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## THE TAXONOMY AND BIOGEOGRAPHY OF THE *EXHAUSTA* GROUP OF THE GENUS *BAETURIA* STÅL, 1866 (HOMOPTERA, TIBICINIDAE)

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### ABSTRACT

The *exhausta* group is proposed for a supposedly monophyletic group of eight species of the cicada genus *Baeturia* Stål, 1866. Three species (*B. bicolorata* Distant, *B. exhausta* Guérin Méneville, and *B. vanderhammeni* Blöte) are redescribed and five species (*B. colossea*, *B. maai*, *B. rossi*, *B. versicolor*, and *B. wauensis*) are described as new. A neotype is designated for *B. exhausta* and the male of *B. bicolorata* is described for the first time. The synonymy of *B. exhausta* to *Cicada hastipennis* Walker and *Dandubia parabola* Walker is discussed and *Cicada parallela* Walker is added as a new synonym to this species. A key to the males is provided. The monophyly of the *exhausta* group and its phylogenetic position within the genus *Baeturia* are discussed. The *exhausta* group is distributed in Timor, the greater part of Maluku, and in New Guinea with exception of its central mountain ranges. Maps of distribution are presented.

### INTRODUCTION

The cicada genus *Baeturia* Stål, 1866, belongs to a supposedly monophyletic group of New Guinean and Australian genera defined earlier as the "*Baeturia* and related genera complex" (De Boer, 1990). The distributions of the New Guinean representatives of that complex reflect the geological history of the island. New Guinea was formed after a series of collisions of fragments of an oceanic island arc, with the northern craton of the Australian continent (Hamilton, 1979; Daly et al, 1991; Pigram & Davies, 1987; Pigram & Panggabean, 1984). Many of these fragments can still be recognized as areas

of endemism for monophyletic groups of cicadas (Duffels, 1986; Duffels & De Boer, 1990), indicating that these groups evolved when the areas were still isolated from Australian New Guinea. The phylogenetic relationships between these monophyletic groups can hopefully tell us something about the historical relationships between the various fragments of the island arc, and may reflect the order in which they collided with the Australian continent. For these reasons, a phylogenetic and biogeographic revision of the "*Baeturia* and related genera complex" is undertaken.

This publication is part of a series of papers, dealing with the phylogeny and biogeography of

monophyletic species groups, that are recognized within the genus *Baeturia*, the largest genus of the complex. Revisions have already been published for the *nasuta* group (De Boer, 1982), the *conviva* group (De Boer, 1986), the *bloetei* group (De Boer, 1989), the *viridis* group (De Boer, 1992a), and the *guttulinervis* group (De Boer, 1994b), the *loriae* group (De Boer, 1994a).

The *exhausta* group contains 8 species, sharing supposed synapomorphies in clasper-shape and in shape of the lateral lobes of the pygofer. The species can also be separated from other species of *Baeturia* by a slightly more slender and more erect caudodorsal beak on the pygofer. The group is distributed over New Guinea and southern Maluku, including the island of Timor, but seems concentrated in northwestern New Guinea, where 3 of its 8 species occur.

## MATERIAL AND METHODS

The material examined for this study is deposited in the following collections:

AMNH	American Museum of Natural History, New York
AMS	Australian Museum, Sydney
BMNH	Natural History Museum [formerly: British Museum (Natural History)], London
BPBM	Bernice P. Bishop Museum, Honolulu
CAS	California Academy of Sciences, Department of Entomology, San Francisco
CZL	Instituto de investigação científica tropical Centro de Zoologia, Lisboa
IPS	Institute of Plant Sciences, Burnley, Australia
IZW	Polska Akademia Nauk, Instytut Zoologii, Warszawa
KBIN	Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussel
MAKB	Museum "Alexander König", Bonn
MSNG	Museo Civico di Storia Naturale "G. Doria", Genova
MNP	Muséum Nationale d'Histoire Naturelle, Paris
Moul	Personal collection Mr. M.S. Moulds, Sidney
MVM	Museum of Victoria, Melbourne
MZB	Museum Zoologicum Bogoriense, Bogor
MZS	Musée Zoologique de l' Université et de la Ville, Strasbourg
NBM	Naturhistorisches Museum, Basel

NCSU	North Carolina State University Insect Collection, Raleigh
NhMW	Naturhistorisches Museum, Wien
RMNH	Nationaal Natuurhistorisch Museum (formerly: Rijksmuseum van Natuurlijke Historie), Leiden
SMD	Staatliches Museum für Tierkunde, Dresden
SMN	Staatliches Museum für Naturkunde, Stuttgart
TMB	Természettudomány Múzeum, Budapest
ZMA	Institute for Systematics and Population Biology (Zoologisch Museum), Amsterdam
ZMB	Institut für Spezielle Zoologie und Zoologisches Museum der Humboldt-Universität, Berlin

The following geographical sources have been used: "The Times Atlas of the World (Comprehensive Edition)" (1968) and a "List of New Guinea localities" published by the Bishop Museum (1966). Some of the terms used in the descriptions are explained in Figs. 8, 11, and 14.

After overnight softening, male genitalia were examined by pulling out the pygofer with a sharp needle inserted between pygofer and 8th abdominal segment. The aedeagus was pulled out at the same time, by inserting the needle between the claspers. For all specimens body length and tegmen length were measured; other measurements are based on a maximum of ten specimens.

## PHYLOGENY

The monophyly of the *exhausta* group

The monophyly of the *exhausta* group is based on two apomorphies in male genitalia, but a third genital character might also be apomorphous.

The species of the *exhausta* group have a short, posteriorly directed clasper, with a distinct rectangular clasper heel and a short and broadly rounded ventral hollow in its slightly downwards curved apical part. The clasper is further conspicuous by the distinctly outcurving crest along its straight dorsal margin. As a result of this outcurvature, both claspers together form a cup-

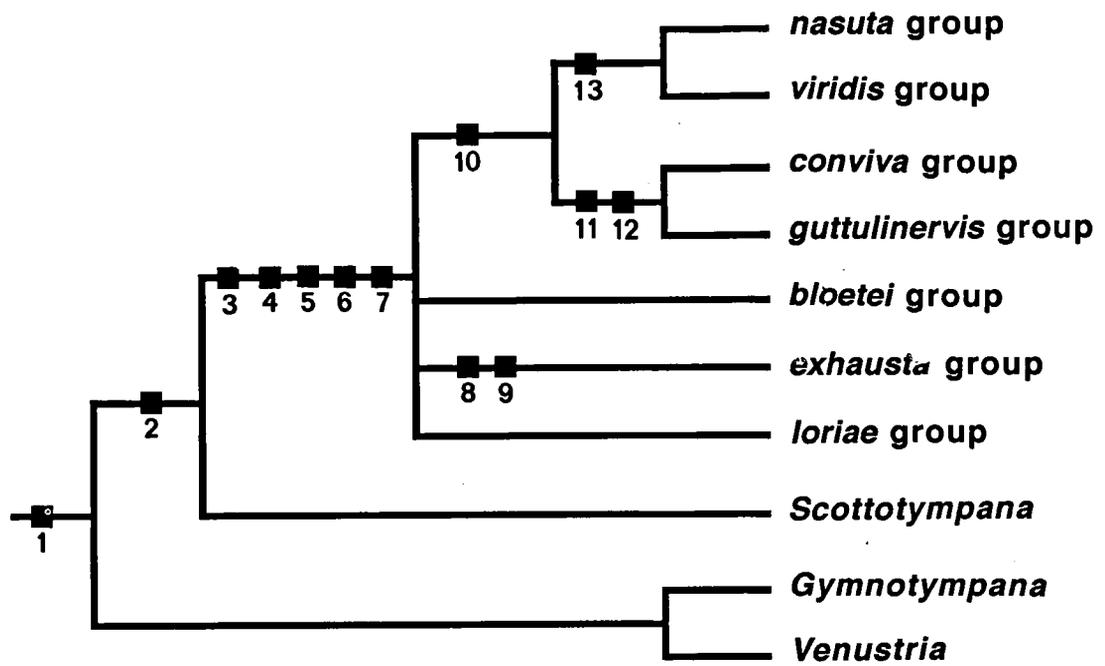


Fig. 1a. Phylogenetic relationships of the *exhausta* group. Numbers refer to apomorphic characters discussed in the tekst.

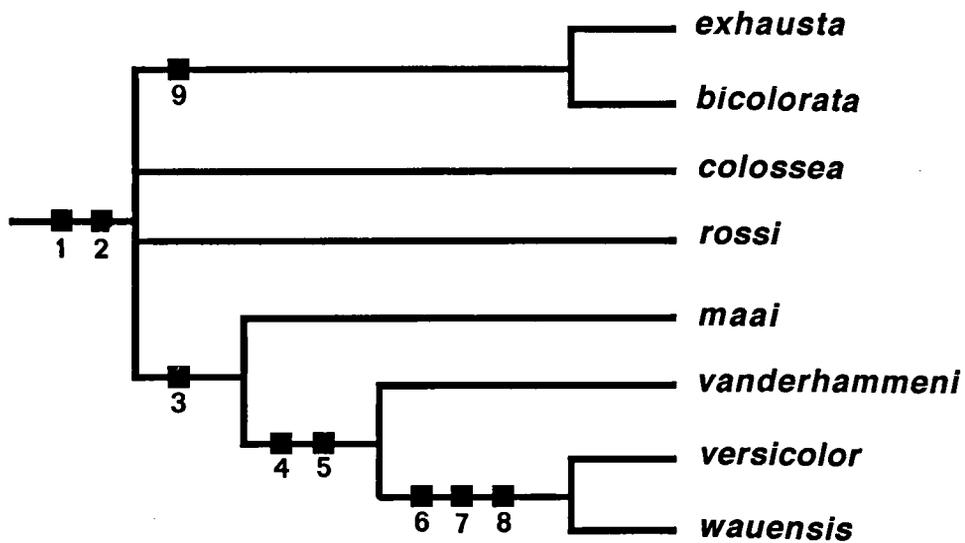


Fig. 1b. Tentative cladogram of the *exhausta* group. Numbers refer to apomorphic characters discussed in the tekst.

shaped hollow around the aedeagus (Fig. 6). This latter character is regarded apomorphic (8 in Fig. 1a, 1 in Fig. 1b). The claspers of *B. brongersmai* Blöte, 1960, *B. lorentzi* De Boer, 1992, and *B. viridis* Blöte, 1960, of the *viridis* group and those of the species of the *exhausta* group share a similarly shaped clasper hollow, but the claspers in the *viridis* group are broader in lateral view, have a less strongly outcurving dorsal crest and a convex dorsal margin (De Boer, 1992). In other species of *Baeturia* the dorsal crest of the clasper is generally less distinct, or absent, and the clasper hollow generally longer, often more directed posteriorly (compare the *nasuta* group De Boer, 1982; the *conviva* group De Boer, 1986; the *bloetei* group De Boer, 1989; the *viridis* group De Boer, 1992a). Related genera have an altogether different clasper.

The lateral lobes of the male pygofer are strongly curved, quite often sharply folded mesiad (Fig. 5), so that the distal margin of the pygofer is generally not visible in lateral view, which is regarded apomorphic (9 in Fig. 1a, 2 in Fig. 1b). The pygofer lobes are only weakly curved mesiad in other *Baeturia* species. Similarly strongly curved pygofer lobes only occur in species of the genus *Gymnotympana* Stål, which must be explained as a parallelism.

Furthermore, males of the *exhausta* group can be recognized by a very slender and erect caudodorsal beak (cf. Figs. 8-9). The beak is generally more slender and more erect than in other *Baeturia* species, and longer than what is common in related genera. However, though this character strongly varies between the various species groups, a stout and more strongly bent caudodorsal beak might be synapomorphic for all other *Baeturia* species together. In that case, it could be argued, that a shape of caudodorsal beak, as found in the *exhausta* group, is the plesiomorphic state for *Baeturia*. A decision on this problem depends on the position of the *loriae* group within the cladogram of *Baeturia* (see the next section).

The phylogenetic position of the *exhausta* group

The construction of an unambiguous cladogram

for *Baeturia* is hampered by the questionable phylogenetic position of the *loriae* group (De Boer, 1994a). The species of that group combine characters that seem to be apomorphic for either *Baeturia* or *Gymnotympana*. Current phylogenetic analysis involving all species of the "*Baeturia* and related genera complex" shows that the *loriae* group included in *Baeturia* is the most parsimonious solution (Fig. 1a). (Full results of this analysis will be published later).

The monophyly of *Baeturia*, including the *loriae* group is based on the following apomorphies: 1) a strongly curved aedeagus, tapering to its apex; 2) lobate lateral crests on the aedeagus; 3) a short dorsal elongation of the aedeagal apex; 4) an oval aedeagal pore; and 5) a broad, triangle-shaped, medial thorn on the fore femur (3-7 in Fig. 1a).

*Baeturia* is, in this most parsimonious reconstruction, the sister group of *Scottotympana* De Boer. The dorsal parts of the claspers in these genera are not fused to a collar around the base of anal valves, which is regarded apomorphic (2 in Fig. 1a). *Gymnotympana* with its presumed sister group *Venustria* Goding & Froggatt form the sister group of *Baeturia* and *Scottotympana*, based on large male opercula, extending medially of the meracanthus (1 in Fig. 1a).

The phylogenetic relationships of the *exhausta* group with other species groups of *Baeturia* are uncertain, as is expressed by the polytomy of Fig. 1a. The *nasuta*, *conviva*, *guttulinervis*, and *viridis* groups form a monophyletic group based on the synapomorphic posteriorly directed protuberance on the lateral lobes of the pygofer (10 in Fig. 1a). The *nasuta* and *viridis* groups are sister groups, based on an angularly bent caudodorsal beak (13 in Fig. 1a) (De Boer, 1992a), and the *conviva* and *guttulinervis* groups are sister groups, based on presumed synapomorphies in the shape of the pygofer and claspers (11 and 12 in Fig. 1a) (De Boer, 1992a, unpublished data).

Current phylogenetic analysis indicates that the *loriae* group at the base of the cladogram and the *exhausta* group as sister group of the remaining groups is the most parsimonious solution, but neither the herein construed monophyletic group consisting of the *nasuta*, *conviva*, *guttulinervis*, *viridis*,

and *bloetei* groups, nor the group formed by that group together with the *exhausta* group are defined by clear apomorphic characters, they are merely based on the most parsimonious way to deal with several homoplasious characters.

#### Infra group relationships

The distribution of characters that are presumably significant for the phylogeny of the *exhausta* group are discussed below. When appropriate, the occurrence of these characters outside the group is discussed. These data are summarised in a preliminary cladogram of the *exhausta* group (Fig. 1b).

#### Shape of postclypeus

*B. rossi*, *B. versicolor*, and *B. wauensis* have a distinctly swollen postclypeus (Figs. 54, 61) with a convex anterior margin (lateral view). The postclypeus is weakly swollen in *B. vanderhammeni*, while in *B. exhausta* swollen and unswollen postclypei occur. The postclypeus is not swollen, and has an almost straight anterior margin (lateral view), in the remaining species of the group.

An unswollen postclypeus is found in all species of the *bloetei* group (De Boer, 1989) and several species of the *viridis* group (De Boer, 1992a). A swollen postclypeus is very common among other species of *Baeturia*. The phylogenetic significance of this character is not clear.

#### Fore femur

*B. maai*, *B. vanderhammeni*, *B. versicolor*, and *B. wauensis* presumably form a monophyletic group. These species share a fairly short proximal spine on the fore femur; shorter than the distance to the middle spine (3 in Fig. 1b). The proximal spine on the fore femur is about as long as the distance to the middle spine in other species of the group. Similarly short spines also occur in some species of the *B. viridis* group, however.

#### Tegmina and wings

Setae are formed on the veins of tegmina and wings of many species of *Baeturia*. The veins of especially *B. versicolor* and *B. wauensis*, and to a

lesser extent those of *B. vanderhammeni*, are densely set with long and thin setae, on upper- and underside. All other species of the *exhausta* group have only very few setae on the veins. The tegmina of these three species also tend to be longer, relative to body length, than in the other species of the *exhausta* group (see descriptions). This latter character might be synapomorphic for these species (4 in Fig. 1b).

Comparably densely "hairy" veins are found in the *nasuta* group, the *conviva* group, and the *guttulinervis* group, in some species of the *loriae* group, and in some species of the *viridis* group, though the density of setae is variable between the species of these groups. The veins are practically bald in all other genera of the "*Baeturia* and related genera complex", but similar setae occur in several species groups of the Prasiini, which probably form the sister group of the complex.

*B. versicolor* and *B. wauensis* have 9 or 10 apical areas in the tegmina as presumed synapomorphy (6 in Fig. 1b), all other species have 8 apical areas. Eight apical areas is common in *Baeturia* and in most of the related genera. In several species of *Thaumastopsaltria* (De Boer, 1992b) and *Gymnotympana* (unpublished), the number of apical areas varies between 10 and 15, and often differs within individuals. The only male known of *B. karkarensis*, belonging to the *viridis* group, also has 9 apical areas in the tegmen, but a female that possibly belongs to that species has 8 (De Boer, 1992a).

#### Shape of opercula

The distal part of the male operculum of *B. maai*, *B. vanderhammeni*, *B. versicolor*, and *B. wauensis* tends to be more slender than in the remaining species of the *exhausta* group, but such differences occur also in other groups of *Baeturia*. Males of *B. versicolor* and *B. wauensis* share a very short operculum, not reaching beyond the apex of the meracanthus (Figs. 59, 69). Such short male opercula regularly occur in the more distantly related *conviva*, *guttulinervis*, *nasuta*, and *viridis* groups, but can presumably be regarded apomorphic for these two species (7 in Fig. 1b), while the occurrence of short opercula in other groups must be explained by parallelism.

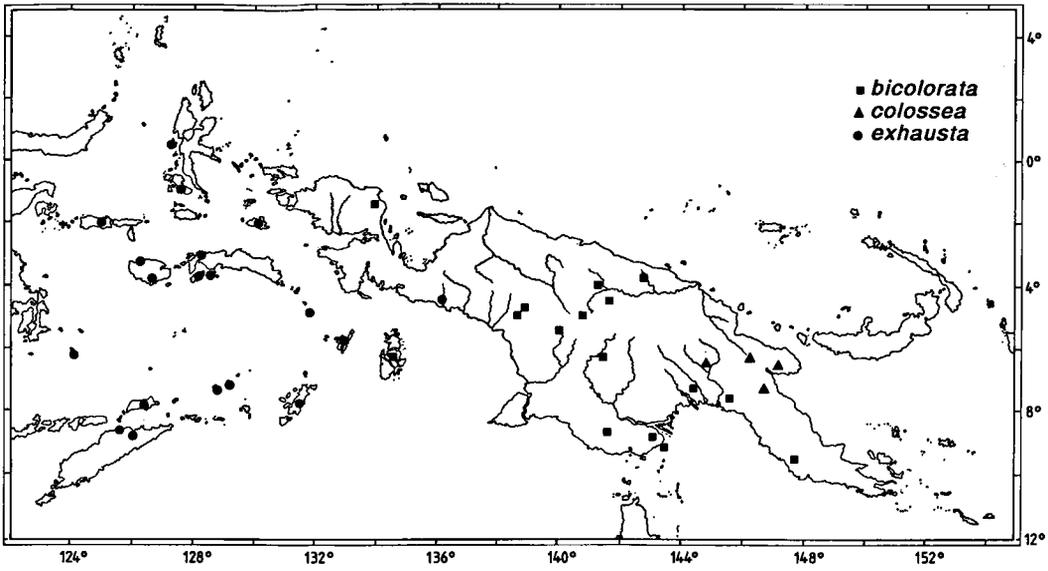


Fig. 2a. Localities of *Baeturia bicolorata*, *B. colossea*, and *B. exhausta*.

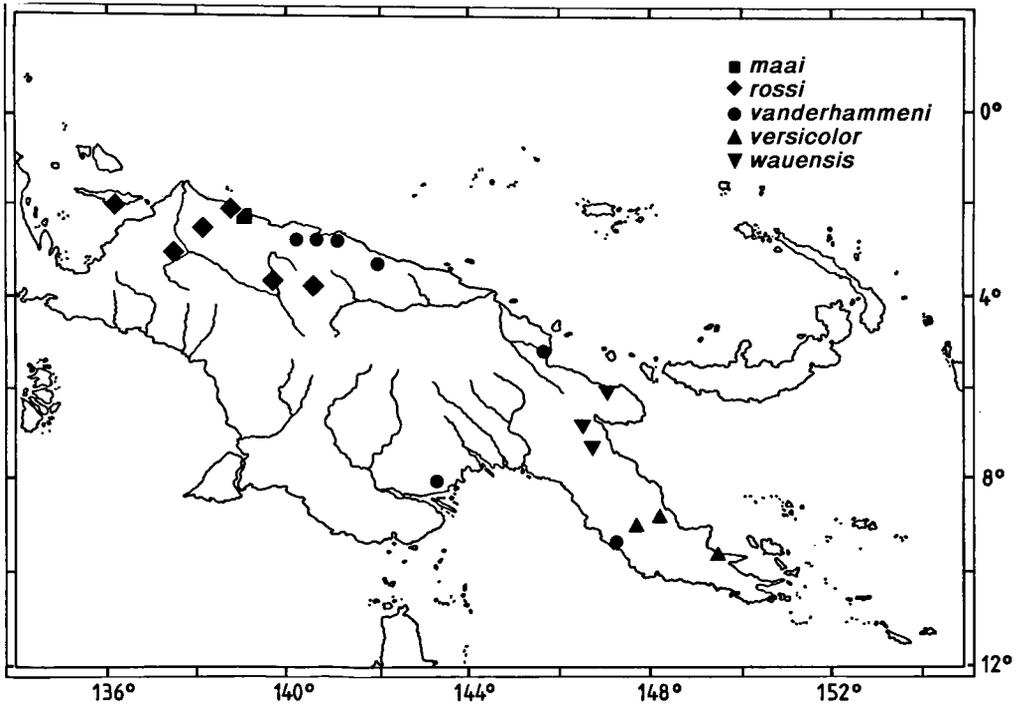


Fig. 2b. Localities of *Baeturia maai*, *B. rossi*, *B. vanderhammeni*, *B. versicolor* and *B. wauensis*.

#### Shape of male caudodorsal beak

*B. vanderhammeni* and *B. wauensis* share a very slender caudodorsal beak; the beak is oblong in dorsal view (Figs. 43, 53). This shape of beak is unique, and the might be synapomorphous for these two species and *B. versicolor* (5 in Fig. 1b), the more strongly curved beak of the latter species being an autapomorphy.

#### Shape of clasper

*B. exhausta* and most specimens of *B. bicolorata* share an almost straight distal margin of the clasper (Figs. 11, 26-32), which is possibly synapomorphous for these two species (9 in Fig. 1b). The distal margin of the clasper is concave, marking the end of the dorsal crest, in all other species of the *exhausta* group (Fig. 34 arrow) and in other *Baeturia* species that have a distinct dorsal crest. The distal margin of the clasper is only very weakly concave in *B. maai*, however. The distal end of the dorsal crest of clasper is very prominent and often somewhat protruding in *B. versicolor* and *B. wauensis*, this character is presumably synapomorphous for these two species (8 in Fig. 1b).

### BIOGEOGRAPHY

The *exhausta* group is distributed in New Guinea and Maluku, including Timor island. Two species, *B. bicolorata* and *B. exhausta*, have a relatively wide distribution.

*B. exhausta* is recorded from Timor, most of the southern Moluccan and Banda islands, the Aru islands, and the Mimika coast of New Guinea. Though *B. exhausta* has not been recorded from the north Moluccan islands of Halmahera, Morotai or Talaud, the species is recorded from Bacan and Ternate (Fig. 2a). A similarly wide distribution was found for *B. macgillavryi* De Boer, 1989, of the *bloetei* group, and for *Hamza ciliaris* (Linnaeus, 1758). The distribution area of *B. macgillavryi* includes Halmahera, Morotai and Talaud, but the species is not recorded from the eastern islands (Aru, Kai, and Tanimbar), and is not known from Sula and most of the smaller Moluccan islands (Bacan, Damar, Haruku,

Larat, Laut, Teun, and Tomea) (De Boer, 1989). Though *B. macgillavryi* is not recorded from New Guinea, it was remarked, that two specimens from southern New Guinea, and attributed to *B. bloetei* (the sister species of *B. macgillavryi*) take a somewhat intermediate position between these two species (De Boer, 1989). *H. ciliaris* too, is widely distributed over the Moluccan islands and also recorded from Timor, but the species extends northward into Mindanao and the Palau group of the Caroline Islands (Duffels, 1991). It is remarkable, that those species reaching the southern Moluccas and Timor tend to have such wide distributions, while species restricted to the northern Moluccas are much more endemic (see the *Diceropyga obtecta* group, Duffels, 1977 and the *Baeturia conviva* group De Boer, 1986).

It is supposed that the distributions of *B. exhausta* and *B. macgillavryi* are the result of a recent dispersal from New Guinea, since many of the south Moluccan islands only recently, less than 1 million years ago, emerged (Fortuin & De Smet, 1991). *H. ciliaris* has no near relatives on New Guinea, and has presumably a different biogeographical history.

*B. bicolorata*, the sister species of *B. exhausta* and very similar to that species, is widely distributed in New Guinea, from Cendrawasih to the Papuan peninsula, occurring north, as well as south of the central mountain ranges, and is further recorded from the Aru Islands. Only two cicada species are known to have a similarly wide distribution in New Guinea occurring north and south of the central mountain ranges: *Guineapsaltria flava* (Goding & Froggatt, 1904), which is also found in the eastern parts of the Cape York Peninsula of Queensland (De Boer 1993a), and *Aedeastria latifrons* (Blöte, 1960), which has a slightly more limited distribution and does not occur on Cendrawasih or in eastern Papua New Guinea (De Boer, 1993b). It is curious to notice that both these species are also recorded from the Aru islands.

The remaining species of the *exhausta* group have a much more limited distribution. Three species (*B. maai*, *B. rossi*, and *B. vanderhammeni*) occur in the northern parts of New Guinea, *B. maai* and *B. rossi* are endemic there, while *B. van-*

*derhammeni* is also recorded from Balimo in south-eastern Papua New Guinea and from Bisianumu on the Papuan peninsula. Two species (*B. colosseae* and *B. wauensis*) are endemic to northeastern Papua New Guinea, in and near the Finisterre range, and one species (*B. versicolor*) is endemic to the Papuan peninsula (Figs. 2a-b).

By far most of the New Guinean cicadas occur in northern New Guinea or on the Papuan peninsula. The distribution of species or monophyletic species groups in these areas is a common pattern, found in *Baeturia* (De Boer, 1982; 1989; 1992), *Diceropyga* (Duffels, 1977), *Guineapsaltria* (De Boer, 1993a), *Gymnotympana* (unpublished), and *Thaumastopsaltria* (De Boer, 1992b). However, *Diceropyga*, *Gymnotympana*, and *Thaumastopsaltria* appear to be concentrated in the Papuan peninsula, as far as their New Guinean species are concerned, while *Baeturia* seems to have most species in northern and western New Guinea.

## TAXONOMY

### Description of the *exhausta* group

The species of the *exhausta* group show a striking similarity, especially in male genital structures. In other species groups the clasper shape alone often suffices for identification on species level, but in the *exhausta* group other characters (viz. postclypeus shape, operculum shape, numbers of apical areas in tegmina and numbers of tymbal ridges) are needed to distinguish the species.

Body of males reddish brown, generally densely brown speckled on head, thorax and predominantly the dorsal parts of abdomen, sometimes with a light and unspeckled middorsal band over whole length of body. *B. versicolor* unspeckled, with a conspicuous pattern of olive green and black markings. Females generally darker brown and more densely speckled than males, but females of *B. bicolorata* unspeckled, with greenish head and thorax, and ochraceous abdomen. Females often shorter than males, but with more robust head and thorax, and longer tegmina. Male abdomen 1.3-1.8 x as long as head and

thorax (1.1-1.4 x in *B. wauensis*), of females 1.0-1.3 x. Tegmina of males 1.0-1.2 x as long as body length (1.2-1.4 x in *B. wauensis*), of females 1.2-1.6 x.

Head: Postclypeus distinctly protruding beyond vertex lobes (Fig. 3), broadly rounded at anterior margin and 1.4-2.9 x as broad as long. Lateral parts of postclypeus with 6-7 rows of short parallel ridges, forming a broad band along lorum (Fig. 4). Distance between eyes 1.4-2.0 x as long as postclypeus width. Head only slightly narrower than anterior width of pronotum, 2.2-3.1 x as wide as long and 2.1-2.6 x as wide as distance between eyes. Pronotal collar 1.2-1.5 x as wide as head. Ocelli fairly large and close together. Distance between lateral ocelli 0.8-1.7 x as long as distance between eye and lateral ocellus and 1.0-2.0 x the width of frontal ocellus. Distance between eyes in males 1.2-1.6 x as wide as eye, in females 1.3-1.8 x.

Thorax: Pronotum with two pairs of deep oblique fissures; speckling generally most dense between these fissures and in medial band, but medial band occasionally immaculate and lighter coloured. Pronotum 2.1-2.6 x as broad as long. Mesonotum greyish brown, or greenish, generally densely speckled, but less so in two semicircular spots at pronotal margin and in lateral bands, and generally without black spots in front of cruciform elevation. Mesonotum 0.7-0.8 x as long as width of pronotal collar.

Tegmina and wings: Hyaline. Tegmen with 8, in two species 9-10, apical areas, a very narrow subcostal area and a fairly narrow hyaline border along its hind margin. Wing with 6 apical areas and a slightly broader hyaline border along its hind margin. Venation ochraceous or greenish, in some species densely set with setae.

Legs: Fore femur (Fig. 7) with row of three or four pointed spines, diminishing in length towards tibia. Most proximal spine shorter than, or about as long as, distance to middle spine.

Opercula: Consisting of a vaulted basal part, with a distinct crest around its rectangular distolateral corner, and a flat distal part. Male operculum with oval to oblong-shaped distal part, which generally covers the greater part of tymbal cavity, and always reaches medially of meracan-

thus. Distal part of female operculum much smaller than that of male and sickle-shaped.

Tymbal organ: Generally with seven parallel sclerotized ridges spanning the tymbal, while an 8th, most proximal ridge, is only partly developed and reaches to about half the tymbal width. *B. rossi* has six ridges and a half, *B. maai* has five ridges and a half.

Abdomen: Male abdomen very delicate, distinctly inflated, generally with reddish segmental hind margins, and often with ventrolateral row of dark spots on segments 3-7 or 8. First tergite fairly long, partly hidden under metanotum in *B. versicolor* and *B. wauensis*. Anterior margin of 2nd tergite convex medially, but weakly concave in *B. versicolor* and *B. wauensis*. Lateral parts of 2nd tergite weakly inflated and adjacent to tymbal. Ventral part of 2nd tergite straight between auditory capsule and 1st sternite. Auditory capsules distinctly swollen. First sternite broad and bluntly rounded distally, forming a small distal lobe. Female abdomen more solid than that of male. Female caudodorsal beak sharply pointed at apex. Ovipositor sheaths reaching to, or just beyond, apex of beak (Fig. 21).

Male genitalia: Pygofer with very slender and erect caudodorsal beak. Dorsal margin of pygofer slightly convex, generally continuously curved with rounding of beak. Lateral lobes of pygofer strongly curved or folded mesiad, forming bluntly rounded protuberances at their distal corners. Ventral margin of pygofer angularly bent. Ventral margins converging to sharp angle at base of pygofer (Figs. 5, 45, 73). Caudodorsal beak pointed at apex. Claspers parallel, not fused at base, and thus not forming a ring-shaped collar around base of anal valves. Clasper with distinctly outcurving crest along its straight dorsal margin. As a result of this outcurvation, both claspers together form a cup-shaped hollow around the aedeagus (Fig. 6). Clasper base forming a rectangular corner, here termed "clasper heel". Apical part of clasper fairly short and strongly bent downwards, with sharply edged ventral incurvation or "clasper hollow." Aedeagus S-curved, with two small lateral lobes at basal curve.

## KEY TO THE MALES

- 1 a Veins of tegmina and wings densely set with short setae .....2
- b Veins of tegmina and wings with very few setae, practically bald .....4
- 2 a Postclypeus weakly swollen ventrally. Tegmen with 8 apical areas. Operculum long, reaching beyond apex of meracanthus .....*B. vanderhammeni*
- b Postclypeus distinctly swollen ventrally. Tegmen with 9 or 10 apical areas. Operculum short, not reaching to apex of meracanthus (Figs. 59, 69) .....3
- 3 a Body greyish brown and densely brown speckled, especially on head, thorax and dorsal part of abdomen, but without distinct colour pattern. Caudodorsal beak oblong in dorsal view, with almost parallel lateral margins (Fig. 53). .....*B. wauensis*
- b Body light ochraceous and unspeckled. Pronotum with olive green middorsal band and collar. Cruciform elevation of mesonotum and metanotum olive green. Distinct black streak on fore femur and black spots at bases of tegmen and wing. Caudodorsal beak triangular in dorsal view, its lateral margins converging to apex (Figs. 63, 64). .....*B. versicolor*
- 4 a Clasper with distinct bend in distal margin, marking the end of dorsal crest (Fig. 34 arrow) .....5
- b Clasper with straight distal margin (Fig. 11) .....7
- 5 a Postclypeus distinctly swollen ventrally. Operculum very broad, square-shaped (Fig. 86), completely covering tymbal cavity in ventral view and distinctly visible in dorsal view .....*B. rossi*
- b Postclypeus weakly or not swollen ventrally. Operculum oblong (Figs. 38, 74), partly covering tymbal cavity in ventral view and hardly or not visible in dorsal view .....6
- 6 a Body length 24.1-27.4 mm. Frontal ocellus as wide as, or wider than, distance between lateral ocelli. Tymbal with 8 sclerotized ridges .....*B. colossea*
- b Body length 21.5-21.6 mm. Distance between lateral ocelli 1.2-2.0 x as wide as frontal ocellus. Tymbal with 6 sclerotized ridges .....*B. maai*
- 7 a Body length generally under 22 mm. Opercula not strongly directed mesiad, clearly visible in dorsal view. Clasper straight directed posteriad, its dorsal margin parallel with dorsal margin of clasper base (Fig. 11) (Timor, Maluku, Banda, Key and Aru Islands, Mirmika coast of New Guinea) .....*B. exhausta*
- b Body length generally over 22 mm. Opercula strongly directed mesiad, not visible in dorsal view. Clasper often slightly upcurved, its dorsal margin often directed upwards relative to dorsal margin of clasper base (Figs. 26-32) (New Guinea, Aru Islands).....*B. bicolorata*

## DESCRIPTION OF THE SPECIES

### **Baeturia exhausta** (Guérin Méneville, 1831) (Figs. 1-17)

*Cicada exhausta* Guérin Méneville, 1831: Pl. 10 Fig. 6; Guérin Méneville, 1838: 181; Walker, 1850: 120; Walker, 1858: 30; Walker, 1868: 92.

*Baeturia exhausta*; Distant, 1888: 487; Distant, 1892b: xiv, 149, Pl. XV Figs. 13, 13 a-b; Breddin, 1900: 181; Horváth, 1900: 642; Kirkaldy, 1905: 330 (partim: Maluku); Distant, 1906: 157; Kirkaldy, 1907: 308 (partim: Maluku); Distant, 1911: 389; Distant, 1912: 599; Kirkaldy, 1913: 8; Distant, 1914: 346; Schmidt, 1926: 222, 257; Myers, 1928: 55, 60, Figs. 5-9, 11-17, 19-21 (partim: Maluku); Schmidt, 1928: 110; Lallemand, 1931: 78; Kato, 1932: 184, Pl XXVI Fig. 9; Blöte, 1958: 265; Metcalf, 1963: 248-249; Duffels, 1977: 209; Duffels & Van der Laan, 1985: 252; De Boer, 1986: 173; De Boer, 1989: 1, 2, 3, 40; De Boer, 1992a: 166.

*Cicada hastipennis* Walker, 1858: 30; Stål, 1862: 483.

*Baeturia hastipennis*; Blöte, 1958: 265, 267, Fig. 1.

*Cicada parallela* n. syn. Walker, 1868: 94.

*Cicada parallela* in synonymy of *Baeturia conviva*; Distant, 1892b: xiv, 148, 149, Pl XIV Figs. 25, 25 a-b; Horváth, 1900: 642; Distant, 1906: 156; Metcalf, 1963: 247.

*Baeturia parallela*; Blöte, 1958: 266; Duffels & Van der Laan, 1985: 254.

*Dundubia parabola* Walker, 1858: 6.

*Baeturia parabola*; Blöte, 1958: 265, 267, Fig. 2; Duffels & Van der Laan, 1985: 254.

In the following literature *B. exhausta* is mentioned, but, according to the geographical data, some other species is meant: Dohrn, 1859: 74 (Malakka); Myers, 1929: 162, 166, 171 (Samoa); Lallemand, 1935: 677 (Solomon Islands); Lallemand & Synave, 1953: 233 (Sumba).

Material examined: IRIAN JAYA: NEW GUINEA (W): Mimika R., vii.1910, A.F.R. Wollaston, 1♂ *Baeturia vanderhammeni* Blöte det. H.C. Blöte, 1♀, RMNH; ARU: Aru, 1909, W. Stalker 1910-127, 1♂, BMNH; KAI: Iles Key, coll. Noualhier, 1♂, 1♀, MNP; Ins. Key, 2♀, TMB; Kei, 1♂ *Cicada exhausta*, MVM; Key eil. Dangka Exb., 22.iv.1922, Papakula, 1♂, MZB; Key Ins, Planten, 2♂, 3♀, BMNH; Key Inseln, Tual Langgur, 2♂, NhMW; Toeal, 3♀, MZS; Key, 2♀, IZW; Gn Daab, 1922, H.C. Siebers, 1♂, IZW; Toeal, 1922, H.C. Siebers, 1♀, IZW; MYSOOL: Misool Id. (W), 0-75 m, 8.ix-20.x.1948, M.A. Lieftinck, 1♂, MZB; MALUKU: Cer. or Amb., Obeifo [?], 1♂ type *Dundubia parabola* Walker, BMNH; AMBON: Amb, Wallace, 2♀, MVM; Amb, Amboina, Wallace, 1♂ *Cicada exhausta*, MVM; Amboina, 1♂, BMNH; Amboina, A. Kolber, 1♂, 2♀, KBIN; Amboina, F. Muir, 9♂, 10♀, BPBM; same data 1♂,

1♀, ZMA; Amboina, Doherty, 1♂, BMNH; Amboina, Suykerbuyk, 1♂ det. *Baeturia quadrifida* Walk., 2♂, 1♀, KBIN; Amboina, 1873, O. Beccari, 1♂, 1♀, BMNH; same data 1♂ det. *B. quadrifida*, 3♂, 2♀, MSNG; same data but xii.1874, 1♂ det. *B. quadrifida*, 1♂, MSNG; Hitu, Amboina, xii.1891, Exp. Martin, 1♀, BMNH; Leitimor, Amboina, xii.1891, Exp. Martin, 1♂, BMNH; Ambon, 1880, Ten Cloet, 2♂, 1♀, ZMA; Ambon, v-viii.1865, Hoedt, 1♂, 2♀, RMNH; Ambon, coll. Dr D. Macgillavry, 1♀, ZMA; Ambon, Forsten, 1♂, RMNH; Ambon, Ludeking, 1♀, RMNH; Waai, various dates between 14.v.1960 and 15.viii.1967, A.M.R. Wegener, 29♂, 8♀, BPBM; same data 22.v.1960, 1♂; 31.v.1960, 1♀; 2.vi.1960, 1♂; 28.vi.1960, 1♀; 20.iv.1963, 1♂, all ZMA; same data 3.iii.1966, 1♂, 24.iii.1966, 2♂, CAS; BACAN: Batjan Waigaua, 14.vii.1953, 1♂, MZB; BURU: Bouru, 1♂, BMNH; Bouru, Higgins 69, coll. Camille van Voixern, 1♀ det. *Baeturia parallela* Walk. / *Baeturia conviva* Stål, KBIN; Bouru, Doherty, Distant coll. 1911-383, 3♂, BMNH; Bara, W. Bouru, ix.1899, 2♂ *Baeturia exhausta* Guér. det. J.G. Myers, 2♂, 1♀, BMNH; Buru Station 1, 1921, leg L.J. Toxopeus, 1♂ neotype, 1♂, RMNH; same data but Station 9, 1♀, RMNH; DAMAR: Insel Dammer, Ost Indien, W.H. Muche Radeberg ankauf, 1♂, SMD; HARUKU: Haroekoe, Snellius Exp., 3-7.v.1930, 4♂, RMNH; Haroekoe, ii.1892, Oeliasers, Exp. Martin, 1♂, BMNH; NOESSA LAOET: Noessa Laoet, Ludeking, 1♂ *Baeturia parabola* Walk. det H.C. Blöte, 1♂ det. *Baeturia exhausta* Guér., 3♀, RMNH; LARAT: Larat, F. Muir, 4♂, 1♀, BPBM; SERAM: Cer. E., 1♂ type *Cicada parallela* Walker, BMNH; Ceram, 1♂ *Cicada exhausta*, MVM; Ceram, 1♂, 1♀, AMS; Ceram, 1♂, 1♀ type *Cicada hastipennis* Walker, 1♀ det. *exhausta* Guérin / *conviva* Stål, BMNH; Ceram, Forsten, 2♀, RMNH; Ceram, 1913-504, E. Stresemann, 1♂ type *Pomponia jacobsoni* China det. W.E. China, 1♀, BMNH; Ceram I., ix.1909, W. Stalker, 1♂, BMNH; Seram, 1♂, SMD; G. Binaia, N. slope, site 9, 1000 m, viii-ix.1987, J.D. Holloway, 1♂, BMNH; G. Kobipoti, N. side, site 4, 250 m, viii-ix.1987, J.D. Holloway, 1♂, BMNH; same data but site 5, 550 m, 1♂; summit ridge, site 7, 1370 m, 3♂, 2♀, all BMNH; Manusela Wae Mual Plain, ix.1987, M.J.D. Brendell, 1♂, 2♀, BMNH; Piroe, i.1909, F. Muir, 2♂, 1♀, BPBM; same data but ii.1909, 1♀, BPBM; Solea, site 2, 50 m, viii-ix.1987, J.D. Holloway, 4♂, 2♀, BMNH; SULA BESI: Sula, Wallace, 1♂ *Cicada exhausta*, MVM; Sula Besi, Doherty Ex. coll. Fruhstorfer, 1♂, 1♀, TMB; Taliaboe, Zs Archipel, iv.1905, v. Nauhuis, 1♂, RMNH; TANIMBAR: Insula Tanimbar, Coll. Dr D. Macgillavry, 3♂ *Tibicen pucillus* det. M. Gill, 2♀, ZMA; TERNATE: Ternate Malay Archipelago, 1903-31, W. Doherty, 3♂, 2♀, BMNH; same data 1♂, ZMA; TEUN: Teoon, Friese, 1♂, TMB; TOMEA: Tomia, 1903-188, 1♀, BMNH; NUSSA TENGGARA: TIMOR: Timor, 1♀ det. *parallela* Walk., BMNH; Balical, 200-300 m, 14-24.xii.1963, J. Sedlacek, 2♀, BPBM; Dili (near) [Ermera], 1140 m, 25.xi.1967, Raimundo, 1♂, CZL; same data but 975 m, 12.ix.1968, 1♂; same data but 1150 m, 10.xii.1968,

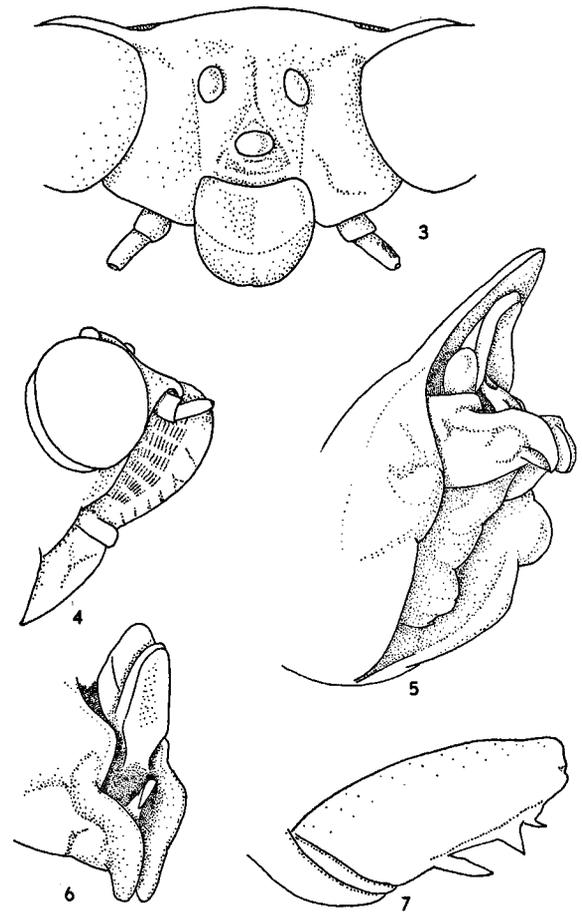
4♂; 23.xii.1968, 4♂, 1♀; 9.i.1969, 1♂; 30.i.1969, 1♂, all CZL; Ermera, Timor (Portugese), 1100-1350 m, 20.xii.1963, J. Sedlacek, 1♀, BPBM; same data but 1200-1500 m, 29.xii.1963, 1♂, BPBM; Ermera-Lete Fobo Rd., 1168 m, 25.i.1968, Raimundo, 1♂, CZL; Manatuto, sea level, 28.vi.1967, Raimundo, 1♂, CZL; same data but 30.vi.1967, 1♂, 1♀, CZL; Soe, Central Timor, 1♂, KBIN; Vor Soe, xii.1931, Mandchin, 1♂, NBM; WETAR: Wetter, Schädler, 1♂, RMNH.

#### Identification of *B. exhausta* and neotype designation

*Cicada exhausta* was described from a male specimen from Buru Island, South Moluccas. The type specimen could not be located, which presents a major difficulty in correct identification of the species. Guérin's description is applicable to many *Baeturia* species and his figure (Pl. X Fig. 6), though clearly that of a *Baeturia*, provides insufficient details for determination.

Study of the Moluccan *Baeturia* material from several major collections (e.g. BMNH, BPBM, MZB, RMNH) revealed the occurrence of only three species of *Baeturia* on Buru Island: *B. macgillavryi* De Boer, 1989, *B. schulzi* Schmidt, 1926, and the species here described as *B. exhausta*. In Metcalf's catalogue (1963) two more species are listed from Buru: *B. bicolorata* Distant, 1892 and *B. conviva* (Stål, 1861) the latter species erroneously including *Cicada quadrifida* Walker, 1868, and *Cicada parallela* Walker, 1868, as junior synonyms. The Buru specimens that were identified as *B. bicolorata* belong to *B. macgillavryi* De Boer, 1989. *B. bicolorata* is redescribed below and appears to be restricted to New Guinea and the Aru Islands, *B. conviva* and *B. quadrifida* are two distinct species, both not occurring on Buru (De Boer, 1986) and *B. parallela* is here brought into the synonymy of *B. exhausta*.

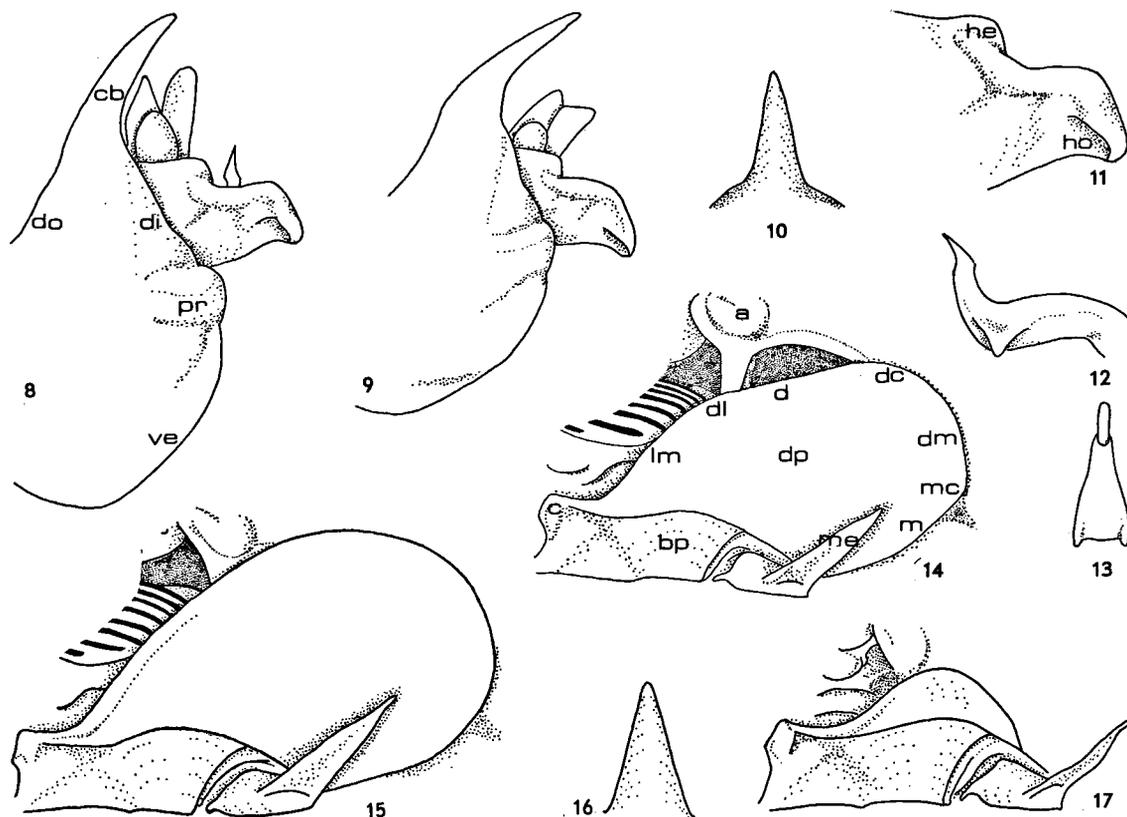
In his description of *Cicada exhausta*, Guérin states: "L' abdomen est gonflé, transparent et vide; chaque segment est bordé d' un fin liséré rose et couvert d' un grand nombre de petites taches brunes." Of the three *Baeturia* species from Buru, this rules out *B. macgillavryi* as a possible synonym of *B. exhausta*, since its abdomen is unspotted and its segmental margins are not reddish coloured. The abdomen of *B. schulzi* is



Figs. 3-7. *B. exhausta*; 3, head in dorsal view, neotype; 4, head in lateral view, neotype; 5, pygofer aslant, Buru; 6, clasper from above, Ambon; 7, fore femur, neotype.

slightly brown speckled and one of the described specimens (De Boer, 1986) has reddish segmental hind margins, so this could be a synonym of *B. exhausta*. The third *Baeturia* species that occurs on Buru has a more distinctly speckled abdomen, often with bright red segmental margins. It seems appropriate, also considering the unquestionable identity of *B. schulzi* (De Boer, 1986), to regard this latter species as identical with Guérin's *Cicada exhausta*.

A male from Buru Island, of the collection of the RMNH, is designated neotype. This specimen has the following labels: "BURU 1921 / station 1 / leg. L.J. Toxopeus" (print); "Ex alcohol" (print).



Figs. 8-17. *Baeturia exhausta*; 8, pygofer in lateral view, neotype; 9, pygofer in lateral view, Ambon; 10, male caudodorsal beak in dorsal view, neotype; 11, clasper, neotype; 12, aedeagus in lateral view, Ambon; 13, aedeagus from behind, Ambon; 14, male operculum, Ambon; 15, male operculum, Buru; 16, female caudodorsal beak in dorsal view, Buru; 17, female operculum, Buru.

Lettering: a = auditory capsule; bp = basal part of operculum; c = crest around distolateral corner of basal part of operculum; cb = caudodorsal beak; d = distal margin of operculum; dc = distomedial corner of operculum; di = distal margin of pygofer; dl = distolateral corner of operculum; dm = distomedial margin of operculum; do = dorsal margin of pygofer; dp = distal part of operculum; he = clasper heel; ho = clasper hollow; lm = lateral margin of operculum; m = medial margin of operculum; mc = medial corner of operculum; me = meracanthus; pr = protuberance on lateral lobe of pygofer; ve = ventral margin of pygofer.

### Synonymy

Metcalfs catalogue (1963) gives as synonyms of *B. exhausta*: *Cicada hastipennis* Walker (1858), *Dundubia parabola* Walker (1858) and *Cephaloxys dilectus* Stål (MS). *Cicada parallela* Walker (1868) and *Pomponia jacobsoni* China (MS?) are added here as new synonyms. The identity of each of these synonyms will be discussed in the following lines.

The type of *Cicada hastipennis* is a female from Seram. This brown speckled specimen definitely belongs to *Baeturia*, it has a truncate caudodorsal

beak, a broad sickle-shaped operculum, which is slightly domed at the distolateral corner of its distal part, and no setae on the veins of tegmina and wings. Three species of *Baeturia* are known from Seram: *B. exhausta*, *B. macgillavryi*, and recently collected by Dr J.D. Holloway (BMNH), *B. schulzi*. Determination of females to species level is generally not possible and the *C. hastipennis* type could belong to either of these species. However, *B. macgillavryi* can be ruled out on account of the absence of body speckling in that species. The type series of *B. schulzi* contains one

female. This specimen was not included in the revision of the *conviva* group (De Boer, 1986) and only recently located in the Warsaw museum. The female of *B. schulzi* shares a very slender, oblong and apically bluntly rounded caudodorsal beak, very short sickle-shaped opercula, and many long setae on the apical veins of tegmina and wings with other species of the *conviva* group. *B. exhausta* females have a triangular, sharply pointed caudodorsal beak, larger, often slightly domed opercula, and have practically bald veins. Considering these facts, *C. hastipennis* most probably belongs to *B. exhausta*.

The type of *Dundubia parabola* is a male from Seram or Ambon (the label is not clear on this point). Unfortunately the genital segments are badly preserved, and glued upon yellow mica. The preparation was made by Myers, who depicted the aedeagus (1928: Fig. 5). Blöte depicts the whole segment (1958: Fig. 2). Despite the deformations, the claspers can still be recognized as identical to those of *B. exhausta*. *D. parabola* certainly is a synonym of *B. exhausta*.

The type of *Cicada parallela* is a male from E. Seram, of which the genital segment is missing. This brown speckled specimen is remarkable by its light ochraceous middorsal band, running over the whole length of the body. Specimens, males and females, with a similar light coloured and unspeckled middorsal band were found throughout the distribution area of *B. exhausta*: on Ambon, Buru, Damar, Haruku, Larat, New Guinea, Taliabu, Tanimbar, Tomea and Timor. Apart from this light middorsal band, these specimens could not be separated from *B. exhausta*. Similarly, in *B. brandti* De Boer, 1989, *B. edauberti* Boulard, 1979, and *B. maddisoni* Duffels, 1988, specimens with a light middorsal band regularly appear (De Boer, 1989: 36, remark, Fig. 163), this character also appears in *B. bicolorata* described below, and several species related to *B. guttulinervis*, Blöte, 1960. Considering this, there is no reason to regard the specimens with a light middorsal band as a separate species. *C. parallela* is regarded as a junior synonym of *B. exhausta*.

*Cephaloxys dilectus* is first mentioned by Distant (1892) as a manuscript name of Stål and a synonym of *B. exhausta*. Distant remarks, that the

type specimen is in the BMNH and was probably arranged under *Cephaloxys* by Walker. In the BMNH I found a male from Moroty (= Morotai) det. *Cephaloxys cillogata*; and a male from Gilolo (= Halmahera) det. *Pilectus* Stål. Both these specimens belong to *B. macgillavryi* and are included in the list of material preceding the description of that species (De Boer, 1989). Recently I found two specimens, a male and female, in the collection of the Museum in Oxford labeled: "Bernstein Noord Halmahera"; "E. Mus Leyden 1868" identified as *Baeturia dilecta* by W.W. Fowler 1896, these specimens also belong to *B. macgillavryi*. Some material identified as *Cephaloxys dilectus* by Walker in the MVM appeared to belong to *B. macgillavryi*, 1♂, 1♀; *B. bloetei* De Boer, 1989, 1♀; *B. schulzi* Schmidt, 1926, 2♂; and *Aedeastria hastulata* De Boer, 1993, 1♀.

A male from Seram is labeled as the type of *Pomponia jacobsoni* China, by W.E. China 1926. This name does not occur in the literature. It is remarkable, that Mr. China did describe a *Cryptotympana jacobsoni* in that same year (Moulton & China, 1926), this however, is a species from Sumatra and stands in no connection with the Seram specimen which belongs to *B. exhausta*.

*B. exhausta* is rather variable in colour, swelling of postclypeus, and shape of the male operculum and pygofer. The various forms of these structures appear randomly distributed throughout the distribution area of the species and apart from small differences in medium size, no differentiation between island populations could be found. Only the Timor specimens form an exception; males and females are unspeckled and tend to be bicoloured, with green head and thorax, and ochraceous brown abdomen. However, one female is dark brown coloured, with a light brown middorsal band. The Timor specimens could not be separated from other *B. exhausta* specimens on morphological grounds and are therefore regarded as belonging to that species.

## DESCRIPTION

Body of males generally reddish brown to ochra-

ceous brown and brown speckled, though very variable in density of speckling. Females shorter than males, but with more robust head and thorax; greyish brown and generally more intensely speckled. Timor specimens, males and females, unspeckled and often bicoloured, with greenish head and thorax, and ochraceous abdomen. Speckled specimens sometimes with a light ochraceous and immaculate middorsal band over whole length of body, from postclypeus to caudodorsal beak. Male abdomen 1.3-1.7 x as long as head and thorax, of females 1.1-1.2 x. Tegmina of males 1.0-1.1 x as long as body length (1.2-1.3 x in three males from Seram, site 7), of females 1.2-1.3 x (1.4-1.5 x in two females from Seram, site 7).

Head (Fig. 3): Postclypeus in dorsal view broad, oblong, and slightly protruding beyond vertex lobes, its anterior margin broadly convex and making an obtuse, sometimes almost right, angle with anterior margins of vertex lobes. Postclypeus 1.7-2.2 x as broad as long, generally slightly swollen ventrally, anterior margin (lateral view) weakly convex (Fig. 4). Occasionally more strongly swollen, with distinctly convex anterior margin, or unswollen, with straight anterior margin.

Thorax: Pronotum ochraceous brown, brown speckling often concentrating in slightly red tinged medial band. Mesonotum often more greyish brown and weakly brown speckled. Sometimes with two black spots in front of cruciform elevation, but generally without. Cruciform elevation often tinged with red.

Legs: Fore femur (Fig. 7) with row of three or four pointed spines, diminishing in length towards tibia. Proximal spine about as long as distance to middle spine.

Tegmina and wings: Hyaline, venation ochraceous or reddish, generally with a few setae in apical parts. Tegmen with 8 apical areas.

Tymbal organs: Tymbal often red between ridges, especially in dorsal parts, nearly always with six weakly sclerotized transverse parallel ridges spanning the tymbal from dorsal to ventral margin, a 7th ridge almost reaching ventral margin and an 8th, most proximal ridge reaching to about half the tymbal width. Seven short

intercalary ridges seem to form a lateral band across tymbal. The Aru specimen has one complete ridge less, the Damar specimen misses the partly developed 8th ridge.

Opercula: Male operculum rather large, shell-shaped and clearly visible in dorsal view. Operculum covering greater part of, or completely covering, tymbal cavity in ventral view. Distal part of male operculum curved flat against the body, generally oblong (Fig. 14), with short lateral margin, bending into long and straight distal margin. Distomedial margin long and weakly convex, making an almost right angle with weakly convex medial margin. Quite often the operculum is broader and more rounded (Fig. 15), with longer lateral margin, broadly rounded into convex distal margin, and broadly rounded at medial corner. Distomedial edge of operculum reaching beyond margin of abdominal segment 2. Meracanthus reaching to about half-length of operculum. Female operculum (Fig. 17), with distal part shorter than basal part, sickle-shaped and generally curved towards abdomen.

Abdomen: Male abdomen strongly inflated, ochraceous brown and brown speckled, mainly on dorsal parts. Ventral side of abdomen unspeckled. Most specimens with row of blackened ventrolateral spots on segments 3-7 or 8. Segmental hind margins generally red. Female abdomen grey-brown and densely speckled. Row of slightly darkened ventrolateral spots hardly visible. Segmental hind margins lighter, ochraceous. Ovipositor sheaths reaching just beyond apex of caudodorsal beak. Female caudodorsal beak (Fig. 16) straight, directed posteriad, sharply pointed at apex, but truncate in holotype of *B. hastipennis*.

Male genitalia: Pygofer in lateral view with short, often rather stout caudodorsal beak (Fig. 9), but slender in neotype (Fig. 8). Dorsal margin of pygofer straight or concave, convexly, often almost angularly, bent into erect caudodorsal beak (Fig. 9). Distal margin weakly convex, concavely bent into margin of beak and forming an obtuse angle with lateral protuberance. Lateral lobe of pygofer distinctly curved mesiad, forming a rather prominent angularly rounded protuber-

ance. Ventral margin of pygofer weakly convex, forming a weakly developed bluntly rounded corner just below protuberance. Ventral margins converging to sharp angle at base of pygofer (Fig. 5). Caudodorsal beak in dorsal view (Fig. 10) slender, triangular, and narrowly rounded, almost pointed at apex. Clasper (Fig. 11) with distinct clasper heel, strongly outwards bending dorsal crest, and a small clasper hollow in its short and bluntly rounded downwards curved apical part. Dorsal margin of clasper straight, making an obtuse angle with straight distal margin. Clasper forming a small and rounded lateral swelling between dorsal crest and clasper hollow. Clasper sometimes more slender and less sharply bent towards apex. Both claspers together form a cup-shaped hollow around aedeagus (Fig. 6). Aedeagus in lateral view slender and strongly S-curved, with bluntly rounded lateral lobes, concave along margin of pore (Fig. 12). Aedeagus from behind (Fig. 13) weakly convex between lateral lobes. Aedeagal pore narrow, oval.

Measurements: Of most islands only very few specimens were available, but of those islands of which larger series could be measured, measurements indicate rather large differences in mean body length between the various populations. For male body length I found on Ambon: 17.5-22.1 mm (x 20.4 mm  $\pm$  1.2) (n=39); on Buru: 20.0-24.4 mm (x 21.7 mm  $\pm$  1.2) (n=10); on Kai: 18.7-21.6 mm (x 19.6 mm  $\pm$  0.8) (n=6); and on Seram: 19.2-24.6 mm (x 21.5 mm  $\pm$  1.7) (n=19). Similar differences were found in tegmen lengths. In females these differences appear to be much smaller, female body length on Ambon: 17.0-22.3 mm (x 19.6 mm  $\pm$  1.3) (n=28); on Buru: 17.5-20.5 mm (x 19.4 mm  $\pm$  1.3) (n=3); on Kai: 19.0-20.6 mm (x 19.7 mm  $\pm$  0.4) (n=8); and on Seram: 17.0-22.9 mm (x 20.5 mm  $\pm$  1.9) (n=24). The following measurements are exclusively based on Buru material, Buru being the type locality. Tegmen length  $\sigma$ : 22.1-24.3 mm (x 23.3 mm  $\pm$  0.8),  $\text{f}$ : 23.5-25.5 mm (x 24.7 mm); head length  $\sigma$ : 1.6-1.9 mm (x 1.7 mm),  $\text{f}$ : 1.7 mm; pronotum length  $\sigma$ : 2.2-2.9 mm (x 2.5 mm),  $\text{f}$ : 2.5-2.8 mm (x 2.7 mm); mesonotum length  $\sigma$ : 4.0-5.0 mm (x 4.4 mm),  $\text{f}$ : 3.7-4.7 mm (x 4.4 mm); head width  $\sigma$ : 4.1-4.6 mm (x 4.4

mm),  $\text{f}$ : 4.3-4.6 mm (x 4.5 mm); width of pronotal collar  $\sigma$ : 5.7-6.9 mm (x 6.1 mm),  $\text{f}$ : 6.0-6.6 mm (x 6.3 mm).

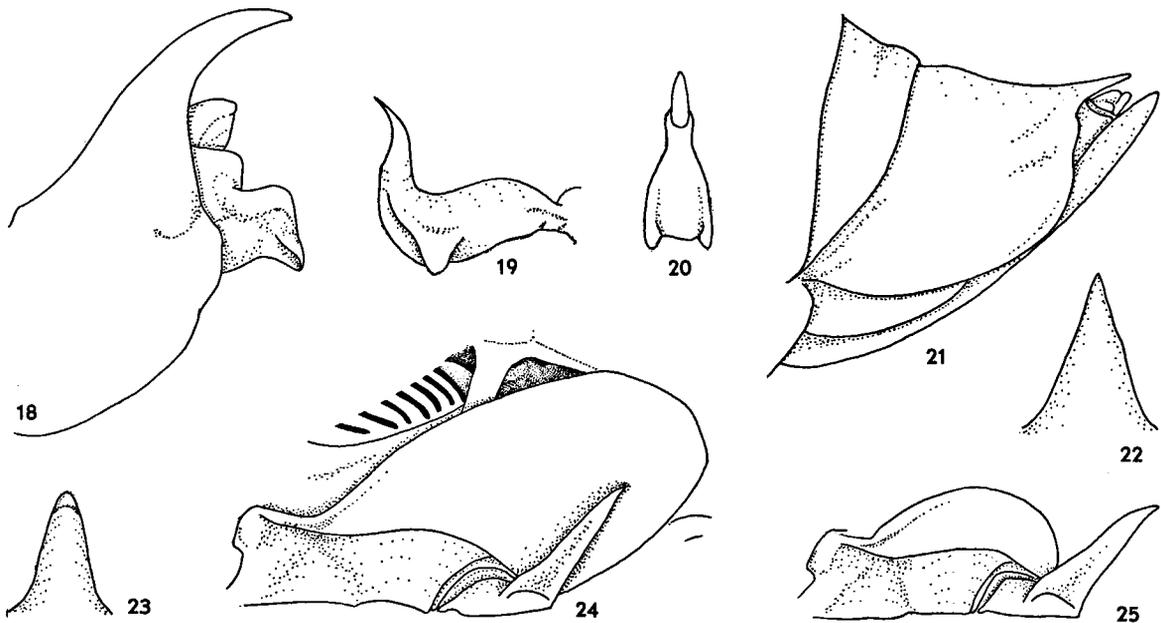
Distribution (Fig. 2a): *B. exhausta* is widely distributed over Maluku and the western islands of Irian Jaya, with records from Ambon, Aru, Bacan, Buru, Damar, Haruku, Kai, Noessa Laoet, Larat, Misool, Seram, Sula Besi, Tanimbar, Ternate, Teun, Tomea, and Wetar and is also recorded from Timor and from one locality on the Mimika coast of southern New Guinea.

**Baeturia bicolorata** Distant, 1892  
(Figs. 1, 18-32)

*Baeturia bicolorata* Distant, 1892a: 316; Distant, 1892b: xiv, 150, Pl XIV Figs. 26, 26 a-b; Distant, 1906: 157; Kato, 1932: 184; Blöte, 1958: 266; Blöte, 1960: 61, 72, 73, 78; Metcalf, 1963: 247; Duffels & Van der Laan, 1985: 251; De Boer, 1989: 2, 10.

Geographical data suggest that the records of *B. bicolorata* from Buru by Schmidt (1926: 222, 257) and Myers (1928: 63) probably concern *B. exhausta*.

Material examined: Ost Indien, 1 $\sigma$ , NhMW; IRIAN JAYA: NEW GUINEA (W): Z. Nieuw Guinea, 27.xi.1912, Versteeg 1292-13, 1 $\sigma$ , ZMA; Angi lake, 1916-244, 1 $\sigma$ , BMNH; Ayem, 60 km NE of Agats, 18-27.xii.1976, J. C. Wright, 1 $\sigma$ , BPBM; Kouh, Kab. Merauke, 6.vi.1993, P.J.A. de Vries, 2 $\text{f}$ , ZMA; same data but 18.vi.1993, 1 $\sigma$ , ZMA; Noord rivier, ix.1909, Lorentz, 1 $\sigma$ , SMD; same data but x.1909, 1 $\sigma$ ; i.1910, 1 $\sigma$ , both SMD; Tiel, Star range, 80 m, 6.ix.1959, Neth. New Guinea Exped., 1 $\sigma$ , RMNH; ARU ISLANDS: Aroe eilanden, Manuembai en omgeving [and surroundings], 11-14.x.1929, Snellius exped., 1 $\sigma$ , RMNH; PAPUA: NEW GUINEA (NE): Maprik, 160 m, 29.xii.1959-17.i.1960, T.C. Maa, 1 $\sigma$ , ZMA; May River patrol sta., Upper Sepik Distr, 100 m, 29.v.1963, R. Straatman, 1 $\sigma$ , 1 $\text{f}$ , BPBM; Kaiserin Augusta Riv. [Sepik River], Hoofd bivak, K.G. [K. Gjellerup], xi.1910, 3 $\sigma$  *B. vanderhammeni* det. H.C. Blöte, 1 $\text{f}$ , RMNH; NEW GUINEA (SE): Daru, mouth of Fly River, vii.1941, R.G. Wind. van Dyke, 2 $\sigma$ , CAS; Fly River,  $\text{f}$  holotype *Baeturia bicolorata* Distant, BMNH; Kiunga, Fly River, 24-25.ix.1957, W.W. Brandt, 1 $\sigma$ , BPBM; same data, several dates between 15.vii-14.x.1957, 1 $\sigma$ , 15 $\text{f}$ , BPBM; same data 15-21.vii.1957, 1 $\text{f}$ ; 24-25.ix.1957, 1 $\text{f}$ , both ZMA; Kiunga, Fly River, viii.1969, 35 m, J. Sedlacek, 2 $\text{f}$ , BPBM; Ruka, 9 m, 12.viii.1964, H. Clissold, 1 $\sigma$ , 1 $\text{f}$ , BPBM; Tabubil, Western



Figs. 18-25. *Baeturia bicolorata*; 18, pygofer in lateral view, Kiunga; 19, aedeagus in lateral view, Kiunga; 20, aedeagus from behind, Kiunga; 21, female genital segment, holotype; 22, female caudodorsal beak in dorsal view, holotype; 23, male caudodorsal beak in dorsal view, Kiunga; 24, male operculum, Kiunga; 25, female operculum, Kiunga.

Province, 5°15' S 141°13' E, 3.vii.1992, R.B. Lachlan, 1♂, Moul; same data but 23.xi.1991, 1♀; 12.x.1992, 1♀; 15.x.1992, 1♂, 26.x.1992, 1♂, all Moul.

Identification of *B. bicolorata*: *B. bicolorata* was described from one female from southern New Guinea. This specimen bears the following labels: "Type" [print, round label red margin]; "Syntype" [print, round label blue margin]; "Fly river N. Guinea" [written]; "bicolorata Dist" [written]; "Distant type [written] Det. Dr H.C. Blöte" [print]; "Distant coll. 1911-383" [print] and is in the collection of the BMNH. In general, females of *Baeturia* can not be identified to species level, due to a great similarity in external morphological characters. The main character on which the description of *bicolorata* is based, is its colour pattern: "thorax pale green - abdomen warm ochraceous." This colour pattern is described for females of several other *Baeturia* species (cf. de Boer, 1989; 1992a). Four of these species (*B. bloetei* de Boer, 1989, *B. brongersmai*, Blöte, 1960, *B. lorentzi* de Boer, 1992, and *B. viridis* Blöte, 1960) occur in southern New Guinea. Blöte (1960) actually identified and depicted a male of *B. bloetei* as the male of *B.*

*bicolorata*. However, *B. bloetei* only reaches the most western parts of southern New Guinea, and the three other species mentioned are also restricted to the Irian Jaya half of the island, while the holotype of *B. bicolorata* presumably comes from the formerly British territory. A larger series of males and bicoloured females from Kiunga, Fly river, that obviously belong to one and the same species, are presumed to represent *B. bicolorata* Distant.

The differences between *B. bicolorata* and *B. exhausta* are very vague, and it could be argued, whether they represent two distinct species or not. Though the females of *B. bicolorata* are unspotted and bicoloured, they share these characters with most Timor specimens of *B. exhausta*. Males of *B. bicolorata* are generally larger than *B. exhausta*, and, contrary to *exhausta*, the operculum is hardly visible in dorsal view. What is here considered the typical *bicolorata* male can be separated from *B. exhausta* by a broader and somewhat upcurved clasper, and a stouter aedeagus with broader, almost triangular, pore. However, these characters tend to be rather vari-

able within the *B. bicolorata* material and the species can sometimes hardly be distinguished from *B. exhausta*. Nevertheless, *B. bicolorata* is here regarded as a separate species

## DESCRIPTION

Body of males brown to greenish and weakly brown speckled. Some males with broad unspeckled middorsal band over whole length of body, in others speckling tends to concentrate in middorsal band. Females much shorter than males and unspeckled, with greenish head and thorax and ochraceous abdomen, though the green colour tends to have faded in most specimens. Male abdomen 1.4-1.8 x as long as head and thorax, in females 1.1-1.2 x. Tegmina of males 1.0-1.1 x as long as body length, of females 1.2-1.3 x.

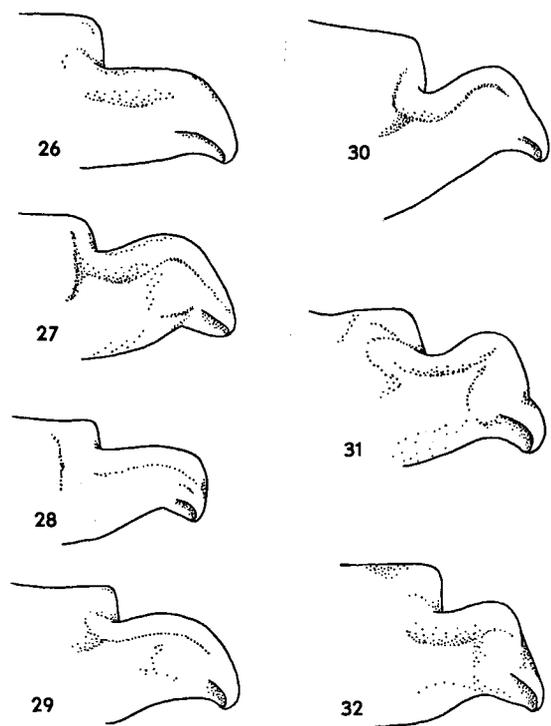
**Head:** Male head light brown and, though generally very slightly, brown speckled. Female head greenish, often with large ochraceous patches, or almost uniformly ochraceous, unspeckled. Postclypeus 1.8-2.9 x as broad as long, almost oblong, bluntly rounded anteriorly. Postclypeus not swollen ventrally, anterior margin (lateral view) straight or weakly convex.

**Thorax:** Pronotum of males light brown, slightly brown speckled. This speckling sometimes more concentrated, sometimes absent in medial band. Female pronotum greenish. Mesonotum of males greyish brown to castaneous, generally brown speckled, but without black spots in front of cruciform elevation. Female mesonotum greenish to ochraceous and unspeckled, but often with brown lateral bands converging from pronotal margin to corners of cruciform elevation and a pair of paramedial semicircular brown spots at pronotal margin.

**Legs:** Proximal spine of fore femur about as long as distance to middle spine.

**Tegmina and wings:** Hyaline, venation ochraceous or reddish, without setae. Tegmen with 8 apical areas.

**Tymbal organs:** Six weakly sclerotized transverse parallel ridges spanning the tymbal from dorsal to ventral margin, a 7th ridge almost



Figs. 26-32. *Bacturia bicolorata* clasper; 26, South New Guinea; 27, Maprik; 28, Kiunga; 29, Boven Digul; 30, Fly river; 31, Fly river; 32, Fly river.

reaching ventral margin and an 8th, most proximal ridge reaching to about half the tymbal width. Seven short intercalary ridges seem to form a lateral band across tymbal.

**Opercula:** Male operculum, contrary to *B. exhausta*, hardly or not visible in dorsal view, but quite large and almost completely covering tymbal cavity in ventral view. Distal part of male operculum curved flat against the body, in some specimens angularly oblong (Fig. 24), in others squarely rounded (cf. Fig. 15). Lateral margin short, bending into long and straight distal margin. Distomedial margin long and angularly convex, making an obtuse angle with weakly convex medial margin. Distomedial edge of operculum reaching beyond margin of abdominal segment 2. Meracanthus reaching to about half-length of operculum. Female operculum (Fig. 25) rather large compared to other species of this group and resembling that of several other species with

bicoloured females, its distal part nearly semi-circular and curved towards abdomen. Distal part slightly shorter than basal part, rounded and curved towards body. Margin of distal part rising abruptly, almost rectangularly, from the crest around distolateral corner of basal part, and broadly convex.

**Abdomen:** Male abdomen strongly inflated, ochraceous to brown and brown speckled, mainly on dorsal parts. Most specimens with row of blackened ventrolateral spots on segments 3-7 or 8. Segmental hind margins light red. Female abdomen fairly short, ochraceous and unspckled. Row of slightly darkened ventrolateral spots hardly visible. Segmental hind margins lighter coloured, ochraceous. Ovipositor sheaths reaching just beyond apex of caudodorsal beak (Fig. 21). Female caudodorsal beak (Fig. 22) straight and directed posteriad, pointed at apex.

**Male genitalia:** Pygofer in lateral view as in Fig. 18. Dorsal margin concave, convexly bent into slender, posteriorly curved, caudodorsal beak. Distal margin weakly convex, concave to apex of beak and forming an obtuse angle with lateral protuberance. Lateral lobe of pygofer distinctly curved mesiad, forming a rather prominent angularly rounded protuberance. Ventral margin of pygofer weakly convex, forming a very small and bluntly rounded corner just below protuberance. Caudodorsal beak in dorsal view (Fig. 23) slender triangular, and rounded or sometimes truncate at apex. Clasper resembling that of *B. exhausta*, with distinct clasper heel, outwards bending dorsal crest and small clasper hollow in short and bluntly rounded downwards curved apical part. Clasper in lateral view very variable in shape (Figs. 26-32) generally broader than in *B. exhausta*, with its dorsal margin upcurved relative to dorsal margin of clasper base. Aedeagus in lateral view stout and strongly S-curved, with bluntly rounded lateral lobes, and strongly concave along margin of pore (Fig. 19). Aedeagus from behind (Fig. 20) weakly convex between lateral lobes. Aedeagal pore in most specimens broad, apically pointed, and almost triangle-shaped, in others narrower and more resembling that of *B. exhausta*.

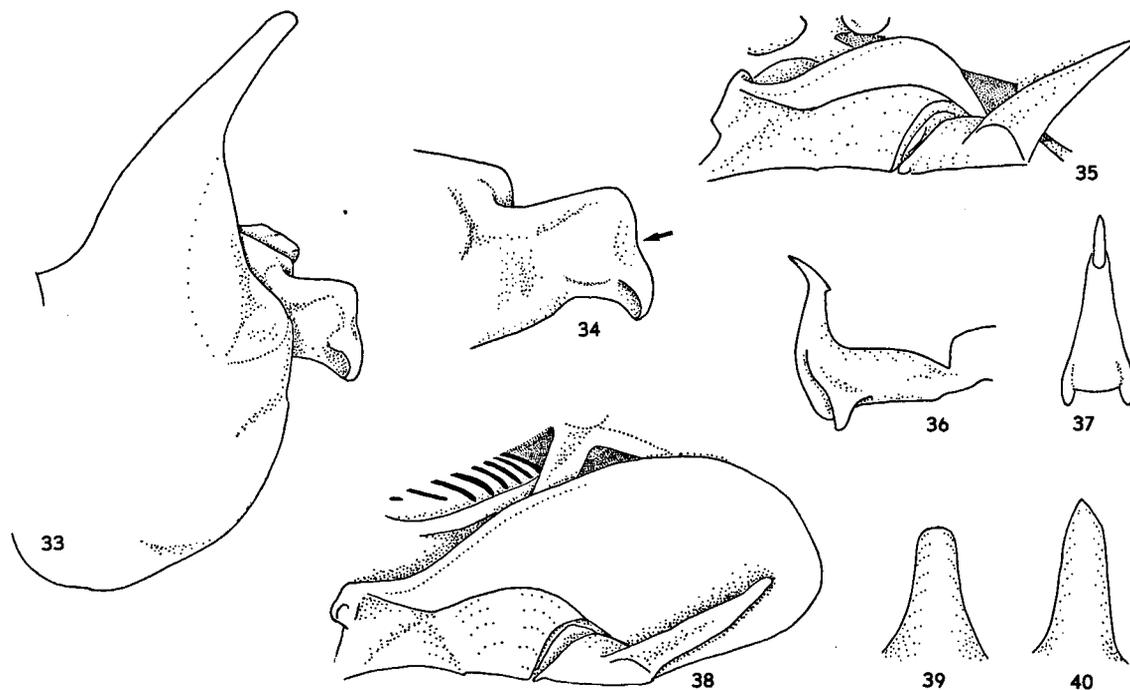
**Measurements:** Body length ♂: 21.9-25.5 mm (x 24.2 mm ± 1.0), ♀: 17.7-22.0 mm (x 19.1 mm ± 0.9); tegmen length ♂: 22.7-26.3 mm (x 24.8 mm ± 1.1), ♀: 22.3-25.3 mm (x 23.9 mm ± 0.7); head length ♂: 1.5-1.9 mm (x 1.7 mm), ♀: 1.5-2.0 mm (x 1.9 mm); pronotum length ♂: 2.5-2.8 mm (x 2.7 mm), ♀: 2.7-3.0 mm (x 2.8 mm); mesonotum length ♂: 4.1-5.1 mm (x 4.7 mm), ♀: 4.3-5.1 mm (x 4.7 mm); head width ♂: 4.2-5.1 mm (x 4.8 mm), ♀: 4.5-4.9 mm (x 4.7 mm); width of pronotal collar ♂: 5.6-7.0 mm (x 6.4 mm), ♀: 6.1-6.9 mm (x 6.6 mm).

**Distribution (Fig. 2a):** *B. bicolorata* is fairly widely distributed in New Guinea, and recorded from north and south of the central mountain ranges.

***Baeturia colossea* n. sp.**  
(Figs. 1, 33-40)

**Holotype:** "New Guinea / Wau m / ix.1965" (print, date partly written); "J. & M. Sedlacek / Collectors / BISHOP" (print), ♂, BPBM; **Paratypes:** PAPUA NEW GUINEA: NEW GUINEA (NE): same data as holotype but 1200 m, 15.iv-15.v.1964, 1♂, BPBM; Aionora plantation near Kainantu, 2.vi.1992, P. Horne & J. Osmeiak, 1♂, IPS; Gang Creek Camp, Mt Rawlinson, 4500 ft, 3.vii.1964, 7th Archbold expd. to New Guinea Huon Peninsula, H.M. van Deusen, 1♂, AMNH; Garaina, 800 m, 15.i.1968, J. & M. Sedlacek, 1♀, BPBM; Kainantu, East Highlands, 1500 m, 20.i.1966, J. & M. Sedlacek, 1♂, BPBM; Kaindi, Wau, Morobe Distr., 1340 m, 18.ix.1977, J.L. & M. Gressitt, 1♂, 1♀, ZMA; Karimui, 1080 m, 13.vii.1963, J. Sedlacek, 1♂, BPBM; Missim Mt., Morobe Distr., 1550 m, 25.viii.1978, T. K. Pratt, 1♀, BPBM; Wau, J. & M. Sedlacek, 1♀, BPBM; Wau, 1100-1300 m, 2.i.1966, L. & M. Gressitt, 1♀, BPBM; Wau, 1200 m, 5-13.iii.1964, J. Sedlacek, 1♂, BPBM; Wau, Big Wau Creek, 1200 m, J. Sedlacek, 1♀, BPBM; Wau, Morobe Dist., 1200 m, 7-16.xii.1961, J. Sedlacek, 1♀, BPBM; same data but 1.ix.1977, G. Nazu, 1♂, BPBM.

*B. colossea* is the largest species of the *exhausta* group, distinctly larger than *B. bicolorata*, but closely resembling that species in male genitalia. The clasper, however, is broader and more angular and the male caudodorsal beak is straight and erect. The species can be recognized by the large ocelli, set closely together; the frontal ocellus is about as wide as the distance between lateral ocelli. A similarly deviating head shape was



Figs. 33-40. *Baeturia colossea*; 33, pygofer in lateral view, Mt Rawlinson; 34, clasper, holotype arrow indicating the end of the dorsal crest; 35, female operculum, Wau; 36, aedeagus in lateral view, Karimui; 37, aedeagus from behind, Karimui; 38, male operculum, holotype; 39, male caudodorsal beak in dorsal view, holotype; 40, female caudodorsal beak in dorsal view, Wau.

described for *B. turgida* of the *viridis* group (De Boer, 1992a). Males are characterized by a narrow and light middorsal band on the abdomen, in one of the specimens this band extends over the mesonotum as well, but it never reaches head or pronotum, as described for some species of *B. exhausta* and *B. bicolorata*. Females are brown and densely brown speckled.

#### DESCRIPTION

Body of males varying from olive green to red-brown, brown speckled. Females grey-brown and densely speckled, shorter than males, but with more robust head and thorax and relatively longer tegmina. Male abdomen 1.4-1.7 x as long as head and thorax, in females 1.0-1.1 x. Tegmina of males 1.1-1.2 x as long as body length, of females 1.3-1.6 x.

Head: Reddish brown or greenish tinged, brown speckled. Vertex with large ocelli; frontal

ocellus about as broad as distance between lateral ocelli. Postclypeus 1.7-2.4 x as broad as long, longer than in foregoing species, squarish in dorsal view, with its lateral corners distinctly protruding beyond vertex lobes. Anterior margin of postclypeus making an almost right angle with anterior margins of vertex lobes. Postclypeus not swollen ventrally, anterior margin (lateral view) straight or weakly convex.

Thorax: Pronotum ochraceous or greenish, sometimes tinged with red in medial band and on pronotal collar. Brown speckling generally most dense in medial band. Mesonotum greyish brown, brown speckled, sometimes reddish in front of cruciform elevation. No black spots in front of elevation. One male with a broad and unspeckled medial band over mesonotum.

Legs: Proximal spine of fore femur about as long as distance to middle spine.

Tegmina and wings: Hyaline. Veins in apical parts of tegmina and wings with few short setae. Tegmen with 8 apical areas.

Tymbal organs: Six weakly sclerotized transverse parallel ridges spanning the tymbal from dorsal to ventral margin, a 7th ridge almost reaching ventral margin and an 8th, most proximal ridge reaching to about half the tymbal width. Seven short intercalary ridges seem to form a lateral band across tymbal.

Opercula: Male operculum (Fig. 38) hardly or not visible in dorsal view, but rather large and almost completely covering tymbal cavity in ventral view. Distal part of male operculum oval, curved flat against the body. Lateral margin short, angularly bending into weakly convex distal margin. Medial margin short and straight. Distomedial corner broadly rounded, medial corner narrowly rounded. Meracanthus reaching to about 3/4 of operculum length. Female operculum (Fig. 35) with distal part shorter than basal part, sickle-shaped and erect.

Abdomen: Male abdomen strongly inflated, ochraceous brown (olive green in Mt. Rawlinson specimen). Brown speckling most dense on dorsal parts of abdomen. Ventral side, a large oval area on lateral sides and a narrow middorsal band unspeckled. Distinct row of darkened ventrolateral spots on segments 3-6. Segmental hind margins light red, but yellow-green in Mt. Rawlinson specimen. Female abdomen brown and densely speckled. Row of slightly darkened ventrolateral spots hardly visible. Segmental hind margins slightly reddened. Ovipositor sheaths reaching just beyond apex of caudodorsal beak. Female caudodorsal beak (Fig. 40) straight, directed posteriad and pointed at apex.

Male genitalia: Pygofer in lateral view as in Fig. 33. Dorsal margin concave at base, but straight and continuous with straight and erect caudodorsal beak. Distal margin weakly convex, forming an obtuse, but rounded, angle with straight margin of beak and forming an obtuse angle with lateral protuberance. Lateral lobe of pygofer distinctly curved mesiad, forming a large and rounded protuberance. Ventral margin of pygofer convex, forming a small and rounded corner below this protuberance. Caudodorsal beak in dorsal view (Fig. 39) oblong and truncate at apex. Clasper broad and angular in lateral view (Fig. 34), with distinct clasper heel, slightly

outwards bending dorsal crest and a short and small clasper hollow in its bluntly rounded, downwards curved apical part. Dorsal margin of clasper straight, slightly directed upwards, relative to dorsal margin of clasper base. Distodorsal corner of clasper almost rectangular. Distal margin concave at half-length. Aedeagus in lateral view (Fig. 36) stout and strongly S-curved, with slender and bluntly rounded lateral lobes. Aedeagus concave along margin of pore, but more gradually curved than in *B. bicolorata* (Fig. 19). Aedeagus from behind (Fig. 37) weakly convex between lateral lobes. Aedeagal pore narrow, elongate and apically pointed.

Measurements: Body length ♂: 24.1-27.9 mm (x 26.6 mm ± 1.2), ♀: 22.3-24.5 mm (x 23.3 mm ± 1.0); tegmen length ♂: 28.0-32.7 mm (x 30.4 mm ± 1.7), ♀: 31.0-33.4 mm (x 32.2 mm ± 1.0); head length ♂: 1.7-2.0 mm (x 1.9 mm), ♀: 1.9-2.1 mm (x 2.0 mm); pronotum length ♂: 2.7-3.1 mm (x 2.9 mm), ♀: 3.1-3.5 mm (x 3.3 mm); mesonotum length ♂: 5.2-5.9 mm (x 5.5 mm), ♀: 5.6-6.4 mm (x 6.0 mm); head width ♂: 4.9-5.3 mm (x 5.1 mm), ♀: 5.5-5.6 mm; width of pronotal collar ♂: 6.8-7.8 mm (x 7.2 mm), ♀: 7.7-8.1 mm (x 7.9 mm).

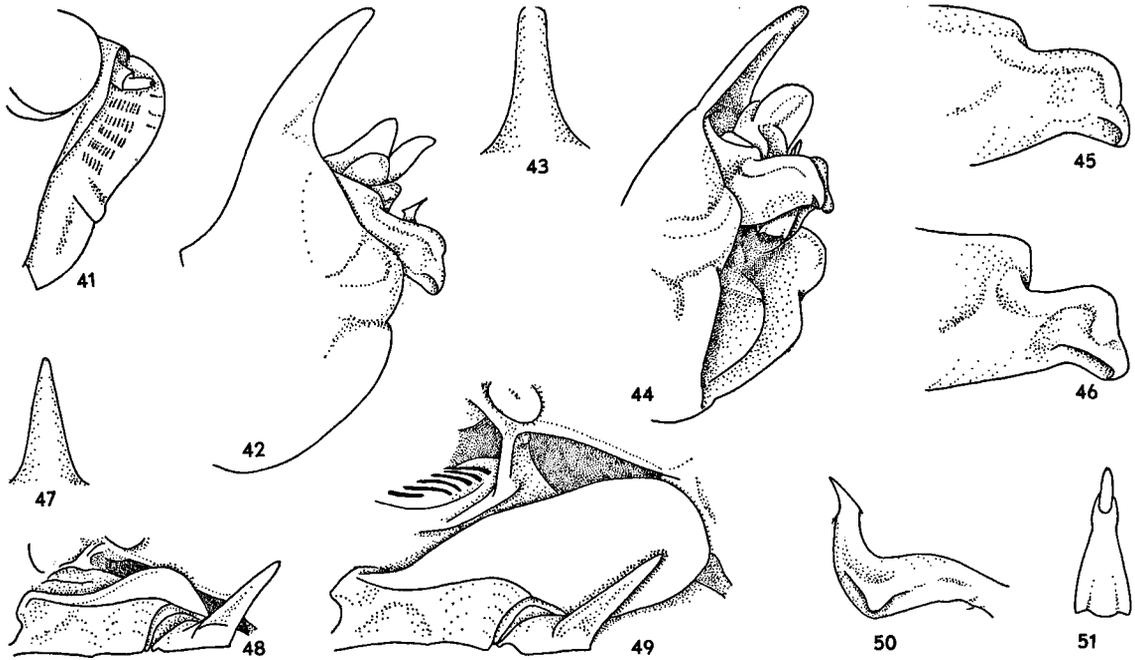
Distribution (Fig. 2a): *B. colossea* is endemic to northeastern Papua New Guinea, and recorded from the Huon peninsula and Wau area.

Etymology: Colosseus (Lat.) means colossal, the name refers to the exceptionally large size of the species.

**Baeturia vanderhammeni** Blöte, 1960  
(Figs. 2, 41-51)

*Baeturia vanderhammeni* Blöte, 1960: 71, Fig. 19; Duffels & Van der Laan, 1985: 255.

Material examined: IRIAN JAYA: NEW GUINEA (W): Neth New Guinea, 225 m, 20.x.1944, T. Aarons, 1♂, CAS; same data but 10.xi.1944, 1♂, 1♀; 4.xii.1944, 1♀, all CAS; Cyclops Mts., W. Sentani, Depapre, Cyclop Mts., 500 m, 11.x.1993, A.J. de Boer, A.L.M. Rutten, & R. de Vos, 1♂, ZMA; Hollandia area, 150-250 m, 17.vi.1959, J.L. Gressitt, 1♂, BPBM; Hollandia, v.1945, S.G. Jewett Jr., 2♂, 2♀, NCSU; Hollandia, 250 ft, v.1945, H. Hoogstraal, 1♂, NCSU; Hollandia, i.1954, L. v.d. Hammen, ♂ holotype, RMNH; Hollandia, behind Dock V, 20 m, 14.vii.1957, D. Elmo Hardy, 1♀, BPBM; Hollandia Binnen, 100 m,



Figs. 41-51. *Baeturia vanderhammeni*; 41, head in lateral view, Hollandia; 42, pygofer in lateral view, holotype; 43, male caudodorsal beak in dorsal view, holotype; 44, pygofer aslant, holotype; 45, clasper, holotype; 46, clasper, Balimo; 47, female caudodorsal beak in dorsal view, Hollandia behind dock; 48, female operculum, Hollandia behind dock; 49, male operculum, Hollandia; 50, aedeagus in lateral view, Hollandia; 51, aedeagus from behind, Hollandia.

22.xi.1958, J.L. Gressitt, 1♂, BPBM; Humboldt Bay, W. Doherty, 1903-31, 1♀, BMNH; Ifar, Cyclops Mts., 450-500 m, 9.ix.1962, J. Sedlacek, 1♂, ZMA; Jutefa Bay Pim., Sea level-100 ft, ii.1936, L.E. Cheesman, 1♂, BMNH; PAPUA: NEW GUINEA (NE): Atua vill., Torricelli Mts., 16.iii-3.iv.1939, G.P. Moote, 1♀, BMNH; Mobitei, Torricelli Mts., 750 m, 1-15.iv.1959, W.W. Brandt, 1♂, BPBM; Ramu expedit., 29.vi.1899, 1♂, 1♀, ZMB; same data but vii.1910, 1♂, ZMB; Stephansort, Astrolabe Bay, Biró, 1♂, TMB; Tamin Mundung, L. Schulze, iv.1910, 1♂, ZMB; NEW GUINEA (SE): Balimo, 9 m, 7.iii.1964, H. Clissold, 1♂, 2♀, BPBM; Bisianumu, E. of Port Moresby, 500 m, 8.vi.1955, J.L. Gressitt, 1♂, BPBM.

Remark: Apart from the holotype, Blöte (1960) mentions four other male specimens as belonging to this species, though he did not include them in a type series. Three of these specimens, from Kaiserin Augusta river, belong to *B. bicolorata*, the fourth, from Mimika river, presumably belongs to *B. exhausta*.

*B. vanderhammeni* is smaller than the foregoing species and can be recognized by its long, slen-

der, and erect caudodorsal beak, and narrow, angular and oblong male operculum.

#### DESCRIPTION

Body of males ochraceous brown to castaneous brown, females darker, greyish brown. Males and females densely brown speckled. Abdomen of males 1.4-1.6 x as long as head and thorax, of females 1.1-1.2 x. Tegmina of males 1.0-1.2 x as long as body length, of females 1.2-1.3 x.

Head: Ochraceous brown and brown speckled. Postclypeus 1.9-2.6 x as broad as long, almost oblong, anterior margin weakly convex in males, more strongly bent in females. Postclypeus weakly swollen ventrally, anterior margin (lateral view) weakly convex (Fig. 41).

Thorax: Pronotum ochraceous, with weak brown speckling concentrated in medial band. Mesonotum greyish brown and weakly speckled, generally without distinct dark spots in front of cruciform elevation.

Legs: Proximal spine of fore femur shorter than distance to middle spine.

Tegmina and wings: Hyaline, venation ochraceous or reddish. Veins in apical part of tegmen, and sometimes wing, quite densely set with short setae. Tegmen with 8 apical areas.

Tymbal organs: Seven weakly sclerotized transverse parallel ridges spanning the tymbal from dorsal to ventral margin. The 7th ridge only just reaching ventral margin. An 8th, partly developed ridge close to proximal tymbal margin reaches to about half the tymbal width. Seven short intercalary ridges seem to form a midlateral band across tymbal.

Opercula: Male operculum (Fig. 49) much shorter than in the foregoing species and only partly covering tymbal cavity in ventral view, not visible in dorsal view. Distal part of male operculum angularly oblong, curved flat against the body. Lateral margin very short, convexly bending into long straight, or sometimes slightly concave distal margin. Medial margin almost straight, medial corners almost rectangular. Meracanthus reaching beyond half-length of operculum. Female operculum (Fig. 48) very short, sickle shaped and erect.

Abdomen: Male abdomen light brown or ochraceous, densely speckled dorsally, unspeckled laterally and ventrally. Ventrolateral row of irregularly darkened spots on segments 3-6. Segmental hind margins darkened or reddish. Female abdomen reddish brown and densely speckled. Ventrolateral row of spots less distinct. Segmental hind margins often ochraceous. Ovipositor sheaths just reaching apex of caudodorsal beak. Female caudodorsal beak in dorsal view (Fig. 47) very long and slender, triangle-shaped and sharply pointed at apex.

Male genitalia: Pygofer in lateral view as in Fig. 42. Dorsal margin concave, convexly bent into weakly curved caudodorsal beak. Distal margin weakly convex, forming an almost right angle with straight margin of beak. Lateral lobe of pygofer distinctly curved mesiad, forming a rather prominent, rounded, and dorsally indented protuberance. Ventral margin of pygofer weakly convex, forming a bluntly rounded corner just below protuberance. Ventral margins

converging to sharp angle at base of pygofer (Fig. 44). Caudodorsal beak long and slender, oblong in dorsal view (Fig. 43), with parallel lateral margins, bluntly rounded or truncate at apex. The specimen from Stephansort with triangular beak. Clasper in lateral view (Fig. 45) almost straight to apex. Apical part of clasper weakly curved down. Proximal part of dorsal crest bending outwards, distal part standing almost vertically on clasper. Crest abruptly ending half-way distal margin of clasper. Clasper forming distinct, though often incurved clasper heel at proximal end of dorsal crest. The specimen from Balimo with extremely high and rectangular clasper heel (Fig. 46). Aedeagus in lateral view slender and strongly S-curved, with bluntly rounded lateral lobes, weakly concave along margin of pore (Fig. 50). Aedeagus from behind (Fig. 51) convex between lateral lobes. Aedeagal pore broad, oval.

Measurements: Body length ♂: 17.9-21.3 mm (x 19.1 mm ± 1.1), ♀: 16.4-17.5 mm (x 16.8 mm ± 0.5); tegmen length ♂: 19.3-23.0 mm (x 20.2 mm ± 1.0), ♀: 19.5-21.8 mm (x 20.7 mm ± 0.7); head length ♂: 1.5-1.9 mm (x 1.7 mm), ♀: 1.7-1.9 mm (x 1.8 mm); pronotum length ♂: 2.1-2.6 mm (x 2.3 mm), ♀: 2.3-2.8 mm (x 2.5 mm); mesonotum length ♂: 3.8-4.8 mm (x 4.2 mm), ♀: 3.9-4.4 mm (x 4.2 mm); head width ♂: 4.1-4.7 mm (x 4.4 mm), ♀: 4.2-4.7 mm (x 4.6 mm); width of pronotal collar ♂: 5.2-6.3 mm (x 5.6 mm), ♀: 5.2-6.3 mm (x 5.9 mm).

Distribution (Fig. 2b): *B. vanderhammeni* is distributed in northern New Guinea between the Cyclops Mountains and Astrolabe Bay, but one male and two females from Balimo, north of the mouth of Fly River (southern New Guinea) and one male from Bisianumu, on the Papuan peninsula, presumably also belong to this species.

**Baeturia wauensis** n. sp.  
(Figs. 2, 52-60)

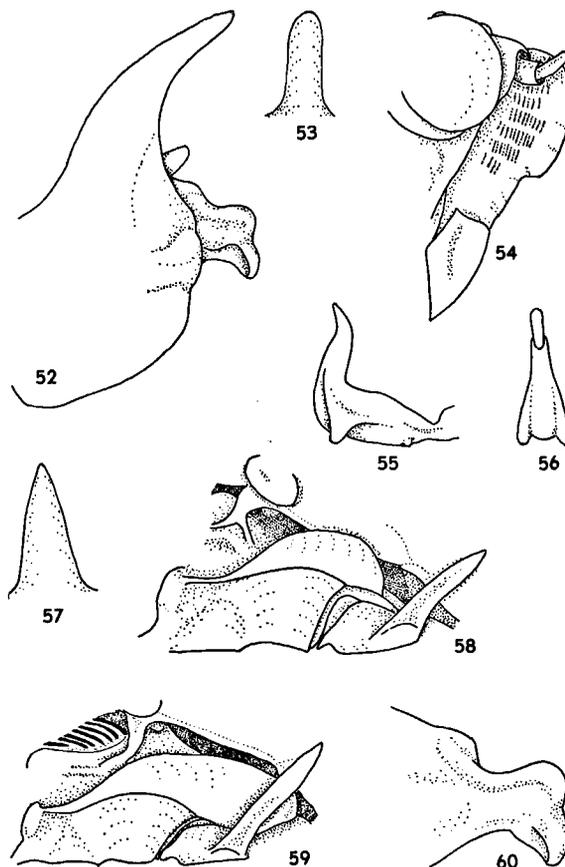
Holotype: "New Guinea: Morobe / District, Wau, Big / Wau Creek 1200 m / 27.vii.1972 / Thomas W. Davies" (print); "Collection of the / CALIFORNIA ACADEMY / OF SCIENCES, San / Francisco, Calif." (print), ♂, CAS. Paratypes: PAPUA: NEW GUINEA(NE): same data as holotype 1♀, CAS; same data but 1.viii.1972, 2♀; 29.viii.1972, 1♂, 1♀; 12.ii.1973, 1♀, 25.iv.1973, 1♀, all

CAS; Big Wau Creek, 1300 m, 3.ii.1966, J. Sedlacek, 1♂, BPBM; Coviak Rdg., Wau, 763 m, 7.xii.1963, H. Clissold, 1♂, 1♀, ZMA; Edie Creek Road, Wau, 1280 m, 19.vi.1984, W.C. Gagné, 1♂, BPBM; Hospital Creek, Wau, 1150-1250 m, 9.i.1966, J. & M. Sedlacek, 1♀, BPBM; Kujeru, Wau, 1500 m, 27.ix.1969, A.B. Mitzi, 1♂, BPBM; Mt. Missim, Wau, 950-1300 m, 8-9.i.1966, J. & M. Sedlacek, 1♀, BPBM; Mt. Missim, Wau, Morobe Dist., 1300 m, 2.ii.1963, J. Sedlacek, 1♂, BPBM; same data but 880-1050 m, 8-9.ii.1963, 2♀, BPBM; Mt. Missim, 1450 m, 12.xii.1979, J.L. Gressitt, 1♂, BPBM; Ulap, Watut, 1200 m, 1-8.viii.1965, H. Pyka, 1♂, SMN; Wanki, Watut valley, Morobe Distr., 5.viii.1972, G.G.E. Scudder, 1♂, BPBM; Wau, 1200 m, 26.iii-2.iv.1964, J. Sedlacek, 1♀, BPBM; same data but 6.xii.1965, 1♂; 11.xii.1965, 2♀; 21-25.xii.1965, 1♂, 1♀; all BPBM; same data but 8.ii.1966, 1♀, ZMA; same data but 22.iii.1969, on coffee, 2♂, BPBM; Wau, 1100-1300 m, 12.x.1964, J. & M. Sedlacek, 1♀, BPBM; Wau, 1150 m, 11.iii.1974, J.J.H. Szent-Ivany, 1♀, BPBM; Wau, Morobe Dist., 12.viii.1972, G.G.E. Scudder, 1♀, BPBM; same data but 13.viii.1972, 1♂, ZMA; same data but 15.viii.1972, 1♀; 9.ix.1972, 1♀, both BPBM; Wau, Morobe Dist., 1200 m, 18.xii.1961, J. Sedlacek, 1♀, BPBM; same data but 10-19.v.1962, 2♂; 1-4.x.1962, 1♀; 5.v.1963, 1♀; 1-3.x.1963, 2♀; 1280 m, 29.viii.1963, 1♀, all BPBM; Wau, Morobe Dist., 1200 m, 25.vii.1961, J. Sedlacek, 1♂, BPBM; same data but 26.x.1961, 1♂, BPBM; same data but 18.xii.1961, J. & J.H. Sedlacek, 1♀, BPBM; Wau, Morobe Dist., 1300 m, 2.viii.1977, J.L. & M. Gressitt, 1♂, ZMA; Wau, 1350 m, 5.ii.1966, J. & M. Sedlacek, 1♂, BPBM; Wau, 1350 m, i.1974, Tawi Bukam, 1♂, BPBM.

This species closely resembles *B. vanderhammeni* in general appearance. The two species share a similarly slender caudodorsal beak, and setae on the veins of tegmina and wings. *B. wauensis* is easily distinguished however, by its 9-10 apical areas of tegmen, a shorter male operculum and a more prominent dorsal crest on the clasper. These characters are also found in *B. versicolor* described next, but the latter species has a very characteristic colour pattern.

#### DESCRIPTION

Body of males dark ochraceous brown, females greyish brown to reddish brown. Males and females densely brown speckled. Abdomen of males 1.1-1.4 x as long as head and thorax, of females 1.0-1.3 x. Tegmina of males fairly long, 1.2-1.4 x as long as body length, of females 1.3-1.5 x.



Figs. 52-60. *Baeturia wauensis*; 52, pygofer in lateral view, holotype; 53, male caudodorsal beak in dorsal view, holotype; 54, head in lateral view, paratype Wau; 55, aedeagus in lateral view, holotype; 56, aedeagus from behind, holotype; 57, female caudodorsal beak in dorsal view, paratype Wau; 58, female operculum, paratype Wau; 59, male operculum, holotype; 60, clasper, holotype.

Head: Ochraceous brown, brown speckled all over. Postclypeus 1.4-2.5 x as broad as long, triangularly protruding; anterior margin broadly rounded. Postclypeus distinctly swollen ventrally and rounded dorsally (Fig. 54), anterior margin (lateral view) angularly bent.

Thorax: Pronotum ochraceous, with brown speckling tending to concentrate in red-brown medial band. Mesonotum greyish brown with dense brown speckling. Some specimens with two distinct dark spots in front of cruciform elevation.

Legs: Proximal spine of fore femur distinctly

shorter than distance to middle spine.

Tegmina and wings: Hyaline, venation ochraceous. Veins in tegmen and, to a lesser extent, wing densely set with short setae. Tegmen with 9, occasionally 10, apical areas.

Tymbal organs: Seven sclerotized transverse parallel ridges spanning the tymbal from dorsal to ventral margin. The 7th ridge only just reaching ventral margin. An 8th, partly developed, ridge close to proximal tymbal margin reaches to about half the tymbal width. Seven short intercalary ridges seem to form a lateral band across tymbal. Dorsal part of tymbal slightly tinged with red.

Opercula: Male operculum (Fig. 59) very short, only partly covering tymbal cavity in ventral view. Distal part of operculum much smaller than in *B. vanderhammeni*, angularly oval and curved flat against the body. Lateral margin short and weakly concave, convexly bent into long and convex distal margin. Medial margin straight, distomedial corner almost rectangular. Meracanthus reaching well beyond operculum and beyond anterior margin of abdominal segment 2. Female operculum (Fig. 58) very short, sickle-shaped and erect.

Abdomen: Male abdomen light brown or ochraceous, densely speckled dorsally, lateral parts of segments 4-6 and ventral side of abdomen unspeckled. Ventrolateral row of darkened spots quite distinct on segments 3-4 but only vaguely visible on other segments. Segmental hind margins darkened or reddish. Female abdomen reddish brown or grey-brown and densely speckled. Segmental hind margins ochraceous or darkened. Ventrolateral row of spots vaguely visible, but often a distinct spot on segment 3. Ovipositor sheaths reaching just beyond apex of caudodorsal beak. Female caudodorsal beak in dorsal view (Fig. 57) very long and slender, triangle shaped and sharply pointed at apex.

Male genitalia: Pygofer in lateral view as in Fig. 52. Dorsal margin concave, convexly bent into posteriorly curved caudodorsal beak. Distal margin weakly convex, forming an almost right angle with straight margin of beak. Lateral lobes of pygofer distinctly curved mesiad, forming a

rather prominent, rounded and dorsally indented protuberance. Ventral margin of pygofer weakly convex, forming a bluntly rounded corner just below protuberance. Caudodorsal beak long and slender, oblong in dorsal view (Fig. 53), as in *B. vanderhammeni*, with parallel lateral margins and a bluntly rounded or truncate apex. Clasper in lateral view (Fig. 60) bent down towards apex. Apical part of clasper weakly curved down. Dorsal crest bending outwards proximally, its distal part very prominent and angular, standing almost vertically on clasper and abruptly ending half-way distal margin of clasper. Clasper forming a distinct, though small, clasper heel at proximal end of dorsal crest. Aedeagus in lateral view slender and strongly S-curved, with bluntly rounded lateral lobes, weakly concave along margin of pore (Fig. 55). Aedeagus from behind (Fig. 56) convex between lateral lobes. Aedeagal pore broad, oval.

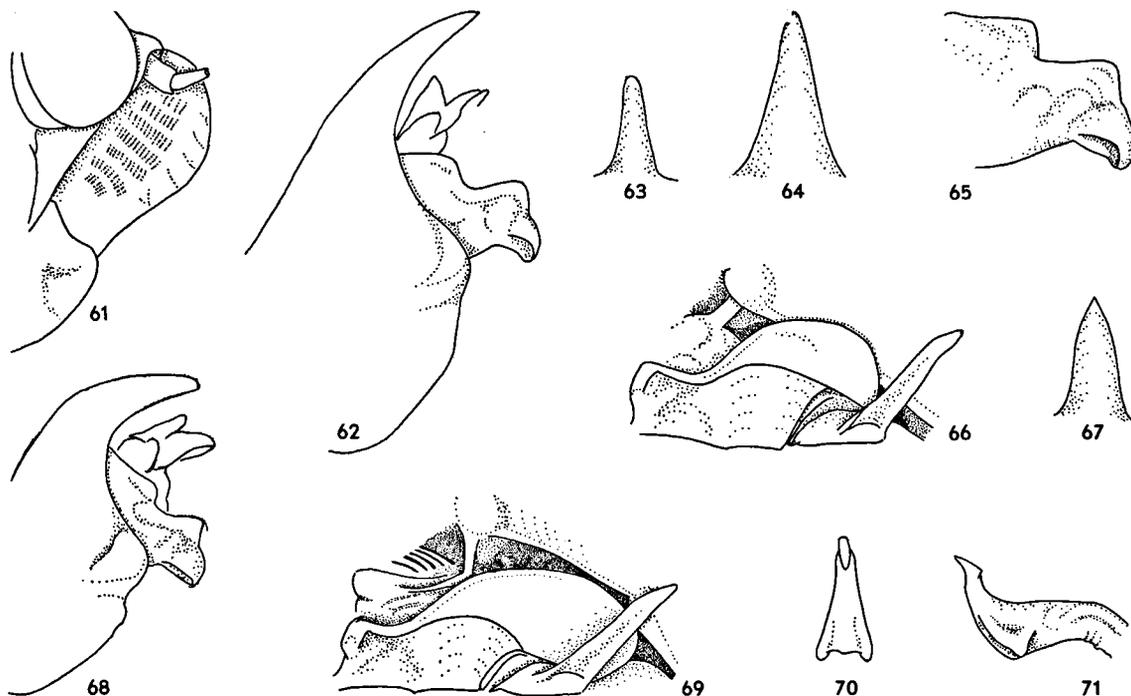
Measurements: Body length ♂: 18.0-20.0 mm (x 18.8 mm ± 0.6), ♀: 16.0-20.9 mm (x 18.9 mm ± 1.2); tegmen length ♂: 21.9-24.4 mm (x 23.1 mm ± 0.9), ♀: 23.4-28.4 mm (x 26.6 mm ± 1.3); head length ♂: 1.5-1.9 mm (x 1.7 mm), ♀: 1.7-2.3 mm (x 1.9 mm); pronotum length ♂: 2.4-2.7 mm (x 2.5 mm), ♀: 2.8-3.3 mm (x 3.0 mm); mesonotum length ♂: 4.2-5.9 mm (x 4.5 mm), ♀: 4.1-5.5 mm (x 5.0 mm); head width ♂: 4.1-4.6 mm (x 4.4 mm), ♀: 4.2-5.4 mm (x 5.0 mm); width of pronotal collar ♂: 5.5-6.4 mm (x 6.0 mm), ♀: 6.1-8.0 mm (x 7.1 mm).

Distribution (Fig. 2b): This species is known from one locality on the Huon peninsula and from the northwestern corner of the Papuan peninsula.

Etymology: This species is named after the town of Wau in Papua New Guinea, where nearly all of the material was collected.

**Baeturia versicolor** n. sp.  
(Figs. 2, 61-71)

Holotype: "PAPUA: Kokoda. / 1,200 ft. ix.1933. / L.E. Cheesman. / B.M. 1934-321." (print); "British Museum / Loan No. 4074" (print, number written); "n.g. n. sp. / cf. Mardalana (written) / M. Boulard det. 19 (print) 75 (written)" ♂, MNF. Paratypes: PAPUA: NEW GUINEA (SE): Baiawa, Moi Biri Bay, 0-30 m, v-ix.1953, Geoffrey M.



Figs. 61-71. *Baetria versicolor*; 61, head in lateral view, paratype Moi Biri; 62, pygofer in lateral view, holotype; 63, male caudodorsal beak in dorsal view, paratype Moi Biri; 64, male caudodorsal beak in dorsal view, holotype; 65, clasper, paratype Moi Biri; 66, female operculum, paratype Popondetta; 67, female caudodorsal beak in dorsal view, paratype Popondetta; 68, pygofer in lateral view, paratype Moi Biri; 69, male operculum, paratype Kokoda; 70, aedeagus from behind, paratype Moi Biri; 71, aedeagus in lateral view, paratype Moi Biri.

Tate, 1♂, AMNH; Jumbora, 60 m, P.S. [P. Shanahan], 1♀, BPBM; Popondetta, 25m, vi.1966, Shanahan-Lippert, 1♀, BPBM; Mt. Lamington, Northern Division, v.1927, C.T. McNamara, 1♀, AMS; same data but i-ii.1929, 1♀, AMS.

This species is described after two males and four females only. *B. versicolor* closely resembles the two foregoing species in size and in shape of male genitalia. *B. versicolor* shares a very short male operculum and 9-10 apical areas of tegmen with *B. wauensis*, its probable sister species. *B. versicolor* is easily recognized by its bright colour pattern, unique for *Baetria*. Thanks to this colour pattern, the females can be easily identified.

#### DESCRIPTION

Body ochraceous, with olive green bands on thorax and very distinct black spots at bases of

tegmina and wings and on fore femora and abdomen, but missing the brown speckling characteristic of related species. The green colour has disappeared in both females from Mt. Lamington. Females about as long as males, but with more robust head and thorax and distinctly longer tegmina. Male abdomen 1.3-1.5 x as long as head and thorax, in females 1.2-1.3 x. Tegmina in males 1.2 x as long as body length, in females 1.2-1.4 x.

Head: Uniformly ochraceous. Postclypeus 1.5-2.1 x as wide as long, broadly rounded anteriorly, and globularly swollen in lateral view (Fig. 61). Anterior margin (lateral view) strongly convex, but concave towards anteclypeus.

Thorax: Pronotum ochraceous; with a broad olive green medial band, widening anteriorly and posteriorly; pronotal collar also olive green. Mesonotum ochraceous to greyish brown.

Cruciform elevation and lateral parts of mesonotum, between elevation and tegmen base, olive green. Metanotum olive green.

Legs: Femora olive green, tibiae and tarsi of fore legs black-brown, of other legs only slightly darkened from half-length the tibiae downwards. Fore femora with dark medial and lateral streaks, these marks are absent in the male paratype. Proximal spine of fore femur distinctly shorter than distance to middle spine.

Tegmina and wings: Hyaline, with greenish venation and a dark spot at base. Veins densely set with setae. Tegmina with 9 (10 in the holotype) apical areas. Tegmina and wings with very narrow hyaline border along hind margins.

Tymbal organs: Seven weakly sclerotized transverse parallel ridges spanning the tymbal from dorsal to ventral margin. An 8th, partly developed, ridge close to the proximal tymbal margin reaches to about half the tymbal width. Seven short intercalary ridges seem to form a lateral band across tymbal.

Opercula: Male operculum (Fig. 69) as in foregoing species very small and erect, not covering tymbal cavity in ventral view. Distal part of male operculum oval and strongly curved towards body at distolateral edge, so that its lateral part is almost globularly domed. Distolateral margin broadly convex, medial margin more narrowly convex. Operculum reaching medially of meracanthus. Meracanthus reaching well beyond operculum, to sternite 2. Female operculum (Fig. 66) closely resembling that of male, but with its distal part reaching less far mesiad. Distal part rather large compared to that of the two foregoing species, and semi-circular, with continuously convex margin.

Abdomen: Ochraceous brown, with ventrolateral row of very distinct black spots on segments 3-7 and slightly darkened segmental hind margins. Male abdomen not inflated, its first tergite very narrow and partly hidden under metanotum. Anterior margin of 2nd tergite almost straight medially. Female abdomen with same distinct colouring as male. Ovipositor sheaths reaching just beyond apex of caudodorsal beak. Female caudodorsal beak in dorsal view (Fig. 67) long, slender and sharply pointed at apex.

Male genitalia: Pygofer of holotype in lateral view (Fig. 62) strongly resembling that of *B. wauensis*, but with shorter and more strongly bent, spiny, caudodorsal beak, especially in paratype (Fig. 68). Dorsal margin slightly concave, gradually bent into convex beak. Distal margin almost straight between beak and lateral lobe. Ventral margin angularly bent, especially in the paratype. Caudodorsal beak in holotype much longer than in paratype, in dorsal view (Figs. 63-64) slender and narrowly rounded at apex. Lateral lobe of pygofer with bluntly rounded distolateral protuberance. Pygofer lobe curved mesiad towards distal margin. Clasper closely resembling that of *B. wauensis* but more angular at dorsodistal edge, and very broad and angular in lateral view (Fig. 65). Clasper heel high and rectangular. Dorsal margin of clasper straight, abruptly bending into straight distal margin at very prominent and rectangular dorsodistal corner. Clasper with weakly outwards bending crest along dorsal margin. Distal margin angularly bent. Apical part of clasper slightly posteriorly projecting and downwards directed, with small rounded ventral hollow. Aedeagus in lateral view slender and strongly S-curved, with bluntly rounded lateral lobes, weakly concave along margin of pore (Fig. 71). Aedeagus from behind (Fig. 70) convex between lateral lobes. Aedeagal pore broad and oval.

Measurements: Body length ♂: 17.6 & 21.0 mm, ♀: 19.9-22.0 mm (x 20.6 mm ± 1.1); tegmen length ♂: 20.6 & 24.3 mm, ♀: 25.5-29.0 mm (x 27.3 mm ± 1.3); head length ♂: 1.8 mm, ♀: 1.9-2.1 mm (x 2.0 mm); pronotum length ♂: 2.4 & 2.5 mm, ♀: 2.9-3.2 mm (x 3.1 mm); mesonotum length ♂: 3.6 & 4.2 mm, ♀: 4.2-5.0 mm (x 4.7 mm); head width ♂: 4.0 & 4.5 mm, ♀: 4.8-5.3 mm (x 5.0 mm); width of pronotal collar ♂: 5.3 & 6.0 mm, ♀: 6.6-7.2 mm (x 6.9 mm).

Distribution (Fig. 2b): *B. versicolor* is endemic to the Papuan peninsula.

Etymology: *Versicolor* (Lat.) means multi coloured. The name refers to the unique colour pattern of this species.

**Baeturia maai** n. sp.

(Figs. 2, 72-78)

Holotype: NEW GUINEA: NETH. / River Tor (mouth) / 4 km. E. of Hol / Maffen, vii.1.1959" (print); "M.V. Light Trap / Maa" (print) ♂, BPBM. Paratypes: same data as holotype 2♂, BPBM; same data but 2.vii.1959, 1♂, ZMA.

*B. maai* is of about the same size as *B. vanderhammeni* and closely resembles that species in male genitalia. The caudodorsal beak of *B. maai*, however, is distinctly broader in lateral view and more triangle-shaped in dorsal view. The species can be most easily separated from *B. vanderhammeni*, by its lesser number of tymbal ridges. Females of this species are unknown.

DESCRIPTION

Body reddish brown, weakly brown speckled. Abdomen 1.5-1.7 x as long as head and thorax. Tegmina only slightly longer than body length.

Head: Reddish ochraceous, brown speckled. Postclypeus 1.9-2.2 x as broad as long, almost oblong; its anterior margin slightly convex. Lateral corners of postclypeus distinctly protruding beyond vertex lobes. Postclypeus not swollen ventrally; anterior margin (lateral view) very weakly convex.

Thorax: Pronotum ochraceous, with weak brown speckling concentrated in medial band. Mesonotum greyish brown and weakly speckled, lacking dark spots in front of cruciform elevation.

Legs: Proximal spine of fore femur distinctly shorter than distance to middle spine.

Tegmina and wings: Hyaline, venation ochraceous or reddish. Veins in apical part of tegmen sparsely set with short setae. Tegmen with 8 apical areas.

Tymbal organs: Five sclerotized transverse parallel ridges spanning the tymbal from dorsal to ventral margin, a 6th most proximal ridge, spanning about 3/4 of tymbal width. Five short intercalary ridges seem to form a lateral band across tymbal.

Operculum (Fig. 74): Short as in *B. vanderhammeni* and only partly covering tymbal cavity in

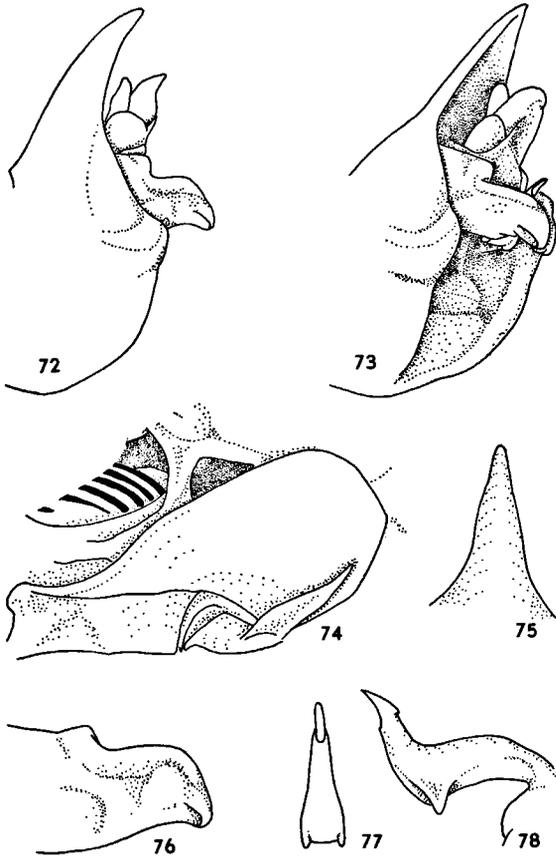
ventral view. Distal part of operculum angularly oblong, curved flat against the body. Lateral margin short, bending into long and straight distal margin. Medial margin almost straight. Distomedial and medial corners almost rectangular. Distomedial edge of operculum reaching beyond margin of abdominal segment 2. Meracanthus reaching to about half-length of operculum.

Abdomen: Reddish brown, weakly speckled dorsally. Distinct ventrolateral row of blackish spots on segments 3-7 or 8. Segmental hind margins reddish.

Genitalia: Pygofer in lateral view as in Fig. 72. Dorsal margin convexly bent, continuous with rounding of caudodorsal beak. Caudodorsal beak distinctly broader at its base than in *B. vanderhammeni*. Distal margin weakly convex, concavely bent into margin of beak. Lateral lobe of pygofer distinctly curved mesiad, forming a rather prominent rounded and dorsally indented protuberance. Ventral margin of pygofer broadly convex. Ventral margins converging to sharp angle at base of pygofer (Fig. 73). Caudodorsal beak triangular in dorsal view (Fig. 75) and sharply pointed at apex. Clasper in lateral view (Fig. 76) closely resembling that of *B. vanderhammeni*, but more rounded at distodorsal corner. Apical part of clasper weakly curved down, with small clasper hollow. Proximal half of dorsal crest bending outwards, distal part not forming a prominent distal corner, but gradually narrowing towards clasper apex. Clasper with distinct and angular clasper heel. Aedeagus in lateral view slender and strongly S-curved, with slender, almost pointed lateral lobes, and strongly concave along margin of pore (Fig. 78). Aedeagus from behind (Fig. 77) very slender and weakly convex between lateral lobes. Aedeagal pore narrow and oval, rounded at apex.

Measurements: Body length: 21.5-21.6 mm; tegmen length: 21.4-22.5 mm (x 21.9 mm); head length: 1.8 mm; pronotum length: 4.2-4.5 mm (x 4.4 mm); mesonotum length: 4.0-4.6 mm (x 4.3 mm); head width: 4.2-4.5 mm (x 4.4 mm); width of pronotal collar: 5.4-5.7 mm (x 5.6 mm).

Distribution (Fig. 2b): *B. maai* is only known from the mouth of the Tor River, in northern



Figs. 72-78. *Baeturia maai*; 72, pygofer in lateral view, paratype; 73, pygofer aslant, holotype; 74, operculum, paratype; 75, caudodorsal beak in dorsal view, holotype; 76, clasper, holotype; 77, aedeagus from behind, holotype; 78, aedeagus in lateral view, holotype.

#### Irian Jaya.

Etymology: This species is named in honour of Dr. T.C. Maa, who collected the type series, besides many other specimens on which the current revision of the genus *Baeturia* is based.

#### *Baeturia rossi* n. sp.

(Figs. 2, 79-86)

Holotype: "Maffin Bay, / Dutch N. Guinea (print) / v-28-44 (written) / E.S. Ross Coll. (print)"; "Collection of the / CALIFORNIA ACADEMY / OF SCIENCES, San / Francisco, Calif." (print), ♂, CAS. Paratypes: IRIAN JAYA: NEW GUINEA (W): same data as holotype with several dates between v-x.1944, 7♂, 4♀, CAS; same data 2♂, 1♀, ZMA; Bernhard Camp, 50 m, vii.1938 & 22.xii.1938, J.

Olthof, Neth. Ind - American New Guinea exped., 2♂ *Gymnotympna* det. H.C. Blöte, 3♀ *Gymnotympna* det. H.C. Blöte, RMNH; Berkamboe? Torrivier, 17-20.x.1911, Bosch, 2♂, MZB; Motorbivak, Meervlakte, viii.1926, N. N. Guinea Exp. 1926, W. Docters v. Leeuwen, 2♂, MZB; Sarmeh, 1901, J.B. Ledru, 1♂, 1♀, MAKB; YAPEN ISLAND: Seroei, 4.v.1952, W.J. Roosdorp, 1♂ *Gymnotympna* det. H.C. Blöte, RMNH; same data but 10.v.1952, 1♀, RMNH. Other material: IRIAN JAYA: NEW GUINEA (W): Pionierbivak, i.1920, W.C. v. Heurn, 1♂, MZB; same data but xii.1920-i.1921, 1♂, MZB; Waris, S. of Hollandia, 450-500 m, 1-7.viii.1959, T.C. Maa, 1♂, BPBM; same data but 8-15.viii.1959, 1♂, BPBM.

*B. rossi* is of medium size and tends to be larger than *B. maai* and *B. vanderhammeni*, the two other species of the *exhausta* group from northwestern New Guinea. *B. rossi* can be separated from these species by a distinctly swollen postclypeus and a large, rounded, male operculum. The specimens from Pionierbivak and Waris are distinctly smaller than the others and possibly represent a different species.

#### DESCRIPTION

Body of males dark red-brown coloured and densely brown speckled. Especially the abdomen often deep red tinged. Females smaller than males, but with more robust head and thorax. Body of females ochraceous to dark reddish brown. Abdomen of males 1.5-1.7 x as long as head and thorax, of females 1.0-1.1 x. Tegmen of males 1.0-1.1 x as long as body length, of females 1.2-1.3 x.

Head: Reddish brown and brown speckled, darker red-brown towards anterior margins of vertex lobes and on postclypeus. Postclypeus 1.6-2.2 x as broad as long, almost oblong; anterior margin broadly convex. Lateral corners of postclypeus sometimes distinctly protruding beyond vertex lobes. Postclypeus distinctly swollen ventrally; anterior margin (lateral view) strongly convex.

Thorax: Pronotum ochraceous brown, brown speckling most dense in red-brown medial band. Mesonotum greyish brown, reddish tinged medially and densely brown speckled. Two distinct

dark spots in front of reddish cruciform elevation.

Legs: Proximal spine of fore femur about as long as distance to middle spine.

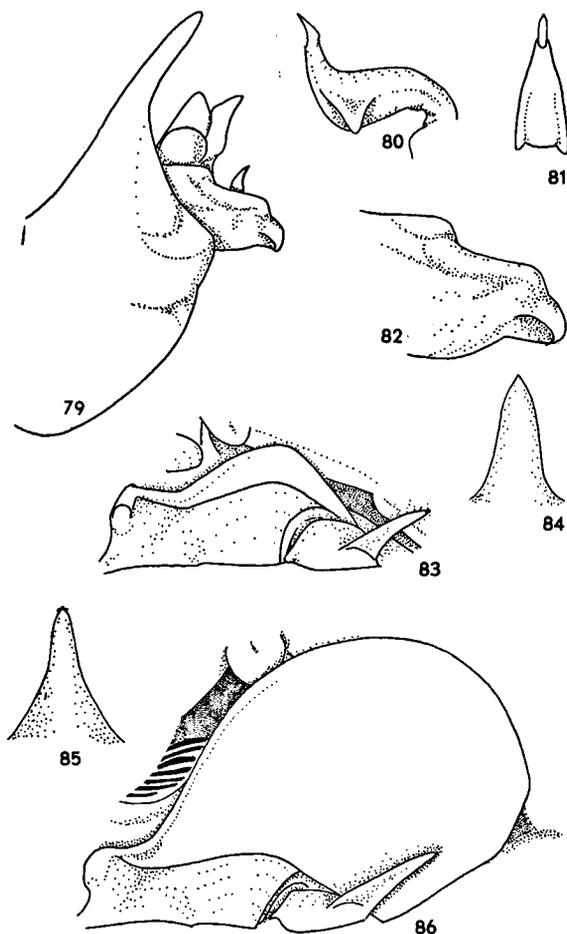
Tegmina and wings: Hyaline, venation red. Veins with very few short setae. Tegmen with 8 apical areas.

Tymbal organs: Bright red between ridges. Five sclerotized transverse parallel ridges spanning the tymbal from dorsal to ventral margin, a 6th ridge almost reaching ventral margin and a 7th, most proximal ridge, spanning about 3/4 of tymbal width. Five short intercalary ridges seem to form a lateral band across tymbal.

Opercula: Male operculum (Fig. 86) very large and resembling the opercula of the species of the *bloetei* group (cf. De Boer, 1989), shell shaped, clearly visible in dorsal view and completely covering tymbal cavity in ventral view. Distal part of operculum squarely rounded, curved flat against the body. Lateral margin weakly convex, forming an almost right angle with crest around rectangular corner of basal part, distal margin more strongly convex. Medial margin almost straight. Distomedial and medial corners rounded. Distal margin of operculum reaching beyond margin of abdominal segment 2. Meracanthus reaching to about half-length of operculum. Female operculum (Fig. 83) very short, sickle-shaped and erect.

Abdomen: Male abdomen often red-brown, sometimes discoloured ochraceous, and densely speckled; ventral side unspeckled. Ventrolateral row of dark spots on segments 3-7 visible in most specimens. Segmental hind margins bright red. Female abdomen ochraceous to castaneous brown and densely speckled. Ventrolateral row of spots hardly visible. Segmental hind margins often only very slightly reddened. Ovipositor sheaths reaching just beyond apex of caudodorsal beak. Female caudodorsal beak in dorsal view (Fig. 84) triangle-shaped and sharply pointed at apex.

Male genitalia: Pygofer in lateral view as in Fig. 79. Dorsal margin weakly concave, and convexly bent into straight margin of erect caudodorsal beak. Caudodorsal beak very slender in lateral view. Distal margin of pygofer weakly convex, angularly bent into straight margin of beak.



Figs. 79-86. *Baeturia rossi*, paratype Maffin Bay: 79, pygofer in lateral view; 80, aedeagus in lateral view; 81, aedeagus from behind; 82, clasper; 83, female operculum; 84, female caudodorsal beak in dorsal view; 85, male caudodorsal beak in dorsal view; 86, male operculum.

Lateral lobe of pygofer distinctly curved mesiad, forming a small rounded protuberance. Ventral margin of pygofer weakly convex. Caudodorsal beak triangular in dorsal view (Fig. 85), abruptly narrowing at half-length and pointed at apex. Clasper in lateral view (Fig. 82) almost straight to apex. Apical part of clasper weakly curved down, with small clasper hollow and distinct, but only weakly outwards bending dorsal crest. Dorsal crest abruptly ending and slightly swollen at dorsodistal corner of clasper. Clasper with distinct, but rounded clasper heel. Aedeagus in lateral view quite stout and strongly S-curved, with slen-

der, almost pointed lateral lobes, and strongly concave along margin of pore (Fig. 80). Aedeagus from behind (Fig. 81) very slender and weakly convex between lateral lobes. Aedeagal pore narrow and oval, but pointed at apex.

Measurements: Body length ♂: 19.7-24.6 mm (x 22.0 mm ± 2.6), ♀: 19.3-22.0 mm (x 20.5 mm ± 0.8); tegmen length ♂: 21.0-24.6 mm (x 22.8 mm ± 1.3), ♀: 23.6-27.8 mm (x 24.4 mm ± 1.2); head length ♂: 1.6-1.9 mm (x 1.8 mm), ♀: 1.9-2.2 mm (x 2.1 mm); pronotum length ♂: 2.3-2.7 mm (x 2.6 mm), ♀: 2.8-3.2 mm (x 3.0 mm); mesonotum length ♂: 3.8-5.1 mm (x 4.4 mm), ♀: 4.7-5.5 mm (x 5.1 mm); head width ♂: 4.0-4.6 mm (x 4.3 mm), ♀: 4.9-5.3 mm (x 5.1 mm); width of pronotal collar ♂: 5.4-6.2 mm (x 5.9 mm), ♀: 6.6-7.4 mm (x 7.0 mm).

Distribution (Fig. 2b): *B. rossi* is recorded from northwestern Irian Jaya, east of the Geelvink Bay, and from Yapen Island.

Etymology: This species is named in honour of Mr. E.S. Ross, who collected a part of the type series.

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#### REFERENCES

- ANONYMOUS, 1938. Atlas van tropisch Nederland: [i-ix], maps 1-31b, legenda 1-31b, 1-17 (Koninklijk Nederlands Aardrijkskundig Genootschap & Topografische Dienst in Nederlandsch-Indië, Amsterdam / Batavia).
- ANONYMOUS, 1966. List of New Guinea localities: 1-19 (Bernice P. Bishop Museum, Honolulu).
- ANONYMOUS, 1968. The Times atlas of the world: i-xliii, 1-272, pls. 1-123. (Times Newspapers Ltd., London).
- BLÖTE, H.C., 1958. On the history of the genus *Baeturia* Stål (Insecta, Homoptera, Cicadidae). Archs. néerl. Zool., **13**, (Suppl. 1): 262-269.
- BLÖTE, H.C., 1960. The genus *Baeturia* Stål as represented in New Guinea (Homoptera, Cicadidae). Zoöl. Meded., Leiden, **37**: 61-80.
- BOER, A.J. de, 1982. The taxonomy and biogeography of the *nasuta* group of the genus *Baeturia* Stål, 1866 (Homoptera, Tibicinidae). Beaufortia, **32** (4): 57-78.
- BOER, A.J. de, 1986. The taxonomy and biogeography of the *conviva* group of the genus *Baeturia* Stål, 1866 (Homoptera, Tibicinidae). Beaufortia, **36** (7): 167-182.
- BOER, A.J. de, 1989. The taxonomy and biogeography of the *bloetei* group of the genus *Baeturia* Stål, 1866 (Homoptera, Tibicinidae). Beaufortia, **39** (1): 1-43.
- BOER, A.J. de, 1990. *Aedeastria*, a new cicada genus from New Guinea, its phylogeny and biogeography (Homoptera, Tibicinidae), preceded by a discussion on the taxonomy of New Guinean Tibicinidae. Beaufortia, **40** (3): 63-72.
- BOER, A.J. de, 1991. *Scottotympana*, a new cicad genus from New Guinea, with the description of three new species, their taxonomy and biogeography (Homoptera, Tibicini-idae). Beaufortia, **42** (1): 1-11.
- BOER, A.J. de, 1992a. The taxonomy and biogeography of the *viridis* group of the genus *Baeturia* Stål, 1866 (Homoptera, Tibicinidae). Bijdr. Dierk., **61** (3): 163-183.
- BOER, A.J. de, 1992b. The taxonomy and biogeography of the genus *Thaunastopsaltria* Kirkaldy, 1900, (Homoptera, Tibicinidae). Beaufortia, **43** (3): 17-44.
- BOER, A.J. de, 1993a. *Guineapsaltria*, a new genus of the Australian-New Guinean region, with notes on the taxonomy and biogeography (Homoptera, Tibicinidae). Bijdr. Dierk., **63** (1): 15-41.
- BOER, A.J. de, 1993b. Ten new species of the genus *Aedeastria* De Boer, 1990, with notes on the taxonomy and biogeography (Homoptera, Tibicinidae). Beaufortia, **43** (9): 140-167.

- BOER, A.J. de, 1994a. The taxonomy and biogeography of the *loriae* group of the genus *Baeturia* Stål, 1866 (Homoptera, Tibicinidae). Tijdschr. Ent., **136**: 1-26.
- BOER, A.J. de, 1994b. The taxonomy and biogeography of the *guttulinervis* group of the genus *Baeturia* Stål, 1866 (Homoptera, Tibicinidae). Bijdr. Dierk., **64** (2): 87-100.
- BREDDIN, G., 1900. Hemiptera gesammelt von Professor Kükenthal im Malayischen Archipel. Abh. senckenb. naturforsch. Ges., **25**: 139-202.
- DISTANT, W. L., 1888. An enumeration of the Rhynchota received from Baron von Müller, and collected by Mr. Sayer in New Guinea during Mr. Cuthbertson's expedition. Trans. ent. Soc. London, **1888**: 475-489.
- DISTANT, W. L., 1892a. On some undescribed Cicadidae, with synonymical notes. Ann. Mag. nat. Hist., (6) **9**: 313-327.
- DISTANT, W. L., 1892b. A monograph of Oriental Cicadidae, Parts 5-7: i-xiv, 97-158; Pls. X-XV. (Trustees Indian Museum, London).
- DISTANT, W. L., 1906. A synonymic catalogue of Homoptera. Part 1. Cicadidae: 1-207. (Trustees Indian Museum, London).
- DISTANT, W. L., 1911. New genera and species of Cicadidae. Ann. Mag. nat. Hist., (8) **8**: 132-137.
- DISTANT, W. L., 1912. Homoptera Fam. Cicadidae, Subfam. Cicadinae. - Genera Insectorum, **142**: 1-64.
- DISTANT, W. L., 1914. Homoptera, Fam. Cicadidae, subfam. Gaeaninae. Genera Insectorum, **158**: 1-38.
- DOHRN, F. A., 1859. Homoptera. Catalogus Hemiptorum. Herausgegeben von dem Entomologischen Verein zu Stettin 1859: 1-102.
- DUFFELS, J.P., 1977. A revision of the genus *Diceropyga* Stål, 1870 (Homoptera, Cicadidae). Monografieën Ned. ent. Veren., **8**: 1-227.
- DUFFELS, J.P., 1982. *Brachylobopyga decorata* n. gen., n. sp. from Sulawesi, a new taxon of the subtribe Cosmopsaltria (Homoptera, Cicadidae). Ent. Ber., Amsterdam, **42**: 156-160.
- DUFFELS, J.P., 1983. Taxonomy, phylogeny and biogeography of the genus *Cosmopsaltria*, with remarks on the historic biogeography of the subtribe Cosmopsaltria (Homoptera: Cicadidae). Pacific Insects Monogr., **39**: 1-127.
- DUFFELS, J.P., 1986. Biogeography of Indopacific Cicadoidea, a tentative recognition of areas of endemism. Cladistics, **2** (4): 318-336.
- DUFFELS, J.P., 1991. The eye-catching cicada *Hamza ciliaris* (Linnaeus, 1758) comb. n. in Indonesia and the Pacific: taxonomic status, synonymy, and distribution (Homoptera, Cicadoidea). Bijdr. Dierk., **61** (2): 119-130.
- DUFFELS, J.P. & A.J. de BOER, 1990. Areas of endemism and composite areas in East Malesia. In: P. Baas, C. Kalkman & R. Geesink (eds.), The plant diversity of East Malesia: Proceedings of the Flora Malesiana symposium commemorating Professor Dr. C.G.G.J. van Steenis, Leiden, August 1989: 249-272 (Kluwer Academic Publishers, Dordrecht).
- DUFFELS, J.P. & P.A. van der LAAN, 1985. Catalogue of the Cicadoidea (Homoptera, Auchenorrhyncha) 1956-1980. Series Ent., **33**: i-xvi, 1-414.
- FORTUIN, A. R. & M. E. M. De SMET, 1991. Rates and magnitudes of late Cenozoic vertical movements in the Indonesian Banda Arc and the distinction of eustatic effects. Spec. Publ. int. Ass. Sedimentol., **12**: 79-89.
- GUÉRIN-MÉNEVILLE, F. E., 1831. Hemiptera. Plates from Voyage autour du monde sur la Coquille. 1831: Pls. 1-21 [10]
- GUÉRIN-MÉNEVILLE, F. E., 1838. Crustacés, arachnides et insectes. Voyage autour du monde, exécuté par ordre du roi, sur la corvette de sa majesté, La Coquille, pendant les années 1822, 1823, 1824 et 1825 par M. L. I. Duperry, **2** (2): 1-319.
- HAMILTON, W.B., 1979. Tectonics of the Indonesian region. U.S. Geol. Surv. prof. Paper, **1078**: i-ix, 1-345.
- HORVATH, G., 1900. Hemiptera in Systematik, Tiergeographie, Anatomie der wirbelloser Thiere. Zoologische Forschungsreisen in Australien und dem Malayischen Archipel. Mit Unterstützung des Herrn Dr. Paul von Ritter ausgeführt in den Jahren 1891-1893 von Richard Semon, **5**: 629-642.
- KATO, M., 1932. Monograph of Cicadidae: 1-450.
- KIRKALDY, G. W., 1905. Memoir on the Rhynchota collected by Dr. Arthur Willey, F.R.S., chiefly in Birara (New Britain) and Lifu. Trans. ent. Soc. London., **1905**: 327-363.
- KIRKALDY, G. W., 1907. Some annotations to M. Distant's recent Catalogue of the Cicadidae. (Hem.). Anns Soc. ent. Belg., **51**: 303-309.
- KIRKALDY, G. W., 1913. On some new species of leafhoppers. Part. 1. Bull. Hawaiian Sug. Plrs' Ass. Exp. Stn, **12**: 7-27.
- LALLEMAND, V., 1931. Hemiptera-Homoptera. In: Résultats scientifiques du voyage aux Indes Orientales Néerlandaises de LL. AA. RR. le Prince et la Princesse Léopold de Belgique. Mém. Mus. r. Hist. nat. Belg., **4** (1): 71-85.
- LALLEMAND, V., 1935. Homopteres des illes de la Sonde et de l'Australie du nord. Revue Suisse Zool., **42**: 661-681.
- LALLEMAND, V., & H. SYNAVE, 1953. Homopteres de Sumba et Flores. In: Wissenschaftliche Ergebnisse der Sumba Expedition des Museums für Volkerkunde und des Naturhistorischen Museums in Basel, 1949. Verh. naturf. Ges. Basel, **64**: 229-254.
- METCALF, Z. P., 1963. General catalogue of the Homoptera, VIII. Part 2. Tibicinidae. North Carolina State College, Raleigh, N.C.: i-iv, 1-492
- MOULTON, J.C. & W.E. CHINA, 1926. Fauna Sumatrensis. Cicadidae (Homoptera). Supplta ent., **14**: 120-126.
- MYERS, J. G., 1928. Cicadidae. Insects of Samoa and other Samoan terrestrial Arthropoda, **2** (2): 55-65.

- (Trustees of the British Museum, London).
- MYERS, J. G., 1929. *Insect Singers. A natural history of the Cicadas*. G. Routledge and Sons, London: xiv + 304 pp.
- PIGRAM, C. J., & H.L. DAVIES, 1987. Terranes and the accretion history of the New Guinea orogen. *B.M.R. J. Aust. Geo. Geoph.*, **10**: 193-212.
- PIGRAM, C. J. & H. PANGGABEAN, 1984. Rifting of the northern margin of the Australian continent and the origin of some microcontinents in the eastern Indonesia. *Tectonophysics*, **107**: 331-353.
- SCHMIDT, E., 1926. Fauna Buruana. Homoptera. *Treubia*, **7**: 217-258.
- SCHMIDT, E., 1928. Die Zikaden des Buitenzorger Museums. (Hemipt.-Homopt.). I. *Treubia*, **10**: 107-144.
- STÅL, C., 1862. Synonymiska och systematiska anteckningar öfver Hemiptera. Öfvers. K. Vetensk. Akad. Förh. Stockholm, **19**: 479-504.
- WALKER, F., 1850. List of the specimens of homopterous insects in the collection of the British Museum, **4**: 1119-1188 [1119-1168].
- WALKER, F., 1858. *Insecta Saudersiana: or characters of undescribed insects in the collection of William Wilson Saunders, Esq., F.R.S., F.L.S., & c. Homoptera*. John van Voorst, London: 1-117.
- WALKER, F. 1858. Supplement. List of the specimens of the Homopterous insects in the collection of the British Museum, 1858: 1-307.
- WALKER, F., 1868. Catalogue of the homopterous insects collected in the Indian Archipelago by Mr. A. R. Wallace, with descriptions of new species. *J. Linn. Soc. (Zool.)*, **10**: 82-193.

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