightly greener than back but not forming contrasting cap as in *C. minutillus*. Dull white frosting on head more or less confined to lores and above eyes. Lacking the pronounced white wing patch of *C. crassirostris*, though some secondary coverts have white fringes (these diminishing and disappearing in some specimens through abrasion). Underparts with pronounced transverse barring, face with a broad dark green smudge on cheek. Tail similar in aspect to that of *C. crassirostris*: rectrices mainly blackish green (inner webs of some inner pairs paler in some skins), the outermost one or two pairs banded black and white, the others except the median pair having only a white terminal spot on the inner web. In two adults of the twenty-four examined (AMNH 626969, ♂, Leti, 3 Nov. 1902, and AMNH 626980, Moa,

12 Dec. 1902) there is some trace of rufous on the inner of the second or second and third rectrices from the outside, here considered attributable to individual variation (as for example in *C. m. peninsularis*, *C. m. minutillus* and *C. r. jungei*) or to retention of this preadult character (see pp. 21-22) rather than to hybridization between *rufomerus* and *minutillus*. Colour of bare eyerim: ad. ♂ red, ad. ♀ pale yellow.

Distribution. — Lesser Sundas: Romang, Kisar, Leti, Moa, Sermata and Damar. The specimen listed from Wetar by Mayr (1939) is an immature of *C. lucidus plagosus*.

Specimens examined. — Romang 1, Leti 2, Moa 3, Sermata 1 (AMNH); Damar 6 (AMNH, ZMB, SMT); 13 others examined in AMNH by Mrs M. LeCroy.

### **Chrysococcyx crassirostris** (Salvadori) — Pied Bronze-Cuckoo

*Lamprococcyx crassirostris* Salvadori, 1878, Annal. Mus. Civ. Stor. Nat. Giacomo Doria, 13: 460 — in Insulis Kei, Goram, Amboina, Halmahera, Ternate, Nova Guinea (implicitly restricted to Tual, Little Kai, by Salvadori, 1880, Orn. Pap. Molucc., 1: 355; S.A.P.).

Characters. — Adult male: bill grosser than in *C. rufomerus*; upperparts, lores and face gleaming blackish blue with some green iridescence; variable white patch on upper wing, formed by group of white or partly white greater and median secondary coverts; underparts whitish, sometimes with a few short weak bars on flanks (bases of the white feathers are dark, giving impression of extra barring when revealed). Rectrices: outer pair blackish with white barring, central pair blackish green, the rest blackish with a white spot at tip of inner web. Putative adult female (see p. 20): similar in patterning to adult male but dorsal surface dark oil-green, crown brownish tinged green (for discussion of the preadult phases of this and *rufomerus* see pp. 21-22). Colour of bare eyerim: ad. ♂ red, ad. ♀ unknown, but second-phase ♀ red.

Distribution. — Kur Is. (Kilsuin I.), Kai Group (Taam, Rumadan, Tual) and Tanimbar Is. (Larat). Records from Sorong, Halmahera, Ternate, Ambon and Gorong require confirmation.

Specimens examined. — Kilsuin 1, Taam 1, Tual 4 (AMNH); Little Kai Is. 1, 'Sorong' 2, 'Amboina' 1, 'Halmahera' 1, 'Gorong' 1 (RMNH); 'Ternate' 2 (RMNH, MZB).

Remarks. — It is suggested above that the range of *C. crassirostris* is largely determined by the distribution of its putative host, the small warbler *Gerygone dorsalis*, which has not so far been recorded from Sorong, Halmahera, Ternate, Ambon or Gorong (see pp. 16-17).



Because of similar amounts of rufous in the tail, second-phase immatures of *C. crassirostris* have sometimes been confused with sub-adults of *C. m. minutillus*. The former can be distinguished, however, by being generally duller, more brownish green above, especially on the head and nape, and in having the upper tail coverts and often the adjacent feathers of the lower back a dull deep oil-green.

The variability in size and bilateral symmetry of the white wing patch in adults is here considered attributable to the leucism that sometimes arises in small populations.

The unique specimen and holotype of *Chalcites malayanus salvadorii* Hartert & Stresemann from Babar (pl. 2) is phenetically closest to *C. crassirostris*. As discussed above (p. 22), it could represent a hybrid or an autochthonously intermediate population between *C. crassirostris* and *C. rufomerus*, or be an aberrant specimen or a normal but unelucidated plumage phase of the former.

**Chrysococcyx ruficollis** (Salvadori) — Mountain Bronze-Cuckoo

*Lamprococcyx ruficollis* Salvadori, 1875, Annal. Mus. Civ. Stor. Nat. Giacomo Doria, 7: 913 — Hatam, Arfak Mts.

Characters. — Adult male: upperparts dark green with bronze and purple reflexions (crown may sometimes be greyer and duller), some upper tail coverts with inconspicuous pale rufous fringe on outer webs. Underparts white with moderately heavy barring of purplish olive, most pronounced on flanks, less pronounced on throat, and more or less absent in middle of belly. Throat and breast strongly suffused with rufous, especially towards sides. Cheeks, ear coverts and hindbrow dusky rufous, lores and forebrow darker, concolorous with crown (no frosting on head). Rectrices: outermost pair with outer web white and marked with greyish bands that do not reach the outer edge, the last two bands tinged rufous and more or less fused together, the inner web black, with a rufous compartment two-thirds of the way from base containing a large white spot (and sometimes a separate white spot one-third of the way from base), and a large white apical spot contiguous with the white apical area of the outer web; second pair from outside: outer web fuscous green with blackish subterminal area and pale grey tip, and pale rufous edge towards base, inner web blackish with rufous compartment two-thirds of the way from base, and a white apical spot; third pair from outside: outer web dusky bronze-green with blackish subterminal area, edged pale rufous towards base, inner web black with small rufous compartment two-thirds of the way from base (or pale rufous area, followed by fuscous green area, then the black of the subterminal band), and tip with

TABLE 2a  
Wing length (in mm).

		N	R	$\bar{Y}$	SD
<i>peninsularis</i>	♂	6	90.7-97.0	94.18	2.04
	♀	2	83.3, 94.0	93.65	-
<i>albifrons</i>	♂	10	90.0-99.0	94.14	2.83
	♀	4	91.0-95.6	92.90	1.98
<i>cleis</i>	♂	6	88.7-92.8	90.80	1.72
<i>minutillus</i> Australian	♂	20	88.1-98.0	93.63	2.77
	♀	8	90.0-94.0	92.38	1.41
non-Australian	♂	5	92.2-97.5	95.28	2.48
	♀	2	88.5, 98.0	93.25	-
<i>barnardi</i>	♂	4	102.0-106.5	104.30	2.02
	♀	3	98.0-99.0	98.67	0.58
<i>poecilurus</i>	♂	2	101, 101	101.00	-
	♀	4	96.5-100.0	99.13	1.75
<i>aheneus</i>	♂	8	90.8-98.3	93.76	2.52
	♀	10	87.7-96.3	92.72	2.90
<i>jungei</i> mountains	♂	3	88.6-92.7	89.97	2.37
	♀	1	89.3	-	-
lowlands	♂	5	87.6-91.4	89.56	1.54
	♀	2	87.1, 91.7	89.40	-
Madu	♂	1	91.9	-	-
Flores	♂	1	93.0	-	-
<i>misoriensis</i>	♂	15	88.0-95.0	92.17	2.10
	♀	3	88.0-93.5	91.00	2.78
<i>russatus</i> 1)					
Northern Queensland	♂	14	89.0-95.5	92.82	2.02
	♀	3	94.0-98.0	96.33	2.08
Southern Queensland	♂	10	92.0-97.0	94.22	1.52
	♀	5	93.3-98.0	95.98	1.70
New Guinea	♂	2	94.0, 95.0	94.50	-
	♀	2	96.0, 96.0	96.00	-
" <i>russatus</i> " Timor	♂	1	99.3	-	-
<i>rufomerus</i> 2)	♂	21	93.0-98.5	95.87	1.52
	♀	2	92.4, 95.0	93.70	-
<i>salvadorii</i> 2)	♂	1	99.0	-	-
<i>crassirostris</i>	♂	3	89.0-96.6	92.53	3.83
	♀	6	90.0-96.2	92.27	2.23
<i>ruficollis</i>	♂	4	89.0-97.2	93.05	4.15
	♀	2	93.2, 96.0	94.60	-

1) It is likely that longer-winged specimens from northern Queensland, notably two females with wings 97 and 98 collected by K. Broadbent in the Cape York district in the period 16 Jan.—14 May 1884, are wintering birds from further south. 2) The full series of *Chrysococcyx rufomerus* and the holotype of *C. salvadorii* were measured at the AMNH by Mrs M. Lecroy.

Erratum: *peninsularis* ♀, R = 93.3, 94.0 (not 83.3, 94.0).

TABLE 2b  
Tail length (in mm).

		N	R	$\bar{Y}$	SD
<i>peninsularis</i>	♂	5	60.0-65.7	63.48	2.17
	♀	2	61.8,62.6	62.20	-
<i>albifrons</i>	♂	11	61.5-67.0	63.56	1.63
	♀	4	61.6-63.4	62.60	0.78
<i>cleis</i>	♂	6	60.1-62.9	61.72	1.10
<i>minutillus</i> Australian	♂	20	55.6-65.7	60.64	2.92
	♀	7	58.0-63.0	60.80	2.05
non-Australian	♂	5	55.3-66.6	62.70	4.55
	♀	2	54.2,61.0	57.60	-
<i>barnardi</i>	♂	4	64.0-69.0	66.35	2.27
	♀	3	62.0-66.0	64.40	2.12
<i>poecilurus</i>	♂	2	65.0,70.0	67.50	-
	♀	4	64.0,70.0	66.38	2.56
<i>aheneus</i>	♂	8	59.8-64.0	62.46	1.25
	♀	9	60.1-64.2	62.36	1.42
<i>jungei</i> mountains	♂	3	55.3-57.1	56.17	0.90
	♀	1	53.0	-	-
lowlands	♂	5	55.7-60.0	58.34	1.62
	♀	2	56.5,57.0	56.75	-
Madu	♂	1	62.3	-	-
Flores	♂	1	62.0	-	-
<i>misoriensis</i>	♂	14	59.0-65.0	61.96	1.67
	♀	3	61.5-62.3	61.93	0.40
<i>russatus</i> Northern Queensland	♂	14	56.0-64.5	61.35	2.38
	♀	3	60.0-62.0	61.33	1.15
Southern Queensland	♂	10	60.0-64.2	62.03	1.68
	♀	5	62.0-66.5	64.42	1.61
New Guinea	♂	2	63.0,63.4	63.20	-
	♀	2	61.7,65.0	63.35	-
" <i>russatus</i> " Timor	♂	1	68.2	-	-
<i>rufomerus</i>	♂	19	62.5-72.5	66.31	2.48
	♀	2	67.0,72.0	69.50	-
<i>salvadorii</i>	♂	1	68.0	-	-
<i>crassirostris</i>	♂	3	64.0-66.5	64.83	1.44
	♀	6	60.2-62.9	61.25	0.92
<i>ruficollis</i>	♂	4	57.8-68.1	63.38	4.67
	♀	2	65.5,68.1	66.80	-

TABLE 2C  
Bill length from skull (in mm).

		N	R	$\bar{Y}$	SD
<i>peninsularis</i>	♂	4	16.8-19.5	18.20	1.50
	♀	2	16.9,18.3	17.60	-
<i>albifrons</i>	♂	8	18.1-19.1	18.63	0.35
	♀	2	17.9,19.4	18.65	-
<i>cleis</i>	♂	4	16.2-19.5	17.95	1.38
<i>minutillus</i> Australian	♂	19	16.0-19.5	17.12	0.98
	♀	6	16.0-18.2	17.55	0.88
non-Australian	♂	5	16.0-20.4	17.82	1.72
	♀	2	17.0,18.5	17.75	-
<i>barnardi</i>	♂	4	17.5-18.8	18.20	0.54
	♀	2	18.9,19.0	18.95	-
<i>poecilurus</i>	♂	1	19.0	-	-
	♀	4	17.0-22.0	18.88	2.21
<i>aheneus</i>	♂	7	18.1-19.4	18.90	0.45
	♀	10	18.2-19.7	19.35	0.44
<i>jungei</i> mountains	♂	2	17.8,18.8	18.30	-
	♀	1	19.0	-	-
lowlands	♂	4	17.6-18.3	17.88	0.31
	♀	2	17.5,18.2	17.85	-
Madu	♂	1	16.6	-	-
Flores	♂	1	-	-	-
<i>misoriensis</i>	♂	11	16.0-18.6	17.57	0.80
	♀	3	17.0-18.0	17.60	0.53
<i>russatus</i> Northern Queensland	♂	12	15.0-19.6	17.55	1.38
	♀	3	16.5-18.0	17.17	0.76
Southern Queensland	♂	9	17.2-19.5	18.09	0.73
	♀	5	17.2-19.4	18.18	1.04
New Guinea	♂	2	17.2,18.2	17.70	-
	♀	2	18.9,20.0	19.45	-
" <i>russatus</i> " Timor	♂	1	-	-	-
<i>rufomerus</i>	♂	19	18.0-20.0	18.99	0.61
	♀	2	18.9,19.5	19.20	-
<i>salvadorii</i>	♂	1	-	-	-
<i>crassirostris</i>	♂	3	19.0-20.9	19.67	1.07
	♀	5	19.4-21.0	20.46	0.66
<i>ruficollis</i>	♂	4	16.0-18.7	17.49	1.23
	♀	2	17.5,19.5	18.50	-

TABLE 2d

Bill width at nostrils (in mm).

		N	R	$\bar{Y}$	SD
<i>peninsularis</i>	♂	6	5.6-6.5	5.95	0.34
	♀	2	5.8,5.9	5.85	-
<i>albifrons</i>	♂	9	4.8-5.9	5.37	0.34
	♀	2	5.8,5.9	5.85	-
<i>cleis</i>	♂	6	4.0-4.7	4.45	0.22
<i>minutillus</i> Australian	♂	19	5.0-6.2	5.68	0.46
	♀	7	5.4-6.5	6.13	0.39
non-Australian	♂	5	5.7-6.0	5.86	0.13
	♀	2	4.5,6.3	5.40	-
<i>barnardi</i>	♂	4	6.0-6.6	6.15	0.30
	♀	3	6.0	6.00	0
<i>poecilurus</i>	♂	2	6.0,6.4	6.20	-
	♀	4	5.8-7.0	6.20	0.54
<i>aheneus</i>	♂	8	5.1-6.2	5.45	0.42
	♀	9	5.0-6.3	5.70	0.35
<i>jungei</i> 1) mountains	♂	1	5.5	-	-
	♀	1	-	-	-
lowlands	♂	4	5.0-5.7	5.48	0.32
	♀	1	5.3	-	-
Madu	♂	1	-	-	-
Flores	∅	1	5.8	-	-
<i>misoriensis</i>	♂	11	5.5-6.5	6.04	0.31
	♀	3	6.0-6.8	6.47	0.42
<i>russatus</i> Northern Queensland	♂	14	5.0-6.8	6.21	0.48
	♀	3	6.5-6.8	6.63	0.15
Southern Queensland	♂	10	5.8-6.7	6.23	0.37
	♀	5	5.3-6.8	5.80	0.62
New Guinea	♂	2	6.2,6.3	6.25	-
	♀	2	6.6,6.6	6.60	-
" <i>russatus</i> " Timor	∅	1	-	-	-
<i>rufomerus</i>	♂	21	5.0-6.1	5.68	0.32
	♀	2	5.8,6.0	5.90	-
<i>salvadorii</i>	♂	1	5.5	-	-
<i>crassirostris</i>	♂	2	6.0,6.6	6.30	-
	♀	6	5.8-6.8	6.25	0.40
<i>ruficollis</i>	♂	4	5.0-5.8	5.48	0.34
	♀	2	5.5,5.5	5.50	-

1) Sample size in *C. r. jungei* reduced because several specimens had bill constricted by thread.

white apical spot; fourth pair from outside: outer web dark bronze-green edged pale rufous, inner web fuscous green with pale rufous area two-thirds of the way from base, and a white apical spot, both webs with a blackish subterminal area; central pair bronze-green with blackish subterminal area, blackish towards base, and edged pale rufous. Adult female similar but the larger upperwing coverts and the dorsal surface (especially the mid-back) with a striking bright green to blue-green (not purplish bronze) gloss. Colour of bare eyerim unknown for either sex.

Distribution. — Mountains of New Guinea between 1600 m and 2600 m.

Specimens examined. — Paniai, Wissel Lakes 1 (RMNH); Weylands Mts., 2000 m 1 (ZMB); Mount Kaindi, 2300 m, Morobe district 1 (BBM); Bihagi, head of Mambare R. 1, Owgarra, Angabunga R., 6-8000' 1 (AMNH).

### III. DISCUSSION AND CONCLUSIONS

As implied in the introduction, this study has been largely descriptive and exegetic. However, perusing its results, I am persuaded to offer one or two suggestions.

Of particular interest is the colour of the bare periophthalmic ring or eyerim. In table 3 are set out, by form, the colours of this feature as recorded on specimen labels. As can be seen, little such information is available, especially for non-Australian forms. Yet what there is suggests that the colour of the eyerim is of taxonomic significance. Scanning table 3, we see little appreciable variation among adult males; some hue of bright red is noted for all forms, though in addition there is an incidence of orange and orange-red among males of *C. r. russatus* and *C. r. misoriensis*, the two most rufescent forms. In females, however, three groups of colours have been recorded for the eyerim: orange and reds, greys and greens, and yellows. I assume here that the specimens of the first group (except for those of *crassirostris*, see below) have been missexed, and are actually adult or sub-adult males. This leaves us with the types grey/green and yellow. The first has been recorded in females of *C. m. minutillus* and *C. poecilurus*, the second in *C. m. barnardi*, *C. r. aheneus*, *C. r. russatus* and *C. rufomerus*, and once in *C. m. minutillus*. The equivocal type 'greenish yellow' has been recorded for one female of *C. m. albifrons* and one female *C. r. russatus*.

*C. minutillus* and *C. russatus* as here construed differ in that the former tends to be greener above with little or no purpurascence, whereas the latter tends to be less brightly green above with stronger rufescent and purpurascence glosses. In this connexion, the distribution of eyerim types grey/green and yellow relative to the taxonomic arrangement advocated here becomes extremely interesting. It is tempting to surmise that the factor

TABLE 3  
Colour of periphthalmic ring (from specimen labels).

	adult ♂	adult ♀
<i>peninsularis</i>	vermilion 1	-
<i>albifrons</i>	red 1 bright red 1	green-yellow 1
<i>cleis</i>	coral-red 2	-
<i>minutillus</i>	coral-red 1 red 11 vermilion 3 crimson 1 scarlet 4 bright red 1 ochre-red 1	grey 3 greenish grey 1 greenish white 1 olive-grey 1 translucent grey 1 orange 1 pale red 2 light red 1 red 1 pale sulphurous 1
<i>barnardi</i>	bright red 1	deep yellow 1
<i>poecilurus</i>	tomato-red 1	pale greenish white 2
<i>aheneus</i>	scarlet 1 coral-red 2	pale yellowish 3 ochraceous yellow 1
<i>jungei</i>	red 1 scarlet 1 vermilion 1	-
<i>misoriensis</i>	carmine 1 red 1 salmon-red 1 orange-red 1 reddish orange 1 orange 2	-
<i>russatus</i>	vermilion 2 red 12 bright red 2 dark red 1 scarlet 3 bright scarlet 1 orange-red 1 orange-scarlet 2.	greenish yellow 1 pale yellow 1 yellow 2 deep yellow 3 ochraceous yellow 2 yellowish 1
<i>rufomerus</i>	vermilion 13 bright vermilion 2 dark vermilion 2 crimson 1 bright scarlet 1	pale yellow 1 pale sulphurous 1
<i>crassirostris</i>	vermilion 2 red 1 blood-red 1	-
<i>ruficollis</i>	-	-

increasing viridescence in *C. minutillus* and rufescence and purpurascence in *C. russatus* is the same as or linked to the factor controlling the colour of the eyerim in females (the incidence of orange in the two most rufescent forms of *C. russatus*, noted above, suggests that such a factor might operate, though less ostensibly, in adult males also). If there is a physiological basis for this argument, then it is possible that the majority of adult females of the subspecies of *C. minutillus* will have eyerims of the grey/green type, and the majority of adult females of *C. russatus* will have eyerims of the yellow type. Thus we might predict that this character in females of *peninsularis*, *albifrons*, *cleis* and *barnardi* will normally be of the grey/green type (i.e., that the single data so far reported for female *albifrons* and *barnardi* are atypical), and that in females of *jungei* and *misoriensis* it will be of the yellow type.

The eyerim colour of adult females of *C. crassirostris* is unrecorded. Kühn sexed as females two second-phase immatures with eyerims 'vermilion' (AMNH 627130) and 'pale vermilion' (AMNH 627131). Because this form is already known to be aberrant in its plumage coloration, I accept Kühn's judgement rather than the alternative that he missexed two immature males (recall also MZB 2646, a first-phase bird reported by Vorderman to be a female with orange eyerims). This strongly suggests that in contradistinction to the situation in all other forms for which eyerim colour is known for both sexes, the eyerim colour in *crassirostris* is in both adults the same, namely a bright red.

The colour of the eyerim in *C. ruficollis* remains to be recorded. In *C. meyerii*, a species excluded from the present study, the eyerims have been recorded as orange or red in adult males, and mid-grey or mid-bluegrey in adult females (R. Schodde, pers. comm., ex specimens in ANWC; H. Disney, in litt., ex specimen in AM).

Figure 2 shows the distribution of the various forms based on the taxonomic conclusions reached above. One could surmise that the range of *C. minutillus* is shrinking and fragmenting, either through competition with *C. russatus* or through some other factor. In this respect, the distribution of these two species in Australia is of particular interest: here, *C. minutillus* occurs in two subspecies, separated by and apparently hybridizing with *C. russatus*. The latter, probably having entered Australia from New Guinea, may itself have sundered the distribution of *C. minutillus*, or may merely have moved into the vacuum created by an earlier withdrawal of *C. minutillus* from the north-east. When the full extent of hybridization between these two species in Australia is known, we may be in a better position to choose between these two possibilities. A similar pattern of dis-



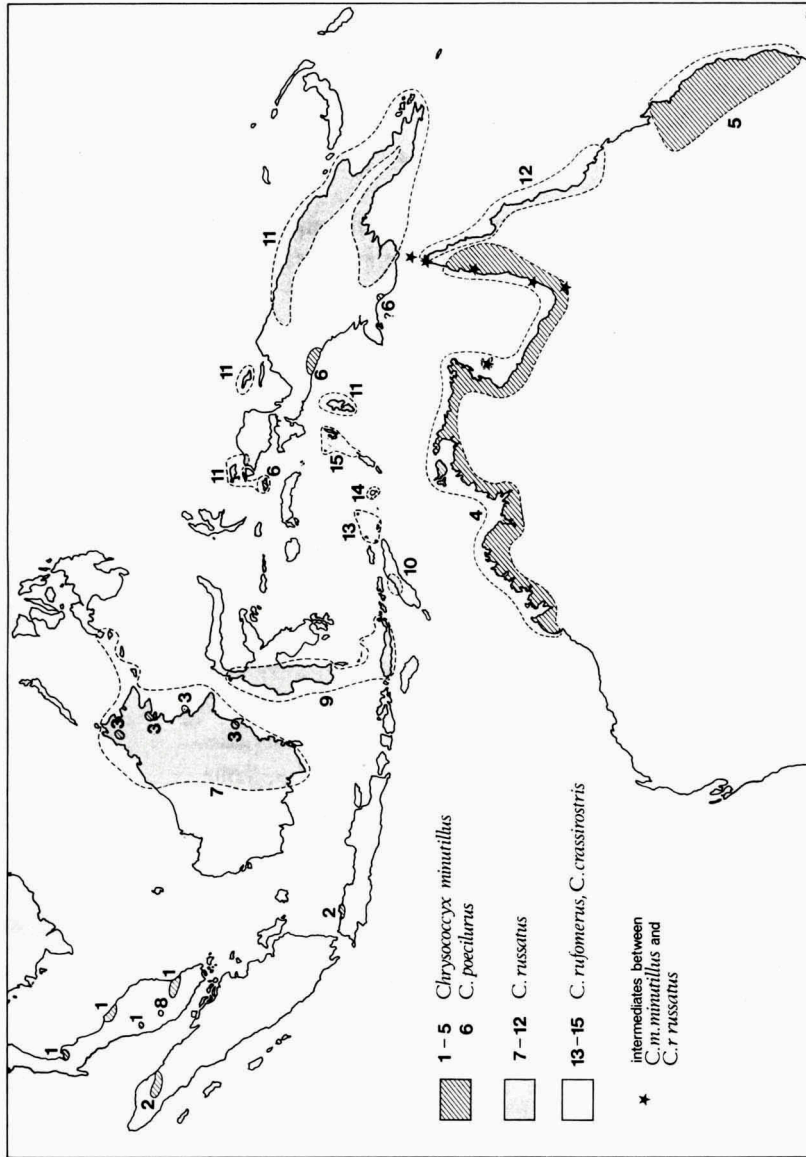


Fig. 2. Distribution (based on specimens) of the *Chrysococcyx* 'malayanus' group (except *C. ruficollis* of the mountains of New Guinea). 1. *C. minutillus peninsularis*, 2. *C. m. albifrons*, 3. *C. m. cleis*, 4. *C. m. minutillus*\*, 5. *C. m. barnardi*\*, 6. *C. poecilurus*, 7. *C. ruscatus aheneus*, 8. *C. r. cf. aheneus*, 9. *C. r. jungei*, 10. *C. r.* subsp., 11. *C. r. misoriensis*, 12. *C. r. ruscatus*\*, 13. *C. rufomerus*, 14. 'salvadorii', 15. *C. crassirostris*.  
 \* Known breeding range only, putative wintering range not shown.  
 Because of the exigencies of scale, the boundaries of some forms have had to be drawn around islands from which those forms have not in fact been recorded. For exact known distribution, see text.

tribution seems to occur in the meliphagid genus *Ramsayornis*, with *R. modestus* occupying New Guinea and eastern Queensland, and *R. fasciatus* occurring as a breeding bird in Australia to the west and south of the range of *R. modestus* (Parker, in prep.). In Borneo, *C. russatus* and *C. minutillus* apparently co-exist without interbreeding.

We return for the last time to the status of *C. poecilurus*. I have suggested above that it may be a distinct form, larger than *C. r. misoriensis* and co-existing with the latter on Misol and perhaps elsewhere in New Guinea. It is possible that these two forms differ also in the colour of the periophthalmic ring of adult females; for whereas I have speculated above that this character in *C. r. misoriensis* will prove to be yellow, it has been recorded in two adult females of *C. poecilurus* as pale greenish white. Moreover, the colour of this feature in *C. poecilurus*, together with its viridescent rather than rufescent dorsum, suggests that this taxon, if real, may be more closely related to *C. minutillus* than to *C. russatus*. This would make sense in terms of the patterns of distribution and interaction elaborated above, for a) the ranges of forms of *C. minutillus* seem to be shrinking, and are usually relatively less in extent than the ranges of forms of *C. russatus*, and b) the two other known instances of interaction (Borneo, Australia) likewise each involve a form of *C. minutillus* and a form of *C. russatus*.

The relationships of *C. rufomerus* and *C. crassirostris* within the group are obscure. Beyond suggesting that the yellow eyering of adult females of *C. rufomerus* points to an affinity with *C. russatus*, I leave the question open. The aberrant coloration of *C. crassirostris* need not deter us from retaining this form in the group, for it is no more than one might expect of the accelerated differentiation of which very small populations are capable. Besides, *C. crassirostris* is linked, at least phenetically, to the more normally plumaged *C. rufomerus* by the phenon *salvadorii* (pl. 2).

The distinctive *C. ruficollis* of montane New Guinea is here considered to be related to this group, but perhaps to constitute a separate division of it. It is worth mentioning in this respect that Schodde & Calaby (1972: 294) proposed two biogeographical provinces in the New Guinea rain forest biota, each referable to different biogeographical regions: the Irian Division of the Oriental Region for the lowland and hill biota, and the Tumbunan Division of the Australian Region for the montane biota above ca. 1200 m. *C. ruficollis* belongs to the Tumbunan Division, and *C. r. misoriensis* and *C. poecilurus* to the Irian Division.

The present contribution to the understanding of this difficult group is intended merely as a basis for and a stimulus to further research, including collecting and field observations. The need for further specimens of adult

females (with colour of eyerim noted!) from Malaysia, Indonesia and New Guinea, is singularly acute. Opportunities for fieldwork in these regions are at present, however, rather few. If these bronze-cuckoos were denizens of rain forest, then this paucity of opportunity would be a matter of concern, for the study of rain forest species in these regions is somewhat of a race against the clock. In fact, because most of the forms involved (except perhaps *C. ruficollis*) prefer other habitats such as mangroves, riverine woodland, secondary growth and native gardens, and may even shun rainforest (q.v. *C. m. peninsularis*, p. 26), their continued existence needs at present be no great cause for concern.

#### IV. ACKNOWLEDGEMENTS

For the loan of, and information concerning specimens in their care I am indebted to the following colleagues: Dr L. C. Binford (CAS), Mr H. J. de S. Disney (AM), Dr S. Eck (SMT), Messrs I. C. J. Galbraith, R. D. P. Goodwin and Dr C. J. O. Harrison (BMNH), Dr J. P. Hubbard, Mr D. M. Niles and Dr J. E. duPont (DMNH), Dr R. E. Johnson (UCB), Drs S. Kadarsan and S. Somadikarta (MZB), Mrs M. K. LeCroy (AMNH), Dr G. Mauersberger (ZMB), Professor E. Mayr and Dr. R. A. Paynter, Jnr (MCZ), Mr A. R. McEvey (NMV), Dr G. F. Mees (RMNH), Professor F. Salomonsen (UZM), Dr R. Schodde (ANWC, CSIRO), Dr D. Smidt (PNG), Dr P. J. Stanbury (MMS), Dr B.-O. Stolt (SMNH), Dr G. M. Storr (WAM), Dr M. A. Traylor (FMNH), Mr D. P. Vernon (QM), Mme C. Voisin (MNHN), Dr J. Wattel (ZMA), Dr D. R. Wells (UMKL), Mrs Yang Chang Man (USS), Dr A. Ziegler (BBM) and Dr R. L. Zusi (NMNH). For other assistance, including help with references and localities, criticisms of drafts and ideas, and use of unpublished observations I am indebted to Major H. Bell, Mr M. Bruce, Mr G. Chapman (CSIRO), the late A. H. Chisholm, the Earl of Cranbrook (formerly Lord Medway), Professor J. Diamond, Mr E. C. Dickinson, Mr W. Filewood, Mr J. R. Ford, Mr M. T. Goddard, the late A. Hoogerwerf, I. Kepars (Librarian, NLA), Dr Ben King, Mrs T. Kloot (Archivist, RAOU), Dr H. J. Lavery, Mr I. Mason (CSIRO), Mr A. R. McGill, Mr J. L. McKean (CSIRO), Dr G. F. Mees, Mr B. Morgan, Dr K. C. Parkes (CMNH), Dr R. Schodde, Professor L. L. Short (AMNH), Dr S. Somadikarta, Dr G. M. Storr, Professor E. Tortonese (MGD) and Dr D. R. Wells.

My colleague Dr G. F. Gross (SAM) translated Salvadori's Italian, and Dr Somadikarta helped in the modernization of Indonesian place names. Miss A. S. Gackle translated the several German references, and Dr G. van Tets (CSIRO) translated Vorderman's 1898 article from the Dutch. Mr R. Ruehle photographed the specimens in pl. I, and Miss J. Thurmer executed the map. Mrs D. Melloy typed the several drafts with awesome speed and accuracy. To these colleagues I also extend my grateful thanks.

Finally, I should like once again to mention my friends Mrs Mary LeCroy and Dr Gerlof Mees for their unflagging responses to the many queries I sent their way. Without their unstinting help the present study would have been a lesser thing indeed.

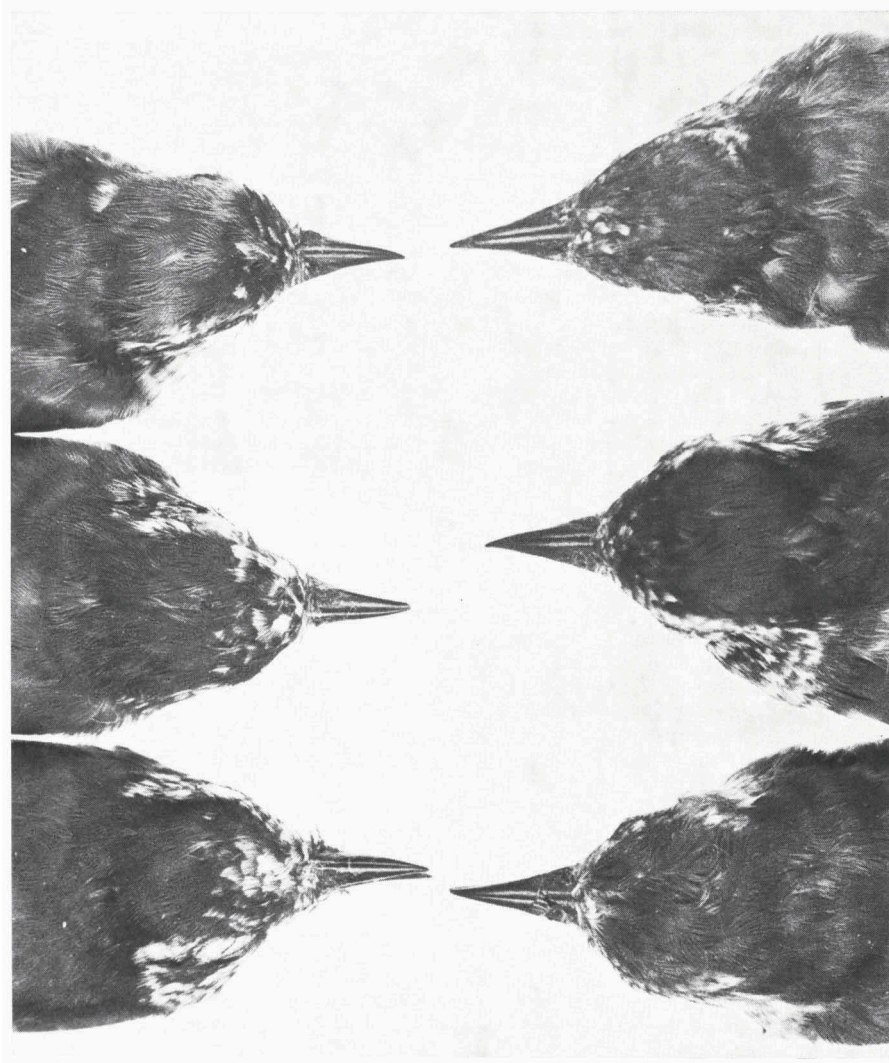
#### V. REFERENCES

- ARBOCCO, G., L. CAPOCACCIA & C. VIOLANI, 1979. Catalogo dei tipi di ucelli del Museo Civico di Storia Naturale di Genova. — *Annal. Mus. Civ. Stor. Nat. Giacomo Doria*, 82: 184-265.

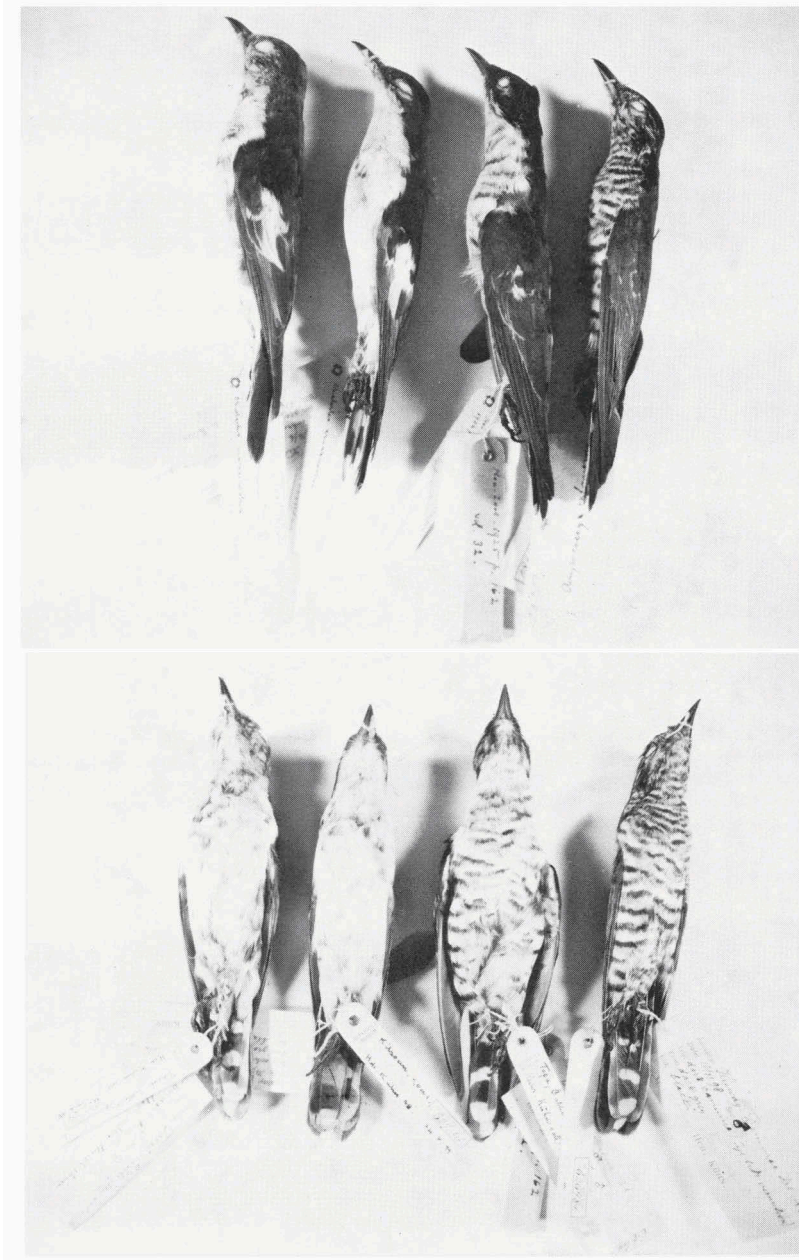
- BEMMEL, A. C. V. VAN, 1948. A faunal list of the birds of the Moluccan islands. — *Treubia*, 19: 323-402.
- BERLIOZ, J. & P. PFEFFER, 1966. Etude d'une collection d'oiseaux d'Amboine (Iles Moluques). — *Bull. Mus. Natn. Hist. Nat.*, 37: 907-915.
- BERNEY, F. L., 1906. Field notes on birds of the Richmond district, north Queensland, 3. — *Emu*, 6: 41-47.
- BROADBENT, K., 1885. On the migration of birds at the Cape York Peninsula. — *Proc. Roy. Soc. Qld.*, 1884: 93-96.
- COOLIDGE, H. J., 1940. Mammal and bird collections of the Asiatic Primate Expedition. — *Bull. Mus. Comp. Zool.*, 87 (3): 121-130.
- DEIGNAN, H. G., 1963. Checklist of the birds of Thailand. — *U.S. Natn. Mus. Bull.*, 226: i-x, 1-263.
- DEIGNAN, H. G. & B. AMOS, 1950. Notes on some forms of the genus *Chalcites* Lesson. — *Emu*, 49: 167-168.
- DELACOUR, J., 1951. Commentaires, modifications et additions à la liste des oiseaux d'Indochine française. — *Oiseau*, 21: 1-32, 81-119.
- DIAMOND, J. M., 1972. Avifauna of the eastern highlands of New Guinea. — *Publ. Nuttall Orn. Club*, 12: i-vii, 1-438.
- DUPONT, J. E., 1971. Philippine birds. — *Delaware Mus. Nat. Hist., Monogr. Ser.*, 2: i-x, 1-480, pl. 1-85.
- DUPONT, J. E. & D. S. RABOR, 1973. South Sulu Archipelago birds. An expedition report. — *Nemouria*, 9: 1-63.
- ECK, S., 1976. Die Vögel der Banggai-Inseln, insbesondere Pelengs. — *Zool. Abh., Dresden*, 34: 53-100.
- FINSCH, O., 1900. Zur Catalogisirung der Ornithologischen Abtheilung. — *Notes Leyd. Mus.*, 22: 75-125.
- FRIEDMANN, H., 1968. The evolutionary history of the avian genus *Chrysococcyx*. — *U.S. Natn. Mus. Bull.*, 265: 1-137.
- GILLIARD, E. T., 1959. The ecology of hybridization in New Guinea honeyeaters (Aves). — *Amer. Mus. Novit.*, 1937: 1-26.
- GOODWIN, R. P. D., 1974. Cuculidae. In: B. P. Hall, ed. *Birds of the Harold Hall Australian expeditions 1962-70: 118-126. Brit. Mus. (Nat. Hist.)*, London.
- GRAY, G. R., 1870. Hand-list of the genera and species of birds, distinguishing those contained in the British Museum, pt. 2: i-xv, 1-278. Trustees of the Brit. Mus., London.
- HARRISON, C. J. O., 1973. The zoogeographical dispersal of the genus *Chrysococcyx*. — *Emu*, 73: 129-133.
- HARTERT, E., 1901. On the birds of the Key and South-East Islands, and of Ceram-laut. — *Novit. Zool.*, 8: 1-5, 93-101, 232-253.
- HARTERT, E. & E. STRESEMANN, 1925. Ueber die Indoaustralischen Glanzkuckucke (*Chalcites*). — *Novit. Zool.*, 32: 158-163.
- HEDLEY, C., 1915. Presidential address. — *J. Proc. Roy. Soc. N.S.W.*, 49: 1-77.
- HELLEBREKERS, W. P. J. & A. HOOGERWERF, 1967. A further contribution to our oological knowledge of the island of Java (Indonesia). — *Zool. Verhand.*, 88: 1-164.
- HIGHTON, R. & S. A. HENRY, 1970. Evolutionary interactions between species of North American salamanders of the genus *Plethodon*. In: T. Dobzhansky, M. K. Hecht & W. C. Steere, ed. *Evolutionary Biology*, 4: 211-256. Appleton-Century-Crofts, New York.
- HOOGERWERF, A., 1948. Contribution to the knowledge of the distribution of birds on the island of Java, with remarks on some new birds. — *Treubia*, 19: 83-137.
- JUNGE, G. C. A., 1938. Remarks on *Chalcites malayanus* (Raffles). — *Zool. Meded.*, 20: 237-239.
- KING, B., M. WOODCOCK & E. C. DICKINSON, 1975. A field guide to the birds of South-East Asia: 1-480, pl. 1-64, fig. 1-1181. Collins, London.

- MCGILL, A. R. & M. T. GODDARD, 1979. The Little Bronze Cuckoo in New South Wales. — *Aust. Bds.*, 14: 23-24.
- MACGILLIVRAY, W. D. K., 1914. Notes on some north Queensland birds. — *Emu*, 13: 132-186.
- MCGREGOR, R. C., 1907. Notes on a collection of birds from the island of Basilan with descriptions of three new species. — *Philippine J. Sci.*, 2, sect. A: 279-291.
- , 1909a. A collection of birds from northern Mindanao. *Philippine J. Sci.*, 4, sect. A: 67-77.
- , 1909b. A manual of Philippine birds. Pt. 1: i-x, 1-412. Manila Bur. Print.
- McKEAN, J. L., 1980. A short visit to Ambon. — *Pap. New Guinea Bird Soc. Newsl.*, 165-166: 25-29.
- MARCHANT, S., 1972. Evolution of the genus *Chrysococcyx*. — *Ibis*, 114: 219-233.
- MASTERS, G., 1876. Zoology of the Chevert — Ornithology, pt. 1. — *Proc. Linn. Soc. N.S.W. for 1875-76*: 44-64.
- MATHEWS, G. M., 1912. Notes on Australian cuckoos. — *Austral Av. Rec.*, 1: 2-22.
- MAYR, E., 1939. The winter quarters of *Chalcites malayanus minutillus* (Gould). — *Emu*, 39: 128-129.
- , 1941. List of New Guinea birds: i-xi, 1-260. *Amer. Mus. Nat. Hist.*, New York.
- MAYR, E. & R. MEYER DE SCHAUENSEE, 1940. Zoological results of the Denison-Crockett Expedition to the South Pacific for the Academy of Natural Sciences of Philadelphia, 1937-1938. 1 — The birds of the island of Biak. — *Proc. Acad. Nat. Sci. Philad.*, 91: 1-37.
- MEDWAY, LORD & D. R. WELLS, 1976. The birds of the Malay Peninsula. Vol. 5: conclusion, and survey of every species: i-xxxii, 1-448, pl. 1-24. Witherby Ltd. in assoc. with Penerbit Universiti Malaya, London/Kuala Lumpur.
- MEES, G. F., 1964. Notes on two small collections of birds from New Guinea. — *Zool. Verhandl.*, 66: 3-37.
- , 1965. The avifauna of Misool. — *Nova Guinea, Zool.*, 31: 139-203.
- MEISE, W., 1929. Die Vögel von Djampea und benachbarten Inseln nach einer Sammlung Baron Plessens. — *J. Orn.*, 77: 431-480.
- MÜLLER, S., 1845. Bijdragen tot de kennis van Timor en eenige andere naburige eilanden. In: C. J. Temminck, ed. *Verhandelingen over de natuurlijke geschiedenis der Nederlandsche overzeesche bezittingen. Land- en volkenkunde*: 129-320 (not seen; reference conveyed by Dr G. F. Mees).
- NORTH, A. J., 1911. Nests and eggs of birds found breeding in Australia and Tasmania, 3 (1): 1-80. — *Aust. Mus. (Sydney) Special Cat. No. 1*.
- OGILVIE-GRANT, W. R., 1915. Report on the birds collected by the British Ornithologists' Union Expedition and the Wollaston Expedition in Dutch New Guinea. — *Ibis Jubilee Suppl.*, 2: i-xx, 1-336, pl. 1-7, map A-B.
- PARKER, S. A., 1961. Checklist of the Birds of the Lesser Sundas: Passerines (based on previous literature and specimens in the BMNH). Manuscript.
- , 1966. Albert S. Meek's collecting-locality on the Cape York Peninsula, 1898. — *Emu*, 66: 121-122.
- PETERS, J. L., 1940. Check-list of birds of the world, 4: i-xii, 1-291. Harvard Univ. Press., Cambridge, Mass.
- RAFFLES, T. S., 1822. Second part of the descriptive catalogue of a zoological collection made in the island of Sumatra and its vicinity. — *Trans. Linn. Soc. Lond.*, 13: 277-340.
- RAND, A. L. & E. T. GILLIARD, 1967. Handbook of New Guinea birds: i-x, 1-612, pl. 1-76. Weidenfeld & Nicolson, London.
- RILEY, J. H., 1930. Birds from the small islands off the northeast coast of Dutch Borneo. — *Proc. U.S. Natn. Mus.*, 77: 1-23.

- SALVADORI, T., 1875. Descrizione di cinquantotto nuove specie di ucelli, ed osservazioni intorno ad altre poco note, della Nuova Guinea e di altre Isole Papuane, raccolte dal Dr Odoardo Beccari e dai cacciatori del Sig. A. A. Bruijn. — *Annal. Mus. Civ. Stor. Nat. Giacomo Doria*, 7: 896-976.
- , 1878. *Prodromus ornithologiae Papuasiae et Moluccarum*, VI, Picariae. — *Annal. Mus. Civ. Stor. Nat. Giacomo Doria*, 13: 456-463.
- , 1880. *Ornitologia della Papuaasia e delle Molucche*, 1: i-xii, 1-573. Stamperia Reale della Ditta G. B. Paravia e Comp., Torino.
- SCHODDE, R. & J. H. CALABY, 1972. The biogeography of the Australo-Papuan bird and mammal faunas in relation to Torres Strait. In: D. Walker ed. *Bridge and Barrier: the Natural and Cultural History of Torres Strait*: 257-300. Res. School Pacif. Studies Publ. BG/3. Aust. Nat. Univ., Canberra.
- SCHODDE, R. & S. J. MATHEWS, 1977. Contributions to Papuan ornithology, V. Survey of the birds of Taam Island, Kai Group. — *CSIRO Div. Wildl. Res. Techn. Pap.*, 33: 1-29.
- SELANDER, R. K., 1971. Systematics and speciation in birds. In: D. S. Farner & J. R. King, ed. *Avian Biology*, 1: 57-147. Academic Press, New York/London.
- SHARPE, R. B., 1877. On the birds collected by Professor J. B. Steere in the Philippine Archipelago. — *Trans. Linn. Soc. Lond. (2nd ser.)*, 1: 307-355.
- SHELLEY, G. E., 1891. Cuculidae. In: *Catalogue of birds in the British Museum*, 19: 209-434. *Brit. Mus.*, London.
- SHORT, L. L., 1969a. Taxonomic aspects of avian hybridization. — *Auk*, 86: 84-105.
- , 1969b. 'Suture zones', secondary contacts, and hybridization. — *Syst. Zool.*, 18: 458-460.
- SIBLEY, C. G., 1950. Species formation in the Red-eyed Towhees of Mexico. — *Univ. Cal. Publ. Zool.*, 50: 109-194.
- STEIN, G. H. W., 1936. Ornithologische Ergebnisse der Expedition Stein 1931-1932. V. Beiträge zur Biologie papuanischer Vögel. — *J. Orn.*, 84: 21-57.
- STORR, G. M., 1973. List of Queensland birds. — *Spec. Publ. West. Aust. Mus.*, 5: i-iii, 1-177.
- STRESEMANN, E., 1914. Die Vögel von Seran (Ceram). — *Novit. Zool.*, 21: 25-153.
- , 1923. Dr. Bürger's ornithologische Ausbeute im Stromgebiet des Sepik. Ein Beitrag zur Kenntnis der Vogelwelt Neuguineas. — *Arch. Naturgesch.*, Ser. A, 89 (7): 1-96; (8): 1-92.
- STRESEMANN, E. & K. PALUDAN, 1935. Ueber eine kleine Vogelsammlung aus dem Bezirk Merauke (Süd-Neuguinea), angelegt von Dr. H. Nevermann. — *Mitteil. Zool. Mus. Berlin*, 20: 447-463.
- TWEEDDALE, MARQUIS OF, 1879. Contributions to the ornithology of the Philippines, No. 11. On the collection made by Mr. A. H. Everett at Zamboanga, in the island of Mindanao. — *Proc. Zool. Soc. Lond. for 1878*: 936-954.
- VAURIE, C., 1956. Systematic notes on Palearctic birds, 24. Ploceidae: the genera *Passer*, *Petronia* and *Montifringilla*. — *Amer. Mus. Novit.*, 1814: 1-27.
- VORDERMAN, A. G., 1898. Molukken-Vogels. — *Natuurk. Tijdschr. Ned.-Indië*, 58: 169-252.
- WALLACE, A. R., 1864. A list of the birds inhabiting the islands of Timor, Flores, and Lombok, with descriptions of the new species. — *Proc. Zool. Soc. Lond. for 1863*: 480-497.
- WELLS, D. R., 1972. Bird Report: 1969. — *Malay Nat. J.*, 25: 43-61.
- , 1975. Bird Report: 1972, 1973. — *Malay Nat. J.*, 28: 186-213.



Bills of the sympatric forms *C. minutillus cleis* and *C. russatus aheneus*, showing possible character displacement (see p. 23). Left row *C. m. cleis* (from top to bottom): NMNH 182298, Pulau Panjang, Borneo (holotype of *cleis*); NMNH 182299, Pulau Panjang; MCZ 197196, Morutai Besar, Borneo. Right row *C. r. aheneus* (from top to bottom): MCZ 197195, Morutai Besar; BBM 15084, Tawau, Borneo; DMNH 15195, Batu Batu, Sulu Archipelago. Photographed by R. Ruehle.



From left to right (both rows): *C. crassirostris* AMNH 627129, Tual, Little Kai, and AMNH 627134, Kilsuin, Kur Group; holotype of *Chalcites malayanus salvadorii*, AMNH 627136, Babar; *C. rufomerus* AMNH 626984, Kuway, Damar Is. Courtesy of the American Museum of Natural History.