ZOOLOGISCHE MEDEDELINGEN

UITGEGEVEN DOOR HET

RIJKSMUSEUM VAN NATUURLIJKE HISTORIE TE LEIDEN
(MINISTERIE VAN WELZIJN, VOLKSGEZONDHEID EN CULTUUR)

Deel 61 no. 14 10 juli 1987 ISSN 0024-0672

DESCRIPTION OF A NEW SPECIES OF BUSH WARBLER OF THE GENUS *CETTIA* BONAPARTE, 1834 (AVES: SYLVIIDAE) FROM YAMDENA, TANIMBAR ISLANDS, INDONESIA

by

F.G. ROZENDAAL

Rozendaal, F.G.: Description of a new species of bush warbler of the genus *Cettia* Bonaparte, 1834 (Aves: Sylviidae) from Yamdena, Tanimbar Islands, Indonesia.

Zool. Med. Leiden, 61 (14), 10-vii-1987: 177-202, figs. 1-12, table 1. — ISSN 0024-0672.

Key Words: Aves, Sylviidae, genus *Cettia,* subgenus *Horeites,* systematics, zoogeography, Tanimbar Islands, South Moluccas.

The use of mistnets in forest on Yamdena (Tanimbar Islands, South Moluccas, Indonesia) revealed the presence of an undescribed bush-warbler of the genus *Cettia* Bonaparte, 1834. The new species is described and illustrated here and its morphological characters and vocalizations are compared with those of Asian-Pacific congeners in the subgenus *Horeites* Hodgson, 1845. It is considered most closely related to the Southwest Pacific warblers previously known as *Vitia* Ramsay, 1875. In addition, the identity of *Cettia bivittata* Finsch, 1901, is discussed.

F.G. Rozendaal, c/o Rijksmuseum van Natuurlijke Historie, P.O. Box 9517, 2300 RA Leiden, The Netherlands.

INTRODUCTION

During fieldwork on Yamdena (Tanimbar Islands, South Moluccas, Indonesia) from 23 August to 8 November 1985, I collected a series of an apparently undescribed sylviid warbler. Initially, birds were mistnetted only, in the undergrowth of primary monsoon forest. Field observations were limited due to the skulking behaviour of the birds but a few general aspects of behaviour were noted and, most importantly, vocalizations were identified and tape-recorded. Later, the species was observed and captured in secondary forest, and observed in scrub in cut-over areas and in roadside bamboo-thickets. Plumage, behaviour and voice established it beyond doubt as a

member of the genus *Cettia* Bonaparte, 1834 as classified by Mayr et al. (1986), and vocalizations, plumage characters, measurements and proportions link this newly discovered Tanimbar species to the Southwest Pacific warblers previously known as *Vitia* Ramsay, 1875 (see Orenstein & Pratt, 1983).

Wells (1982) used morphometric characters and song patterns in establishing biological species limits within the *Cettia fortipes* complex (sensu Delacour, 1943), to define a superspecies composed of *C. fortipes* (Hodgson, 1845) and insular *C. vulcania* (Blyth, 1870). Since, the concept of the genus *Cettia* (subgenus *Horeites* Hodgson, 1845) has been considerably enlarged by Orenstein & Pratt (1983) to include three Pacific representatives: the Palau Warbler *Psamathia annae* Hartlaub & Finsch, 1868 (Palau Is.), Shade Warbler *Vitia parens* Mayr, 1935 (San Christobal, Solomon Is.) and Fiji Warbler *Vitia ruficapilla* Ramsay, 1876 (Fiji Is.), based on song structure, external morphology and colour of the eggs.

This paper is not intended as a revision of Asian-Pacific taxa of *Cettia* (subgenus *Horeites*), but the close geographic proximity of the newly discovered Tanimbar species to Sundaic taxa in the *Cettia fortipes* superspecies necessitates a close comparison with the Sunda-Wallacean *C. vulcania*.

This study presents evidence that the Tanimbarese *Cettia* is closely related to the Southwest Pacific *Cettia (Vitia) ruficapilla,* but differs sufficiently to warrant description as a new species. The Philippine *C. (diphone) seebohmi* Ogilvie-Grant, 1894 is included in this paper on account of the discussion of the presumed ancestry of the Pacific taxa by Orenstein & Pratt (1983), but its affinities are being reviewed (Rozendaal & Scharringa, in prep.).

METHODS

In addition to a series of seven specimens of the new species described in this paper, specimens of the following taxa were examined: *Cettia fortipes pallida* (Brooks, 1872), *C. f. fortipes, C. f. davidiana* (Verreaux, 1871), *C. vulcania sepiaria* Kloss, 1931, *C. v. flaviventris* (Salvadori, 1879), *C. v. oreophila* Sharpe, 1888, *C. v. vulcania,* and *C. v. everetti* (Hartert, 1898); *C. (diphone) seebohmi, C. (Psamathia) annae, C. (Vitia) ruficapilla* and *C. (Vitia) parens.*

Tape-recordings of several of these taxa were studied and vocalizations of *C. f. davidiana, C. v. vulcania, C. v. oreophila, C. v. everetti* and of the new species described here are presented as sonagrams in this paper.

To facilitate a comparison with measurements of *vulcania* and *fortipes*

given by Wells (1982), part of which is based on larger samples, measurements of the specimens examined in this study are graphically presented in the same way, including those of *Vitia* and *Psamathia*. Note that the methods of measuring used in this study differ from the conventions adopted in Orenstein & Pratt (1983; compare also Mayr, 1936: 16-17 with Orenstein & Pratt, 1983: 188-189).

Institutional collections are abbreviated as follows:

AMNH – American Museum of Natural History, New York
BM(NH) – British Museum (Natural History), Tring
SMF – Senckenberg Museum, Frankfurt
RMNH – Rijksmuseum van Natuurlijke Historie, Leiden
USNM – United States National Museum (Smithsonian Institution), Washington
ZMB – Zoologisches Museum der Humboldt-Universität, Berlin.

SPECIES ACCOUNT

Cettia carolinae spec. nov.
(figs. 1-12)

Holotype. — RMNH 83336, adult male with fully ossified skull and enlarged gonads (study skin, in good condition), 10.ix.1985, forest circa 6 km northwest of Bomaki, northwest of Saumlaki across Saumlaki Bay, Yamdena Island (Pulau Yamdena), Tanimbar Islands, South Moluccas, Indonesia, 7°53'S 131°15'E; collected by F.G. Rozendaal and C.M. Rozendaal-Kortekaas; mistnetted simultaneously with female RMNH 83337, in the undergrowth of primary monsoon forest, along a small stream, altitude 70 m (see fig. 8).

Additional material examined. — RMNH 83337-83340, subadult female, adult male, subadult male, adult female, 10/17.ix.1985, primary monsoon forest circa 6 km northwest of Bomaki, Yamdena, Tanimbar Is., altitude 70-80 m (the type-locality); RMNH 83341-83342, adult male, adult female, 7/8.x.1985, mistnetted in dense undergrowth of secondary forest on limestone escarpment behind Loroulung (see fig. 10), Yamdena, Tanimbar Is., 7°51'S 131°22'E, altitude 150 m; collected by F.G. Rozendaal and C.M. Rozendaal-Kortekaas.

Diagnosis. — Typical *Cettia* of the subgenus *Horeites* (sensu Delacour, 1942: 511 and Mayr et al., 1986: 9-16; see also Vaurie, 1959 and Neufeldt, 1971: 366), with short, rounded wing ("generalized" sensu Keast, 1976: 525), relatively short tail (see wing/tail ratios in fig. 6), ten rectrices of normal width (see Orenstein & Pratt, 1983: 190, 193) and tail-coverts of normal width. Upperparts brown with crown slightly more rufous, underparts greyish-white, flanks olive-brown and supercilium pale buff. Three well-developed rictal bristles of 5-8 mm length (cf. Delacour, 1942: 511).

Description of plumage. — (see fig. 1; capitalized colour-notations are

from Ridgway, 1912). Upperparts (nape, mantle, back and lesser wing-coverts) closest to Raw Umber; forehead and crown slightly more rufous, closer to Argus Brown. Greater wing-coverts and flight-feathers dark Bone Brown with greater wing-coverts, secondaries and tertiaries having broad Argus Brown edges to outer vane, creating somewhat of a rufous panel, noticeable in the field; primaries Bone Brown with paler and narrower, Snuff Brown outer edges. Tail Bone Brown with narrow Argus Brown edges. Long, narrow supercilium Cinnamon Buff, tinged greyish behind the eye; eyestripe dark brown; ear-coverts mottled brown and grey. Underparts greyish-white; centre of belly white, shading into cream vent; sides of breast Olive Gray, slightly mixed with Buffy Brown and merging into Buffy Brown to Tawny flanks and under tail-coverts.

Differs from the nearest geographical representative of the *Cettia fortipes* complex, *C. vulcania everetti* from Timor, by richer and darker, rufous-brown plumage. The plumage described above is more similar to that of the Southwest Pacific *Cettia* species, and is closest to that of *C. ruficapilla badiceps* (Finsch, 1876) and *C. r. castaneoptera* Mayr, 1935. From these, it differs in plumage pattern only by a less rufous crown, contrasting less with the paler, rufous-brown mantle and back, and paler ventral parts (see Mayr, 1935: 5 and 1936: 16-17, and Orenstein & Pratt, 1983: 191, table 2).

Fig. 1. Side view of *Cettia carolinae* spec. nov.: RMNH 83341, an adult male from secondary forest at Loroulung (Yamdena, Tanimbar Is.), 8 October 1985 (F.G. Rozendaal).

Soft parts. — Iris dark brown; upper bill blackish-horn with pale horn cutting edges, lower bill flesh to pale horn; legs and feet pinkish-flesh to bluish-horn (taken from field notes on freshly-collected specimens).

Wing and tail formula. — Seventh primary (p7; counted descendantly) longest in all but three specimens: p6 is 0.5 mm longer than p7 in the type specimen and of equal length in two other specimens; in the remainder 0-0.4 mm shorter than p7; p8 2-3 mm shorter than p7, p9 10.5-12, p10 22.5-30, p6 0-0.4, p5 0.5, p4 1.5-5, p3 4-6.5, p2 5-8.5, p1 9-10 (see fig. 3). Outer rectrix 6-7 mm behind tip of inner rectrix.

Measurements and weight. — See figs. 5-7 and table 1. Wing-measurements of *Cettia carolinae* are appreciably higher than those of its congeners in the Indo-Australian Archipelago and the Southwest Pacific, averaging only

Fig. 2. Dorso-lateral view of *Cettia carolinae*: RMNH 83338, an adult male from primary forest northwest of Bomaki (Yamdena, Tanimbar Is.), 10 September 1985 (F.G. Rozendaal).

slightly smaller than those of *Cettia annae* (cf. Mayr, 1936: 17; Baker, 1951: 249; Orenstein & Pratt, 1983: table 1; this study, fig. 5). The wing/tail index in *carolinae* is considerably higher than in other species of *Cettia* under discussion, including *Vitia* and *Psamathia* (this study, fig. 6). Furthermore, it displays a marked sexual dimorphism in size. *C. v. everetti* shows an overlap between male and female wing-lengths, and *C. ruficapilla* shows a less pronounced dimorphism than *C. carolinae* (fig. 5). Actual bill measurements of *carolinae* are larger than those of any known population within the *Cettia fortipes* complex, *C. seebohmi* and *C. ruficapilla*, and approach those of *C. an-*

Fig. 3. Wing-shape of *Cettia carolinae*: RMNH 83338, an adult male from primary forest northwest of Bomaki (Yamdena, Tanimbar Is.), 10 September 1985 (F.G. Rozendaal).

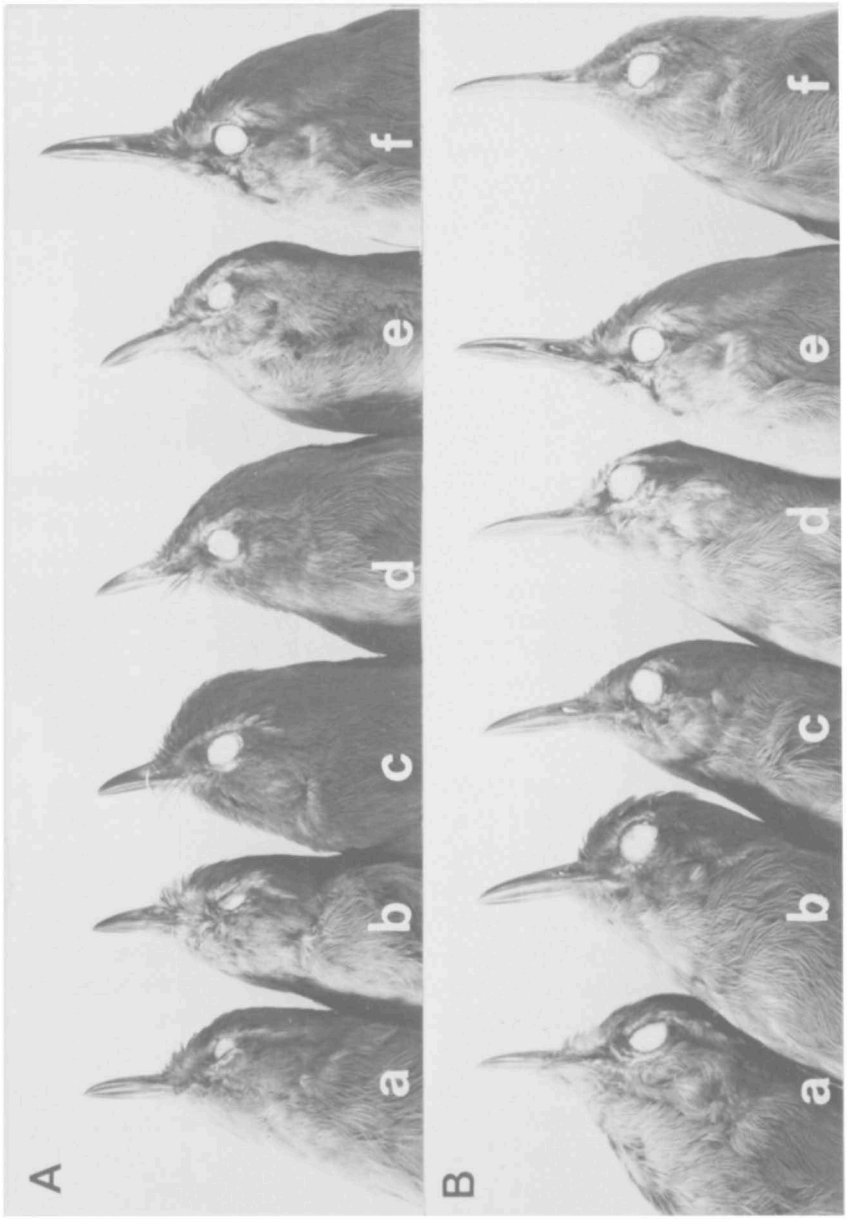

Fig. 4A. Side view of bills of: a, *Cettia f. fortipes* (male, Bhutan, BM[NH] 1938.12.13.46); b, *C. f. davidiana* (male, Taiwan, USNM 472201); c, *C. vulcania sepiaria* (male, Sumatra, RMNH 14068); d, *C. v. vulcania* (male, Java, RMNH 63211); e, *C. v. everetti* (female, Timor, AMNH 345916); f, *C. carolinae* (male, Yamdena I., RMNH 83341). Fig. 4B. Side view of bills of: a, *C. (diphone) seebohmi* (male, Luzon, AMNH 416883); b, *C. ruficapilla funebris* (female, Taveuni, AMNH 251972); c, *C. r. castaneoptera* (female, Vanua Levu, AMNH 251980); d, *C. r. badiceps* (male, Viti Levu, AMNH 251995); e, *C. carolinae* (male, Yamdena I., RMNH 83341); f, *C. annae* (male, Koror, USNM 385720). Photo by E.L.M. van Esch (RMNH).

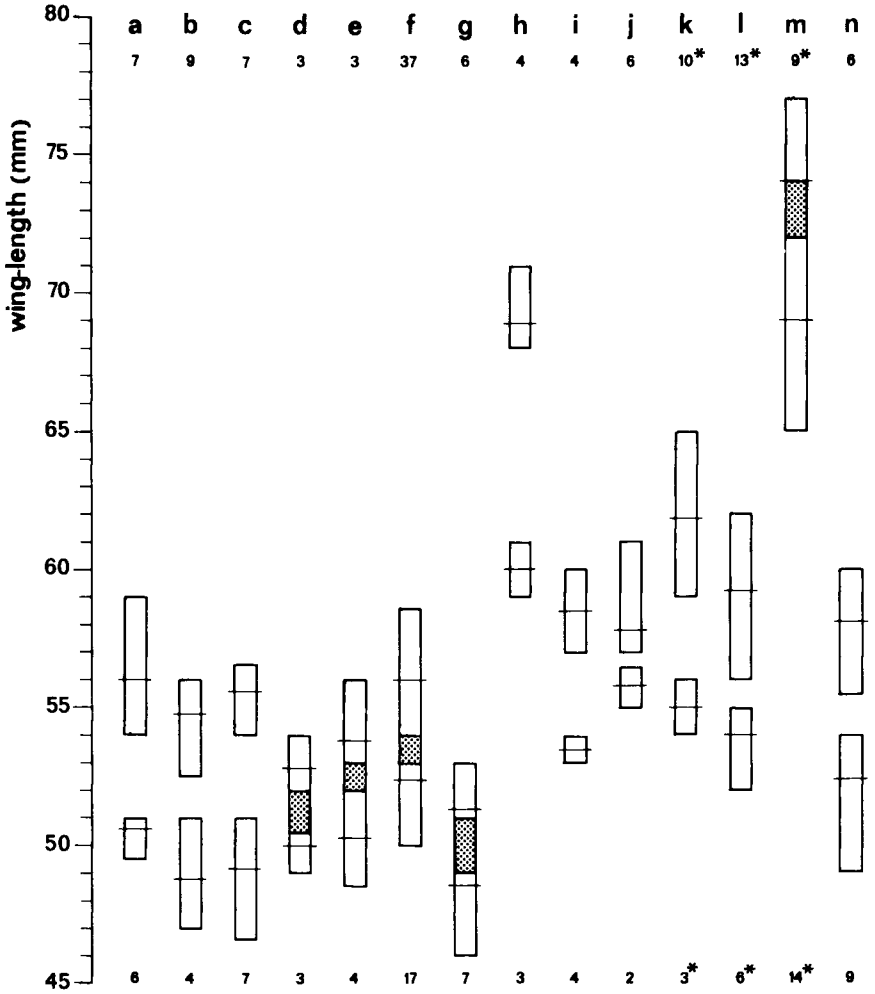

Fig. 5. Male (upper column) and female (lower column) wing-length ranges of *Cettia* species: a, *C. fortipes pallida*; b, *C. f. fortipes*; c, *C. f. davidiana*; d, *C. vulcania oreophila*; e, *C. v. flaviventris*; f, *C. v. vulcania*; g, *C. v. everetti*; h, *C. carolinae*; i, *C. r. ruficapilla*; j, *C. r. badiceps*; k, *C. r. funebris*; l, *C. r. castaneoptera*; m, *C. annae*; n, *C. (diphone) seebohmi*. Horizontal bars indicate mean values; the shaded area denotes the area of overlap between the sexes. Sample sizes appear above and below the respective ranges; the asterisk indicates inclusion of measurements published by Mayr (1936: 17) and Baker (1951: 249).

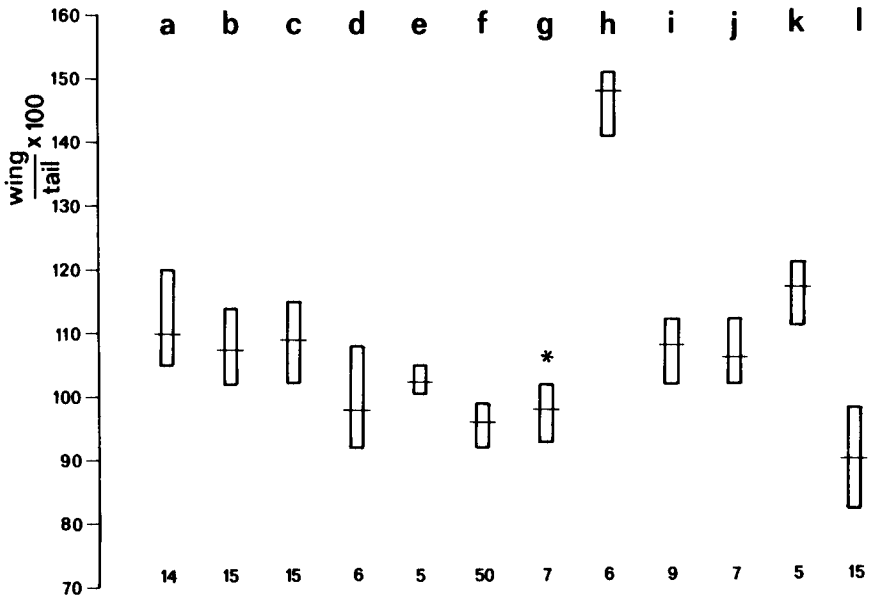

Fig. 6. Wing-length/tail-length indices (range and mean values) of *Cettia* species (sexes combined): a, *C. fortipes pallida*; b, *C. f. fortipes*; c, *C. f. davidiana*; d, *C. vulcania oreophila*; e, *C. v. flaviventris*; f, *C. v. vulcania*; g, *C. v. everetti*; h, *C. carolinae*; i, *C. r. ruficapilla*; j, *C. r. badiceps*; k, *C. annae*; l, *C. (diphone) seebohmi*. The asterisk indicates the ratio of the unique holotype of *Cettia bivittata*. Sample sizes appear below the respective ranges.

nae (Baker, 1951: 249; Keast, 1976: 523, fig. 2; Orenstein & Pratt, 1983: fig. 3, table 1; this study, fig. 4).

Distribution. — At present only known from two localities in the southern part of Yamdena, but likely to have been overlooked due to its skulking behaviour, and perhaps also due to a possible seasonality in vocalizations (cf. Pratt et al., 1980: 125), and inferred to be widespread on Yamdena.

Habitat. — *Cettia carolinae* frequents dense undergrowth in primary monsoon forest (fig. 8), secondary forest, bamboo thickets and scrub in cleared areas (figs. 9-10). A representative sample of plant material from the undergrowth at the type-locality contained the following taxa: (locally abundant) ferns *Thelypteris subpubescens* (Thelypteridaceae), *Alpinia* spec. (Zingiberaceae), *Donax* spec. (Maranthaceae), creepers *Piper* spec. (Piperaceae), *Tabernaemontana* spec. (Apocynaceae), rattans (Palmae) and low pandans *Pandanus* (Pandanaceae) (fig. 8).

Behaviour. — Behavioural observations were limited due to the birds' skulking behaviour. Birds generally moved through the undergrowth within

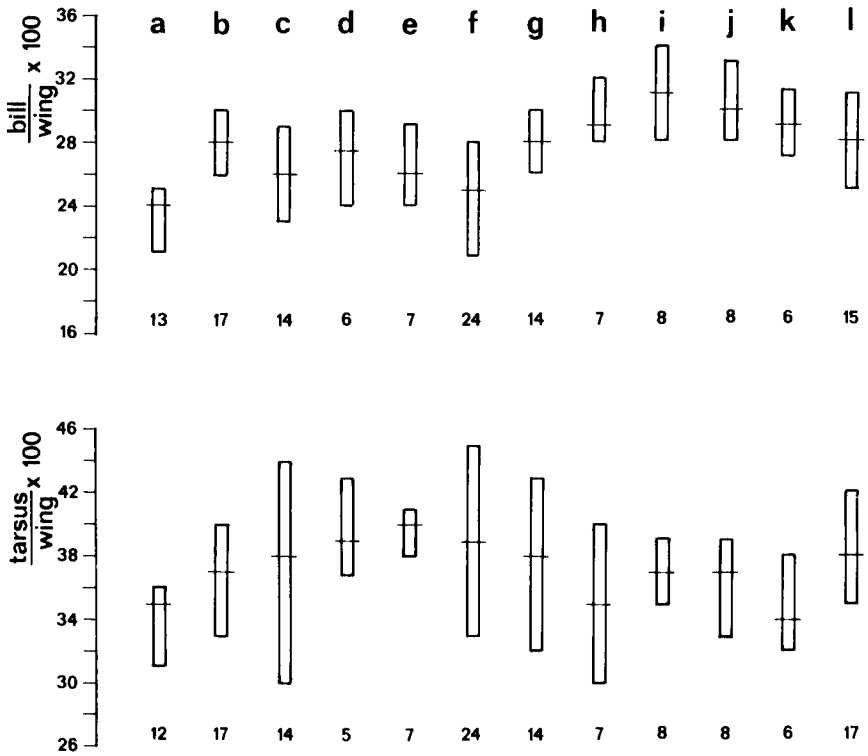

Fig. 7. Bill-length/wing-length indices and tarsus-length/wing-length indices (range and mean values) of: a, *C. fortipes pallida*; b, *C. f. fortipes*; c, *C. f. davidiana*; d, *C. vulcania oreophila*; e, *C. v. flaviventris*; f, *C. v. vulcania*; g, *C. v. everetti*; h, *C. carolinae*; i, *C. r. ruficapilla*; j, *C. r. badiceps*; k, *C. annae*; l, *C. (diphone) seebohmi*. Sample sizes appear below the respective ranges; bill measured from base of skull; tarsus measured including last undivided scale.

1 m of the forest floor, clinging to tree trunks, brushwood, dense tangled lianas and saplings or hopping along horizontal runners of rattan palms. The body was usually held horizontally with the tail slightly raised, and the birds were constantly flicking their wings, now and then snapping up insects. The only direct observations of singing birds involved individuals perched in low saplings circa 1 or 2 m above the ground. On one occasion a bird was seen singing in and moving through dense roadside bamboo thickets, up to 5 m high (cf. accounts of behaviour of the Pacific congeners in Marshall, 1949; Baker, 1951; Holyoak, 1979; Pratt et al., 1980; Watling, 1982; and Orenstein & Pratt, 1983).

Food. — Identifiable items among the stomach contents of specimens

RMNH 83337 and 83339 included remains of ants (Formicidae), true bugs (Heteroptera), beetles (Coleoptera) and tiny snails (Gastropoda).

Vocalizations. — During 14 days at the bivouac site at the type locality, birds were singing very erratically and were actually heard on very few days. Later during the field study, birds were heard more frequently in dense secondary growth at Loroulung and environs.

The natural song (i.e. not induced by play-back of recorded vocalizations) of *carolinae* consists of an 0.6-1.1 second long introductory whistle at an even pitch, increasing in volume, followed by a variably modulated warble. Phrases are repeated at often alternating higher and lower pitch, at intervals of circa 5-15 seconds; when agitated (i.e. after play-back), this is shortened to 3-7 second intervals (see sonagrams, fig. 11). Calls, audible at close range only, consist of single, or a succession of low "cherr" or "chuck" notes. Specimen RMNH 83336 uttered a sharp "tzek" in the net. The song described above is strikingly different from the song pattern that is consistent in the respective, far-flung populations of *vulcania* (see fig. 12 and sonagrams in

Collection	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH	RMNH
Reg. no.	83336 (holotype)	83338	83339	83341	83337	83340	83342
Sex	m	m	m	m	f	f	f
Locality*	B	B	B	L	B	B	L
Date	10.ix	10.ix	17.ix	8.x	10.ix	10.ix	7.x
Weight	19.5	20.6	19.3	18.6	14.5	13.5	15.0
Total length	125	123	130	130	115	110	
Wing length	68	69	71	68	59	61	60
Tail length	46	49	49	45	39	41	(worn)
Tarsus length	24	24	22	25	24	21	22
Bill length (to skull)	20	20	20	20	19	19	19
Exposed culmen	16.5	16.0	16.0	18.5	15.0	16.0	16.0
Culmen (from nostril)	11.5	11.0	11.0	11.5	10.0	11.0	11.5
Gape	21	20	21	22	20	21	21
Skull ossification**	E	E	D	E	C-D	E	E
Gonad condition***	3	3	2.5	1.5	3.5/-	5/-	6.5/0.5

Table 1. Measurements and other morphological data of the type series of *Cettia carolinae* spec. nov. from Yamdena, Tanimbar Is. (South Moluccas, Indonesia). Measurements were taken from fresh specimens immediately after collection and weights were taken to the nearest 0.1 g using Pesola spring balances. Wing measurements were taken with flattened chord. Notes: * localities: B = Bomaki, L = Loroulung; ** the letter tabulated for skull ossification corresponds to the stages figured by Svensson (1975: 26): "E" denotes a fully ossified skull; *** gonad condition of males is listed as length of largest testis in mm; of females as size of ovaries followed by diameter of largest follicle, if 0.5 mm or larger.

Wells, 1982: 59 figs. 1f-i), including *sepiaria* and *flaviventris* (pers. obs., cf. Wells, 1982: 61), and *everetti*. Recently recorded vocalizations of *everetti* on Timor unequivocally identify this taxon with *vulcania* (P. Andrew, pers. comm.; recording studied, see fig. 12), justifying its provisional allocation to *vulcania* by Wells (1982: 61). Likewise, vocalizations of the Lombok population of *vulcania* have been described as being similar to those of nominate *vulcania* from East Java by Rensch (1931: 574; see also White & Bruce, 1986: 339). Moreover, the "whistle-warble" song of *carolinae* shows a striking resemblance to vocalizations of *C. ruficapilla* as described and figured by Orenstein & Pratt (1983: 184-185, fig. 1). The clear, unmodulated whistle is uttered at the same frequency of circa 2 kHz, frequently interrupted by brief pauses near the beginning, and uttered in irregular sequences at often slightly alternating pitch. The concluding warble of *carolinae* differs in being of a simpler structure, consisting of a single phrase only, but, like that of

Fig. 8. Habitat of *Cettia carolinae*: undergrowth in primary monsoon forest at the type locality, northwest of Bomaki (Yamdena, Tanimbar Is.), September 1985 (F.G. Rozendaal).

Fig. 9-10. Habitat of *Cettia carolinae*: (9, left) open secondary growth on the edge of remnant forest patches and native gardens on the limestone escarpment behind Loroulung (Yamdena, Tanimbar Is.), 31 October 1985; (10, right) dense undergrowth in secondary forest on the limestone escarpment behind Loroulung (Yamdena, Tanimbar Is.), 30 October 1985 (F.G. Rozendaal).

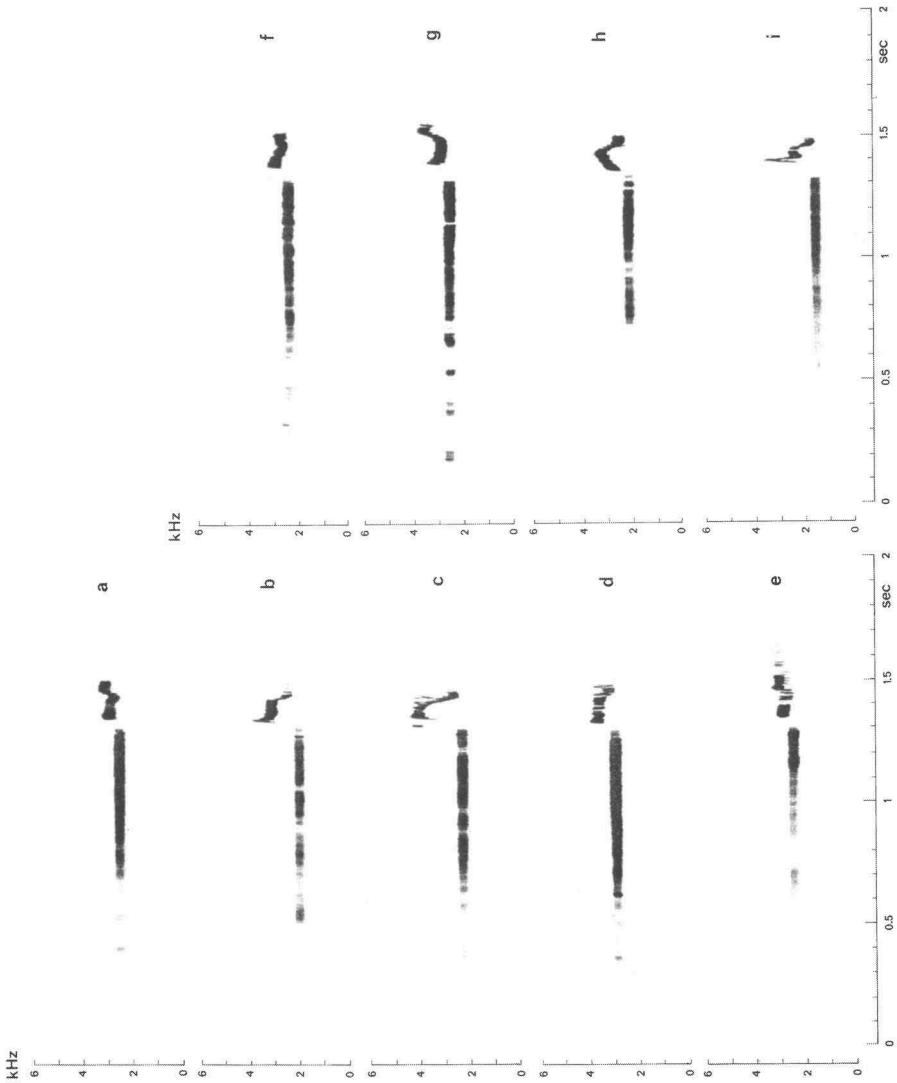

Fig. 11. Sonagrams of two sequences of (natural) song phrases of *Cettia carolinae*; a-e: circa 6 km northwest of Bomaki (Yamdena, Tanimbar Is.), 21 September 1985, 08.30 hrs., primary forest, alt. 50 m (F.G. Rozendaal); f-i: escarpment behind Loroulung (Yamdena, Tanimbar Is.), 20 October 1985, 09.15 hrs., secondary growth, alt. 150 m (F.G. Rozendaal).

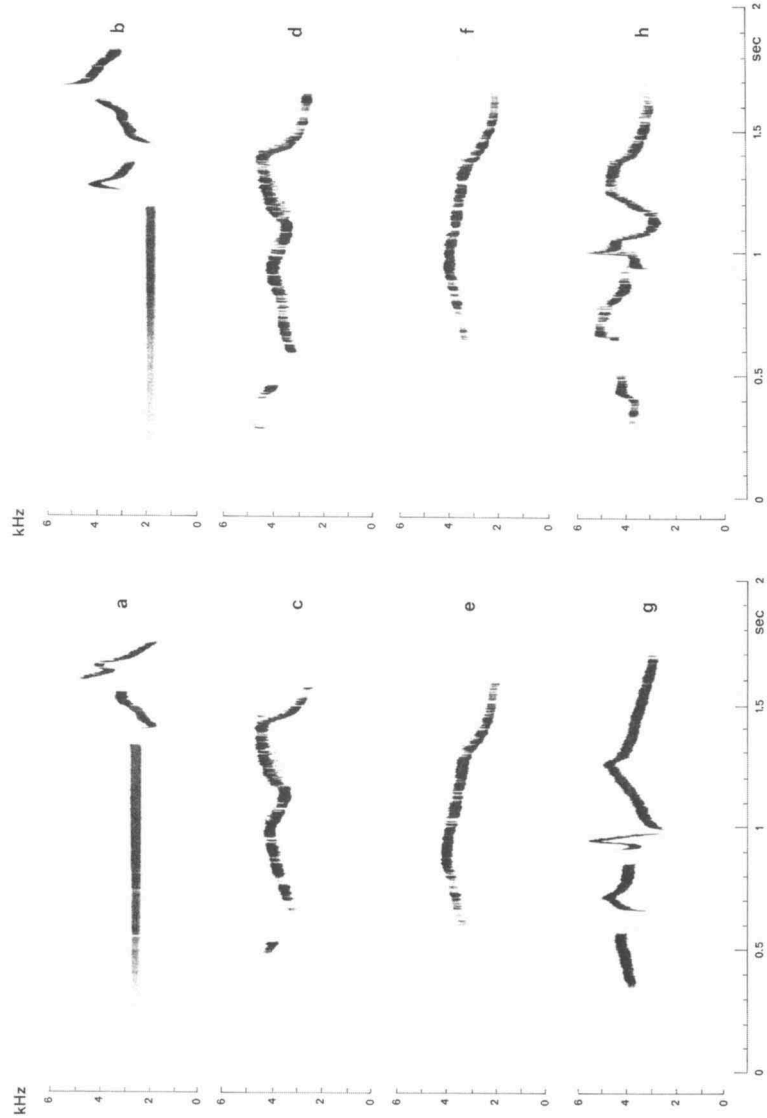

Fig. 12. Sonagrams of songs of representatives of the *Cettia fortipes* superspecies; a-b: *Cettia fortipes davidiana*, above Chitou (Taiwan), 12 July 1984, dense grass at forest edge, alt. 1450 m (J. Scharringa); c-d: *Cettia vulcania vulcania*, Telaga Warna at Puncak Pass (West Java), 15 January 1983, 11.00 hrs., secondary growth on hill slope, alt. 1200 m (F.G. Rozendaal); e-f: *C. v. oreophila*, Mt. Kinabalu (Sabah), power station road, alt. 1600 m, 6 November 1982, 07.40 hrs., roadside grass and thickets (F.G. Rozendaal); g-h: *C. v. everetti*, Gn. Mutis (Timor), 21 March 1985 (P. Andrew). Note that *C. v. everetti* has a greatly modified introductory grace note; a grace note is present in part of the vocalizations of Javanese *C. v. vulcania* recorded by P. Andrew at Gn. Tangkuban Prahu (recordings studied; cf. Wells, 1982: 59).

ruficapilla, is variable in form. Orenstein & Pratt (1983: 186-187, 192) have commented on the similarities in voice between *fortipes, annae* and *ruficapilla.* Representative sonagrams of the typical song patterns of the taxa *fortipes, vulcania* and *carolinae* are reproduced in figs. 11-12. For sonagrams of *ruficapilla, annae,* North-East Asian *diphone borealis* Campbell, 1892 and *diphone cantans* (Temminck & Schlegel, 1847), I refer to Orenstein & Pratt (1983: 185, 187, figs. 1 and 2) and Mauersberger (1981: 48). For additional sonagrams, illustrating the slight intraspecific variation of song patterns within both *fortipes* and *vulcania,* see Wells (1982: 59, fig. 1).

Etymology. — It gives me great pleasure to name this new species after my wife Caroline, who has been instrumental to the success of our fieldwork during 1985 in eastern Indonesia. The species being devoid of any suitably distinctive, descriptive morphological character or otherwise commemorative attribute, I would propose Tanimbar Warbler as an appropriate vernacular name, in line with the geographical names of Pacific relatives.

COMPARATIVE MATERIAL EXAMINED

Cettia ruficapilla ruficapilla (Ramsay)
(figs. 5-7)

Vitia ruficapilla Ramsay, 1876 (February): 42 – Kandavu, Fiji.

Specimens examined. — Nine: four males, four females, 1 unsexed. Fiji Is.: Kandavu (8, AMNH; 1, BM[NH]).

Measurements. — See figs. 5-7.

Cettia ruficapilla badiceps (Finsch)
(figs. 4-7)

Drymochaera badiceps Finsch, 1876 (June): 20 – interior of Viti Levu, Fiji.

Specimens examined. — Twelve: six males, 3 females, 3 specimens of doubtful sex. Fiji Is.: Viti Levu (8, AMNH; 3, BM[NH]; 1, RMNH).

Measurements. — See figs. 5-7.

Cettia ruficapilla castaneoptera (Mayr)
(figs. 4-5)

Vitia ruficapilla castaneoptera Mayr, 1935: 5 - Vanua Levu, Fiji Islands.

Specimens examined. — Two: one male, one female. Fiji Is.: Vanua Levu (2, AMNH).

Measurements. — See Mayr (1935: 5; 1936: 17); Orenstein & Pratt (1983: 188-189), and this study, fig. 5.

Cettia ruficapilla funebris (Mayr)
(figs. 4-5)

Vitia ruficapilla funebris Mayr, 1935: 5 – Tavium [= Taveuni], Fiji Islands.

Specimens examined. — Two: one male, one female. Fiji Islands: Taveuni (2, AMNH).

Measurements. — See Mayr (1935: 5; 1936: 17), Orenstein & Pratt (1983: 188-189), and this study, fig. 5.

Cettia parens (Mayr)

Vitia parens Mayr, 1935: 4 – San Christobal, Solomon Islands.

Specimens examined. — Two females. Solomon Is.: San Christobal, Naghasi ridge, above Wuranakumau, 1400-2200 feet (BM[NH]).

Measurements. — See Mayr (1935: 5; 1936: 16) and Orenstein & Pratt (1983: 188-189).

Cettia annae (Hartlaub & Finsch)
(figs. 4-7)

Psamathia Annae Hartlaub & Finsch, 1868: 5, plate II – Pelew Islands.

Specimens examined. — Nine: two males, three females, four unsexed. Palau Islands: Koror (3), Peleliu (1) (USNM); "Pelew Islands" (1, RMNH); "Palau" (3, BM[NH]; 1, RMNH).

Measurements. — See Baker (1951: 249), Orenstein & Pratt (1983: 188-189), and this study, figs. 5-7. For a comparison of bill size and shape of

Psamathia and *Cettia,* see Keast (1976: 523, fig. 2), Orenstein & Pratt (1983: 192, fig. 3), and this study, fig. 4. See also below under discussion.

Cettia (diphone) seebohmi Ogilvie-Grant
(figs. 4-7)

Cettia seebohmi Ogilvie-Grant, 1894: 507 – northern Luzon.

Specimens examined. — Seventeen: eight males, eight females, one unsexed. Philippines, Luzon: Baguio (3, AMNH); Benguet (8, AMNH, BM[NH]); La Trinidad (1, BM[NH]); Mount Data (3, BM[NH]); North Luzon (1, AMNH; 1, RMNH).

Measurements. — See figs. 5-7.

Remarks. — This taxon is considered by Orenstein & Pratt (1983: 193) as "bearing a close resemblance to the ancestor of the entire *diphone-annae-parens-ruficapilla* complex", a new superspecies concept introduced by Orenstein & Pratt (1983) with the inclusion of *Vitia* and *Psamathia* in the genus *Cettia.* These authors calculated percentages of divergence of morphological characters of *annae, parens* and *ruficapilla* from *seebohmi*; a direct derivation of *Psamathia* from this montane endemic was considered unlikely (on the affinities of *seebohmi,* see also Baker, 1951: 251; Mayr, 1940: 203, and Delacour, 1942: 514). Furthermore, Orenstein & Pratt (1983: 193) commented that "strong sexual dimorphism in wing length" was "lacking in tropical Asian *Cettia,* including *seebohmi* (cf. this study, fig. 5). Morphological characters and details of vocalizations of *seebohmi*, the latter undocumented in the literature and not taken into account by Orenstein & Pratt (1983), warrant a reappraisal of the affinities of the taxon *seebohmi* (Rozendaal & Scharringa, in prep.; see also Rensch, 1931: 574; Ogilvie-Grant, in Hartert, 1896: 539; Kuroda, 1933: 240).

Cettia vulcania vulcania (Blyth)
(figs. 4-7, 12)

Sylvia vulcania Blyth, 1870: 170 – Java and Timor.

Specimens examined. — Sixty-two: 40 males, 21 females, one unsexed. West Java: Gn. Gedeh (2, the syntypes of *Sylvia vulcania*); Gn. Pangrango, summit, 10.000 feet (16, RMNH); Gn. Tjerimai, crater, 3072 m (1, RMNH); Tjinjiroean (2, RMNH). Central Java: Gn. Slamat, Kali Goea, 5000-5500 feet (30, RMNH); Sikatok (Gn. Soembing) (2, RMNH). East Java: Idjen Highlands (4, BM[NH], RMNH); Ngadiwono, Tengger Mts. (2, RMNH); Gn. Raoeng (1, RMNH).

Lombok: Segara Anak, 2000 m (1, SMF).

Measurements. — See figs. 5-7.

Remarks. — For a clarification of nomenclatural issues, see Wells (1982: 61) and White & Bruce (1986: 339). The two syntypes are sexed as male and female, but measurements of the "female" (wing 59, tail 62.5 mm) fall well outside the measured range of overlap between the sexes and indicate that this specimen is likely to have been a male (see fig. 5).

Cettia vulcania oreophila Sharpe
(figs. 5-7, 12)

Cettia oreophila Sharpe, 1888: 387 – Kina Balu.

Specimens examined. — Six: three males, three females. Borneo, Sabah: Mt. Kinabalu (6, BM[NH]).

Measurements. — See figs. 5-7.

Cettia vulcania flaviventris (Salvadori)
(figs. 5-7)

Brachypteryx flaviventris Salvadori, 1879: 226 – M. Singalan.

Specimens examined. — Nine: four males, five females. West Sumatra: Gn. Kerinci, 7300-10.000 feet (6, BM[NH]); Gn. Talamau, 2200 and 2600 m (2, RMNH); South Sumatra: Gn. Dempo, 2200 m (1, RMNH).

Measurements. — See figs. 5-7.

Cettia vulcania sepiaria Kloss

Cettia montana sepiaria Kloss, 1931: 352 – Pajatoengkalan, Pangmoh, Acheen, 2000 m.

Specimens examined. — One male. Aceh: Pajatoengkalan, Pangmoh (type specimen of *sepiaria*, RMNH).

Measurements. — See Wells (1982: 60, fig. 2).

Cettia vulcania everetti Hartert
(figs. 4-7, 12)

Cettia everetti Hartert, 1898: 113 – Atapupu.

Specimens examined. — Fifteen: six males, seven females, two unsexed. Timor: Atapupu (4, BM[NH], AMNH); Gn. Mutis, 1500-2300 m (6, AMNH); Nenas, 1200 m (2, AMNH); Supul (1, AMNH); Tjamplong, 150 m (2, AMNH) (see also Mayr, 1944: 136).

Measurements. — See figs. 5-7.

Remarks. — *Cettia bivittata* was described by Finsch (1901: 209) from a single female specimen collected by Salomon Müller, allegedly on Timor, in 1829. In the original description of *bivittata*, it was compared with the two syntypes of *Cettia montana* (Horsfield, 1821) (= *vulcania,* see Wells, 1982: 61) from Java and the description of *everetti* (Hartert, 1898: 113), and described as differing from these by its overall darker plumage. Evidently, no comparison was made with any Sumatran material, at that time not available to Finsch in the collections of the Rijksmuseum van Natuurlijke Historie.

Hellmayr (1914: 22) listed *bivittata* as a synonym of *everetti*. However, Müller's specimen cannot merely be dismissed as a "durch Staub verunreinigtes und daher dunkleres Stück von *H.[oreites] m.[ontana] everetti*" (Hellmayr, 1914: 23). Its dark brown plumage is identical with that of the dark Sumatran populations *flaviventris* and *sepiaria* (see Kloss, 1931: 352-353, and figure in Robinson & Kloss, 1918: pl. 7, opposite p. 164). Moreover, its measurements (wing 53, tail 50.5, tarsus 22.5, and culmen – from base of skull – 14 mm) agree with those of females of the Sumatran subspecies and the wing/tail ratio falls outside the measured range of *everetti* (see fig. 6 and Wells, 1982: 60, fig. 2). As Salomon Müller is known to have collected at several montane localities in the Padang Highlands (in the Bukit Barisan range) between the years 1833 and 1835 (Van Steenis-Kruseman, 1950: 376), the holotype of *Cettia bivittata* is considered here to have been mislabelled and, although the exact provenance cannot be traced and the specimen cannot readily be subspecifically identified, is surmised to have been collected in the Padang Highlands in West Sumatra. If so, *bivittata* would thus become a junior synonym of *flaviventris* (cf. Violani, 1980). This implies that, in the event of the allocation of *Urosphena (Tesia) everetti* (Hartert, 1897) to the genus *Cettia*, the name *bivittata* would not be available for that taxon (cf. Bruce, in White & Bruce, 1986: 339; see also Mayr et al., 1986: 6, and Rozendaal, in prep.).

Cettia fortipes pallida (Brooks)
(figs. 5-7)

Horeites pallidus Brooks, 1872: 78 – Cashmir.

Specimens examined. — Thirteen: seven males, six females. India: Kashmir (2); Himachal Pradesh (8); Uttar Pradesh (1). Pakistan: Rawalpindi (2) (all BM[NH]).

Measurements. — See figs. 5-7.

Cettia fortipes fortipes (Hodgson)
(figs. 4-7)

Horornis fortipes Hodgson, 1845: 31 – "northern hills" = Nepal, see Hodgson (1845: 22).

Specimens examined. — Eighteen: ten males, eight females. India: Bengal, Duars (6, BM[NH]); Assam, Margherita (3, AMNH). Sikkim (1, AMNH). Bhutan (6, BM[NH]). Burma: Hpare, Chishen (2, AMNH).

Measurements. — See figs. 5-7.

Cettia fortipes davidiana (Verreaux)
(figs. 4-7, 12)

Arundinax davidiana Verreaux, 1871: 37 – "dans les montagnes du Thibet chinois" (= Muping, now Paohing (Pao-Hsing), East Si-kang, Sichuan province; see Vaurie (1959: 224) and Mayr et al. (1986: 12).

Specimens examined. — Twenty-three: fourteen males, nine females. China: Anhui province: Tatung (3, BM[NH]; 1, AMNH); Fujian province: Kuatun (9, BM[NH]); without exact locality (1, AMNH); Jiangsu province: Chinkiang (1, AMNH); Sichuan province: Wanhsien (3, AMNH); Yunnan province: Mengtsz (1, AMNH). Taiwan: 2.2 and 4 miles east of Wusheh, on East-West Highway, 3800 feet (2, USNM); Ta P'o Shan (1, AMNH).

Measurements. — See figs. 5-7.

DISCUSSION

The subgenus *Horeites*, in its enlarged concept as advocated by Orenstein & Pratt (1983), is distributed over a large area in Asia and the Indo-Pacific, penetrating Wallacea on the Lesser Sunda islands of Lombok and Timor and,

apparently, Tanimbar, with isolated Pacific representatives occurring in Micronesia and Melanesia. The discovery of the new species on Tanimbar "closes a distributional gap" and is of considerable zoogeographic interest.

The limited value of morphological characters in delimiting genera and/or species within the sylviid assemblage has been pointed out, amongst others, by Keast (1976) and, with special reference to the genus *Cettia,* by Wells (1982) and Orenstein & Pratt (1983). Sexual dimorphism in size or increased size of bill and tarsus may be due to "character release" in insular situations (Vaurie, 1954: 1; MacArthur & Wilson, 1967: 66; Keast, 1976; Orenstein & Pratt, 1983: 190). However, the combination of plumage characteristics, measurements and proportions, egg-colour and vocalizations is considered by Orenstein & Pratt (1983: 193) to set the subgenus *Horeites*, including *Vitia* and *Psamathia,* apart as a natural unit (see also Neufeldt, 1971). The characters of *Cettia carolinae* fit the attributes of the subgenus well, despite the present lack of details on breeding biology or egg-colour.

The plumage pattern of *carolinae* agrees well with that of *C. ruficapilla.* Its darker brown plumage abruptly breaks the longitudinally clinal variation in plumage coloration – likely due to climatic influences – of *Cettia vulcania*, obvious when progressing southeast from the darkest populations on Sumatra (*sepiaria* and *flaviventris*) via intermediate coloration in nominate *vulcania* (Java, Bali and Lombok) to the palest, olive-grey *everetti* on Timor. This is reinforced by the morphometric gap between *vulcania* and *carolinae, everetti* being moreover the smallest member of the *C. fortipes* superspecies. Females of *carolinae* average larger than males of nominate *vulcania,* the largest of the Sunda-Wallacean forms, in which male and female wing-measurements furthermore widely overlap; they fall within the range of wing-lengths of males of *C. ruficapilla funebris* and *C. r. castaneoptera,* the largest subspecies of the Fiji Warbler (Mayr, 1936: 17).

On account of the considerations given above, *Cettia carolinae* is assigned here to the *"diphone-annae-parens-ruficapilla"* complex of Orenstein & Pratt (1983: 193) and is, on account of similarities in plumage pattern and vocalizations, considered most closely related to *C. ruficapilla.* However, in the light of the presumed ancestry of this complex (cf. Orenstein & Pratt, 1983: 193) – including *C. (diphone) seebohmi* – the affinities of *seebohmi* are being reviewed (see under that taxon; Rozendaal & Scharringa, in prep.).

The distinct morphological gap between *carolinae* and the *fortipes* superspecies and the apparent close relationship to the Southwest Pacific representatives – separated by a distance of circa 1500 km – suggest that *carolinae* is a relict of a formerly widespread ancestral species (Orenstein & Pratt, 1983: 184, 194), rather than derived from an ancestor in common with

the *fortipes* superspecies. The Sunda-Wallacean *vulcania* is morphologically closer to mainland *fortipes* sensu stricto and likely to have originated directly from South-East Asia through the Greater Sundas (see also Mayr, 1944: 171). It remains to be resolved whether *carolinae* is a relict, in the strictest sense, of the ancestral species, presumed by Orenstein & Pratt (1983: 196) to have dispersed through (eastern) Indonesia and eventually colonized some Southwest Pacific islands. Alternatively, it may have become established in the Tanimbar Islands as a result of a secondary colonization from the Papua-Solomons area, as proposed for *Psamathia* (Orenstein & Pratt, 1983: 194; see also Mayr, 1944: 172). For a tentative explanation of evolutionary trends in the Pacific species, see Orenstein & Pratt (1983: 194-195).

The Fiji Warbler *C. ruficapilla* occurs in forest, secondary growth and agricultural land (Holyoak, 1979: 12; Watling, 1982: 108), from sea-level to elevations of over 4000 feet (Gorman, 1975: 157). The Shade Warbler *C. parens* is much less known, occurring in ridge forest (Cain & Galbraith, 1956: 269). The Palau Warbler *C. annae* is a bird of forest, forest edge and secondary growth (Baker, 1951: 520; Marshall, 1949: 212; Pratt et al., 1980: 125). *C. carolinae* appears to be equally common in primary and secondary habitats, much the same as described for its Pacific congeners. Populations of the Sunda-Wallacean *vulcania* are not necessarily denizens of forest undergrowth, and even appear to prefer marginal habitats (pers. obs.). Over the greater part of the range of the superspecies, *fortipes* and insular *vulcania* are montane residents, with some populations of continental *fortipes* performing seasonal altitudinal migrations, but it should be noted that the Timorese *everetti* occurs in the lowlands (Mayr, 1944: 136; Wells, 1982: 57-58; White & Bruce, 1986: 339; P. Andrew, pers. comm.). By necessity, the Tanimbarese *Cettia* is a lowland resident, the highest elevation on Yamdena being circa 150 m above sea-level.

No bush-warbler of the genus *Cettia* has been found on Sulawesi – where it is unlikely to have escaped detection by the many collectors, in particular Gerd Heinrich – or in the North and Central Moluccas (Halmahera, Ceram, Buru and nearby islands) (White & Bruce, 1986). It is possible that further populations of the *fortipes* superspecies remain to be discovered at higher altitudes on one or more of the Lesser Sunda islands, between Lombok and Timor, e.g. Flores. Likewise, it remains possible that more relict populations of the Indo-Pacific species-complex await discovery, e.g. on Papuan satellite islands.

ACKNOWLEDGEMENTS

The avifaunal survey of the Tanimbar Islands was supported by grants from the following foundations: Greshoff's Rumphius Fonds, Maatschappij voor Wetenschappelijk Onderzoek in de Tropen (Treub Mij.), Melchior Treub Stichting, World Wildlife Fund, and P.A. Hens Memorial Fund. The invaluable help of Messrs. Chuck Darsono, Derek A. Holmes and H.M. Kamil Oesman (ICBP – Indonesian Section and Perhimpunan Burung Indonesia) is gratefully acknowledged. Fieldwork was sponsored by the Indonesian Institute of Sciences (Lembaga Ilmu Pengetahuan Indonesia) and National Biological Institute (Lembaga Biologi Nasional). Furthermore, I am grateful to Ir. P. Bennema (Project LTA-72, Ambon), Father K. Böhm MSC (Seminari Saumlaki) and Sister Inviolata (Misi Katolik Loroulung) for local logistic support, to Dr. P. Hansen (Zoologisk Museum, Aarhus) for sonagraphing tape-recordings, to Jelle Scharringa (Utrecht) and Paul Andrew (Orwell) for permission to use their tape-recordings, and to Dr. E.F. de Vogel and Dr. M.M.J. van Balgooy (Rijksherbarium, Leiden) for the identification of plant material. I am indebted to Mrs. M. Le Croy (AMNH), Dr. G.F. Mees (RMNH), Mr. P. Colston (BM[NH]), Dr. S. Olson (USNM) and Dr. S. Peters (SMF) for the loan and use of material under their care, and to Mr. D. Read and Mr. P. Colston (BM[NH]) for their hospitality and assistance when visiting the collections at Tring. Dr. D.R. Wells (Universiti Malaya, Kuala Lumpur), Dr. C. Smeenk (RMNH) and Dr. G.F. Mees kindly commented on successive drafts of this paper.

REFERENCES

Baker, R.H., 1951. The avifauna of Micronesia, its origin, evolution and distribution. – Univ. Kansas Publ. Mus. Nat. Hist. 3: 1-359, figs. 1-16, tabs.

Blyth, E., 1870. Notes relating chiefly to the birds of India. – Ibis (2) 6: 157-176.

Brooks, W.E., 1872. Notes on the ornithology of Cashmir. – Journ. Asiat. Soc. Bengal 41: 73-86.

Cain, A.J. & I.C.J. Galbraith, 1956. Field notes on birds of the eastern Solomon Islands. – Ibis 98: 100-134, 262-295.

Delacour, J., 1942, 1943. The bush-warblers of the genera Cettia and Bradypterus, with notes on allied genera and species. – Ibis (6) 14: 509-519; 85: 27-40.

Finsch, O., 1876. Notes on some Fijian birds, including description of a new genus and species. – Proc. Zool. Soc. London for 1876: 19-20.

Finsch, O., 1901. Zur Catalogisirung der ornithologischen Abteilung. V. Indische Gattungen und Arten, aus den Familien: Oriolidae, Dicruridae, Muscicapidae, Sylviinae, Timeliidae, Zosteropidae und Nectariniidae. – Notes Leyden Mus. 22: 193-224.

Gorman, M.L., 1975. Habitats of the land-birds of Viti Levu, Fiji Islands. – Ibis 117: 152-161, figs. 1-5, tabs. 1-3.

Hartert, E., 1896. An account of the collections of birds made by Mr. William Doherty in the eastern Archipelago. II. On birds from East Java. – Novit. Zool. 3: 537-542.

Hartert, E., 1898. List of birds collected in Timor by Mr. Alfred Everett. – Novit. Zool. 5: 111-124.

Hartlaub, G. & O. Finsch, 1868. On a collection of birds from the Pelew Islands. – Proc. Zool. Soc. London for 1868: 4-9, 1 pl.

Hellmayr, C.E., 1914. Die Avifauna von Timor: 1-112. In: C.B. Haniel (ed.). Zoologie von Timor. 1. Lieferung. E. Schweizerbartsche Verlagsbuchhandlung, Nägele & Dr. Sproesser, Stuttgart.

Hodgson, B., 1845. On Nepalese birds. – Proc. Zool. Soc. Lond. 13: 22-37.

Holyoak, D.T., 1979. Notes on the birds of Viti Levu and Taveuni, Fiji. – Emu 79: 7-18, table 1.
Keast, A., 1976. Adaptive morphology and biogeography relative to the evolution and classification of the Australian and Pacific island warblers. – Proc. 16th Int. Orn. Congr.: 519-529, figs. 1-3.
Kloss, C.B., 1931. An account of the Sumatran birds in the zoological museum, Buitenzorg, with descriptions of nine new races. – Treubia 13: 299-370, pls. 3-4.
Kuroda, N., 1933. Birds of the island of Java. I: Passeres: v-xv, 1-370, pls. i-xiv, map. Published by the author.
MacArthur, R.H. & E.O. Wilson, 1967. The theory of island biogeography. – Monographs in Population Biology 1: v-xi, 3-203, figs. 1-60.
Marshall, J.T., 1949. The endemic avifauna of Saipan, Tinian, Guam and Palau. – Condor 51: 200-221, figs. 1-6, tabs. 1-5.
Mauersberger, G., 1981. Anmerkungen zur Avifauna Nordkoreas. – Mitt. zool. Mus. Berl. 57, Suppl.: Ann. Orn., 5: 15-62, figs. 1-26.
Mayr, E., 1935. Birds collected during the Whitney South Sea Expedition, XXX. Descriptions of twenty-five new species and subspecies. – Amer. Mus. Novit. 820: 1-6.
Mayr, E., 1936. Birds collected during the Whitney South Sea Expedition. XXXI. Descriptions of twenty-five species and subspecies. – Amer. Mus. Novit. 828: 1-19.
Mayr, E., 1940. The origin and the history of the bird fauna of Polynesia. – Proc. 6th Pac. Sci. Congr. 4: 197-216.
Mayr, E., 1944. The birds of Timor and Sumba. – Bull. Amer. Mus. Nat. Hist. 83: 127-194, figs. 1-4.
Mayr, E., M.A. Traylor, Jr. & G.E. Watson, 1986. Check-list of birds of the world XI: i-vii, 1-638. Museum of Comparative Zoology, Cambridge, Massachusetts.
Neufeldt, I.A., 1970. Biology of the short-tailed and short-winged bush warblers as evidence of their generic independance. – Abstr. 15th Orn. Congr.: 164-165.
Neufeldt, I.A., 1971. Der Kurzflügelsänger Horeites diphone (Kittlitz). – Der Falke 18: 364-375, 6 figs., 1 tab.
Ogilvie-Grant, W.R., 1894. On the birds of the Philippine Islands. Part II. The highlands of North Luzon, 5000 feet. With field-notes by John Whitehead. – Ibis (6) 6: 501-522, 2 pls.
Orenstein, R. & H.D. Pratt, 1983. The relationships and evolution of the Southwest Pacific warbler genera Vitia and Psamathia (Sylviinae). – Wilson Bull. 95: 184-198, figs. 1-3, tabs. 1-3.
Pratt, H.D., J. Engbring, P.L. Bruner & D.G. Berrett, 1980. Notes on the taxonomy, natural history, and status of the resident birds of Palau. – Condor 82: 117-131, figs. 1-3, table 1.
Ramsay, E.P., 1876. Characters of a new genus and species of passerine bird from the Fiji Islands, proposed to be called Vitia. – Proc. Linn. Soc. New South Wales 1: 41-42.
Rensch, B., 1931. Die Vogelwelt von Lombok, Sumbawa und Flores. – Mitt. zool. Mus. Berl. 17: 451-637.
Ridgway, R., 1912. Color standards and color nomenclature: i-iii, 1-43, pls. 1-53. Privately published.
Robinson, H.C. & C.B. Kloss, 1918. Results of an expedition to Korinchi Peak, Sumatra. II. Birds. – Journ. Fed. Malay Stat. Mus. 8: 81-260, pls. iv-vii.
Rozendaal, F.G., in prep. Systematics of the short-tailed bush warblers of the genera Urosphena Swinhoe, 1877 and Tesia Hodgson, 1837.
Rozendaal, F.G. & J. Scharringa, in prep. Affinities of Cettia seebohmi Ogilvie-Grant, 1894.
Salvadori, T., 1879. Catalogo di una collezione di uccelli fatta nella parte occidentale di Sumatra dal Prof. Odoardo Beccari. – Ann. Mus. civ. St. Nat. Genova 14: 169-253.
Sharpe, R.B., 1888. Further descriptions of new species of birds discovered by Mr. John Whitehead on the mountain of Kina Balu, northern Borneo. – Ibis (5) 6: 383-396, 4 pls.
Steenis-Kruseman, M.J. van, 1950. Malaysian plant collectors and collections. Flora Malesiana, ser. 1, vol. 1: vii-xlii, 3-639, c. 200 figs., 3 maps. Noordhoff-Kolff N.V., Djakarta.
Svensson, L., 1975. Identification guide to European passerines (2nd., rev. ed.): 4-184, figs. Naturhistoriska Riksmuseet, Stockholm.

Vaurie, C., 1954. Systematic notes on Palearctic birds. No. 10 Sylviinae: the genera Cettia, Hippolais and Locustella. – Amer. Mus. Novit. 1691: 1-9.

Vaurie, C., 1959. The birds of the Palearctic fauna. A systematic reference. Order Passeriformes: vii-xii, 1-762. H.F. & G. Witherby, London.

Verreaux, M.J., 1871. Note sur les espèces nouvelles d'oiseaux recueillis par M. l'Abbé Armand David dans les montagnes du Thibet Chinois. – Bull. Nouv. Arch. Mus. Hist. nat. Paris 6: 33-40.

Violani, C., 1980. "What is Brachypteryx flaviventris Salvadori?". – Bull. Br. Orn. Cl. 100: 187-189, figs. 1-2.

Watling, D., 1982. Birds of Fiji, Tonga and Samoa: 1-176, pls. 1-15, figs., tabs. 1-6. Millwood Press Ltd, Wellington, New Zealand.

Wells, D.R., 1982. Biological species limits in the Cettia fortipes complex. – Bull. Br. Orn. Cl. 102: 57-62, figs. 1-2.

White, C.M.N. & M.D. Bruce, 1986. The birds of Wallacea (Sulawesi, The Moluccas & Lesser Sundas, Indonesia): 1-524, maps 1-5, tabs. 1-16. British Ornithologists' Union, London.