

FOUR SPECIES ADDED TO THE *BAETURIA NASUTA* GROUP, WITH NOTES ON TAXONOMY AND BIOGEOGRAPHY (HOMOPTERA, TIBICINIDAE)

Boer, A. J. de, 1994. Four species added to the *Baeturia nasuta* group, with notes on taxonomy and biogeography (Homoptera, Tibicinidae). – *Tijdschrift voor Entomologie* 137: 161-172, figs. 1-39. [ISSN 0040-7496]. Published 15 December 1994.

A new concept is proposed for the *nasuta* group of the cicada genus *Baeturia* Stål, 1866. Four species are added to this group, bringing the total number of its species to twelve. One of these species (*B. guttulipennis* Blöte, 1960) is redescribed and three (*B. gibberosa*, *B. splendida*, and *B. retracta*) are described as new. Implications for the biogeographic pattern of the group are, that the *nasuta* group can no longer be seen as a typical central New Guinea group; most of the species can apparently be found in northern New Guinea.

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Key words. – *Baeturia*, *nasuta* group, taxonomy, biogeography, New Guinea.

The *nasuta* group was recognized as a monophyletic group consisting of eight New Guinean species of the genus *Baeturia* Stål (de Boer 1982). The monophyly of that group is based on two presumed apomorphies: a narrow and angularly swollen postclypeus and four sclerotized ridges on the tymbals. *B. guttulipennis* Blöte was not included in the *nasuta* group, since it does not share these apomorphies. However, now that most of the remaining species of *Baeturia* have been revised and placed in monophyletic species groups, it appears that *B. guttulipennis* is more closely related to the *nasuta* group than to any other species group. It is proposed here to change the concept of the *nasuta* group and to include *B. guttulipennis* in that group. Furthermore, three new species can be added to the *nasuta* group, these species do share the original apomorphies of that group.

Species of the *nasuta* group, as previously defined, were mainly distributed in the central mountain ranges of New Guinea. Its distribution pattern has been compared to that of the cicada genus *Cosmopsaltria* Stål, which also centres in the montane parts of central New Guinea (de Boer 1982; Duffels 1986; Duffels & de Boer 1990) and it was suggested that the similarities between these patterns might find a common cause in the paleogeology of New Guinea. The present additions to the *nasuta* group greatly alter its general distribution pattern and necessitate a reconsideration of its paleogeographic history.

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; Moul: Personal collection Mr M.S. Moulds, Sydney; RMNH: Nationaal Natuurhistorisch Museum (formerly: Rijksmuseum van Natuurlijke Historie), Leiden; SMN: Staatliches Museum für Naturkunde, Stuttgart; ZMA: Institute for Systematics and Population Biology (Zoölogisch Museum), Amsterdam.

The following geographical sources have been used: Atlas van tropisch Nederland (1938), The Times Atlas of the World (1968) and the 'List of New Guinea localities' published by the Bishop Museum (1966).

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. Measurements are based on all available specimens.

PHYLOGENY

Baeturia belongs to a larger group of genera, the

'*Baeturia* and related genera complex', as defined earlier (de Boer 1990). A phylogenetic analysis of this genus complex, with the oriental Prasiini as defined by De Jong (1985) as outgroup, is in preparation. The ensuing phylogenetic discussions are based on the preliminary results of that analysis.

The monophyly of the *nasuta* group

The monophyly of the *nasuta* group is based on three presumed apomorphies. Males of the *nasuta* group are easily identified by the almost transparent lateral sides of the abdomen, usually restricted to segments 3-7. Only *B. marmorata* does not show this character. A similar transparency of the male abdomen was found in a monophyletic group of three species of the genus *Gymnotympana* (unpublished), but not in other related taxa. A laterally transparent abdomen is regarded as apomorphic for the *nasuta* group (1 in fig. 1b) and the similar transparency in three *Gymnotympana* species must be explained by parallelism.

A strongly curved aedeagus, with lateral lobes at its basal curve, is regarded apomorphic for the genus *Baeturia*. The aedeagus of the species of the *nasuta*

group differs from that of other species by a longer and more slender apical part, distally of the lateral lobes (fig. 11), which is regarded apomorphic (2 in fig. 1b). A very similarly elongate, but stouter, aedeagus was found in *B. loriae* and *B. pigrami* of the *loriae* group (de Boer 1994a). The elongation of the aedeagus in these two groups cannot be regarded as homologous in the most parsimonious solution.

The male pygofer is characterized by a strongly bent and dorsally flattened caudodorsal beak. This shape of the caudodorsal beak is shared by all species and regarded apomorphic for the *nasuta* group (3 in fig. 1b). In other species, which have a similarly strongly bent beak, the beak is convexly curved dorsally (comp. the *viridis* group, de Boer 1992).

The phylogenetic position of the *nasuta* group

Baeturia is a monophyletic genus, for which a frontally rounded and protruding postclypeus, a triangle-shaped medial thorn on the fore femur, and lobate lateral crests on the aedeagus are the presumed apomorphies (1, 2, 3 in fig. 1a). *Baeturia* can be subdivided into seven monophyletic species groups: the *bloetei* group (de Boer 1989), the *conviva* group (de Boer 1986), the *exhausta* group (de Boer 1994b) the *guttulinervis* group (de Boer 1994c), the *loriae* group (de Boer 1994a), the *viridis* group (de Boer 1992), and the *nasuta* group (de Boer 1982).

The *nasuta* group is presumed to form a monophyletic group with the *conviva*, *guttulinervis*, and *viridis* groups. The large, often conically-shaped, distinctly posteriorly projecting protuberance on the lateral lobe of pygofer is regarded synapomorphic for these four species groups together (4 in fig. 1a). Furthermore, these four groups share a very stout and strongly bent caudodorsal beak. The occurrence of a similarly bent caudodorsal beak in several Melanesian species of the *bloetei* group must be explained by parallel development.

The *nasuta* and *viridis* groups are sister groups, sharing an angularly bent caudodorsal beak as supposed synapomorphy (5 in fig. 1a). In the species of these two groups the dorsal margin of the pygofer is not continuously rounded with the dorsal margin of the caudodorsal beak. Furthermore, these species share a generally truncate, but sometimes bluntly rounded or bicuspidate, caudodorsal beak. Species of other groups of *Baeturia* generally have a more narrowly rounded or pointed beak, while a truncate beak only sporadically occurs. The *conviva* and *guttulinervis* groups are sister groups based on a shared apical swelling of the clasper (this swelling is almost globular in the *guttulinervis* group) and a dorsally strongly rounded pygofer (6 in fig. 1a), but the relative position of the remaining species groups of *Baeturia* is not clear.

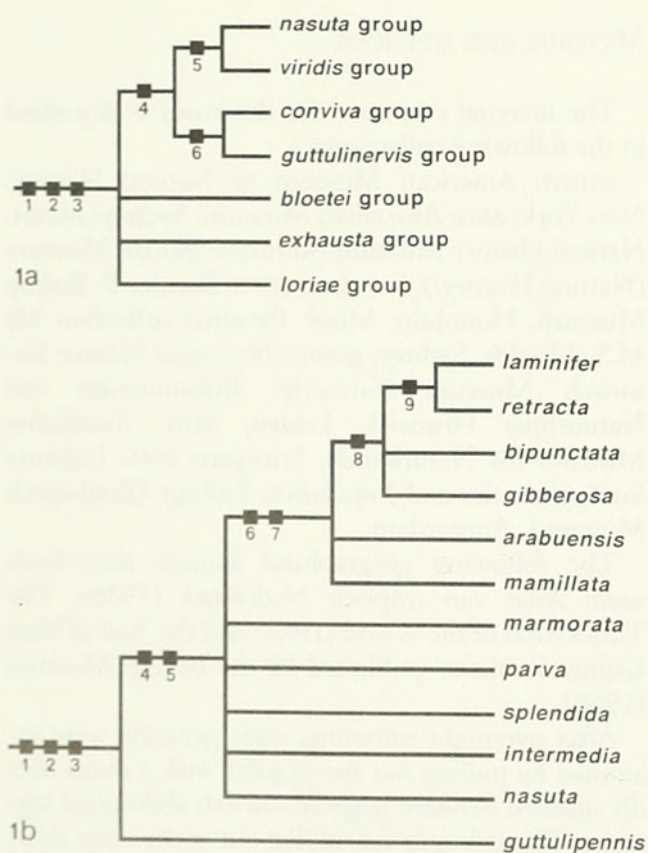


Fig. 1. Cladograms. — a. Cladogram of *Baeturia*, numbers refer to characters discussed in the section on the phylogenetic position of the *nasuta* group; b. Cladogram of the *Baeturia nasuta* group, numbers refer to characters discussed in the sections on the monophyly and ingroup phylogeny of the *nasuta* group.

Ingroup phylogeny

The species of the *nasuta* group are very similar in general appearance. The species differ mainly in the shape of the claspers and some clasper characters indicate phylogenetic relationships. Most other differences observed are either species specific characters, or characters that also occur outside the *nasuta* group. It is not possible to construct a fully resolved and unambiguous cladogram for the group, based on the limited number of characters now available. Nevertheless, some remarks on ingroup phylogeny can be made (see fig. 1b).

B. guttulipennis presumably forms the sister taxon of all other species of the *nasuta* group; these other species share four tymbal ridges (three in *B. parva*) and a more angularly swollen postclypeus, which are the original apomorphies for the *nasuta* group (4, 5 in fig. 1b). *B. guttulipennis* and *B. nasuta* however, share similar brown markings on the tegmina and an apically rounded male caudodorsal beak, and could be sister species. *B. nasuta* and *B. intermedia* share an almost identical clasper and are presumably either sister species or part of a paraphyletic subgroup.

B. arabuensis, *B. bipunctata*, *B. laminifer*, *B. mamillata*, *B. retracta* and *B. gibberosa* share a distinct dorsal protrusion on the clasper as presumed synapomorphy (6 in fig. 1b). That *B. nasuta* and *B. intermedia* should also be included in this group, as was suggested before (de Boer 1982) seems unlikely, since the weakly developed dorsal crest of the claspers of *B. nasuta* and *B. intermedia* is very similar to that found in many other *Baeturia* species. The remaining species of the *nasuta* group share a dorsally smoothly rounded clasper.

B. arabuensis and *B. mamillata* share a posteriorly directed and almost finger-shaped protrusion, and are possibly sister species. *B. bipunctata*, *B. gibberosa*, *B. laminifer* and *B. retracta* have a much broader dorsal protrusion on the clasper, which is regarded as synapomorphic (8 in fig. 1b). *B. laminifer* and *B. retracta* share a laminiform and square-shaped dorsal protrusion on the clasper as presumed synapomorphy (9 in fig. 1b). *B. bipunctata* and *B. gibberosa* have a more triangular, hump-shaped, protrusion; these are either sister species or part of a paraphyletic subgroup.

Females of most of the species that have a dorsal protrusion on the clasper, as far as they could be identified, generally have a truncate caudodorsal beak, which character is unique for these species and presumably apomorphic at that level (7 in fig. 1b). Only the females that presumably belong to *B. arabuensis* and the females of *B. gibberosa* have a pointed beak as those in *B. guttulipennis*, *B. nasuta*, and *B. parva*. The female of *B. splendida* has a bluntly rounded, almost truncate, caudodorsal beak.

BIOGEOGRAPHY

The *nasuta* group is distributed in New Guinea and some adjacent islands, some species reach to the Bismarck Archipelago or the Admiralty Islands.

Study of the New Guinean cicadas indicates that the various genera or monophyletic species groups show different patterns of distribution. The genera seem concentrated with most, and often endemic, species in different parts of the island. These parts of New Guinea, thus recognized as areas of endemism (Duffels & de Boer 1990), largely coincide with frag-

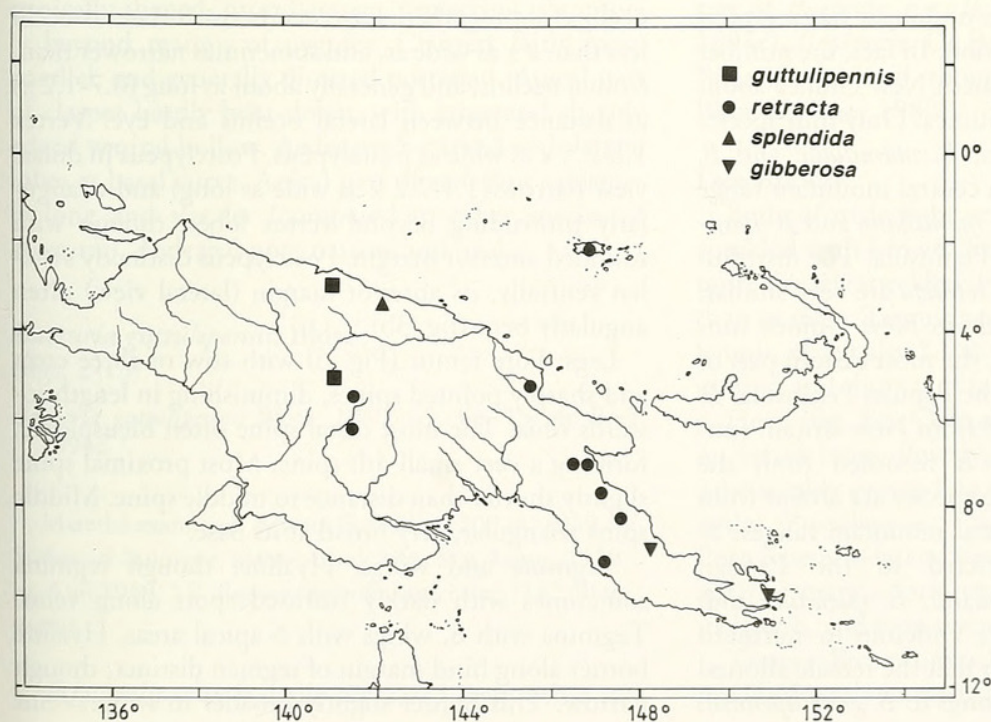


Fig. 2. Distribution of *Baeturia gibberosa*, *B. guttulipennis*, *B. retracta*, and *B. splendida*.

ments of a historic island arc, that collided at different times and in various places with the northern craton of the Australian continent, to form present day New Guinea (for geological reviews see Daly et al. 1991; Rangin et al. 1990a, 1990b; Pigram & Davies 1987). It is supposed that the various genera of New Guinean cicadas evolved on isolated island arc fragments previous to their collision with the Australian continent (de Boer 1994c).

The *nasuta* group was regarded as a typical central New Guinea group (de Boer 1982) and, as such, has been compared to the genus *Cosmopsaltria* Stål (Duffels 1986; Duffels & de Boer 1990). *Cosmopsaltria* and the *B. nasuta* group both appeared to be concentrated in the central mountain ranges of New Guinea. The distributions of *B. arabuensis*, *B. mamillata* and *B. nasuta*, from the Wissel Lakes to well into the Papuan Peninsula, are indeed very similar to that of many species of *Cosmopsaltria* (Duffels 1983). A similar historical explanation for the distribution patterns found in these two groups seemed required. Such an explanation can be found in supposing that both *Cosmopsaltria* and the *nasuta* group evolved on the Sepic Arc terrane as defined by Pigram & Davies (1987), which is the first of the island arc fragments that collided with the Australian continent, and which developed into the central mountain ranges of New Guinea. However, the phylogenetic level of the groups (*Cosmopsaltria* as sister group of *Diceropyga*, *Rhadinopyga*, *Aceropyga*, and *Moana* (Duffels 1986, 1993), and the *nasuta* group as a subgroup of *Baeturia*) possibly indicates a considerable age difference, which contradicts to a contemporaneous evolution on the Sepic Arc fragment.

With the four species here added to the *nasuta* group, this group as a whole no longer has a typical central New Guinea distribution. In fact, the number of species that occurs in northern New Guinea about equals that of central New Guinea. Only four species (*B. arabuensis*, *B. intermedia*, *B. mamillata*, and *B. nasuta*) can be said to have a central mountain range distribution, though two (*B. mamillata*, and *B. nasuta*) also occur in the Papuan Peninsula. The distributions of *B. laminifer* and *B. retracta* are very similar; they are recorded from southern New Guinea (unpublished data for *laminifer*), the most eastern part of northern New Guinea, and the Papuan Peninsula. *B. laminifer* is recently recorded from New Britain (unpublished) and *B. retracta* is recorded from the Admiralty Islands. These two species are absent from the western parts of the central mountain ranges. *B. gibberosa* is possibly restricted to the Papuan Peninsula and Normanby Island. *B. splendida* and, possibly, *B. guttulipennis* are endemic to northern New Guinea (it is not certain that the female allotted to the latter species really belongs to *B. guttulipennis*).

Also *B. parva* is distributed in northern New Guinea, but its distribution extends to the Vogelkop Peninsula, Misool, Biak, the Bismarck Archipelago, and Admiralty Islands. The two remaining species (*B. bipunctata* and *B. marmorata*), both from Araucaria camp and Rattan camp on the northern slopes of the central mountains of western New Guinea, should presumably be regarded more as northern, than as central New Guinean: several other species groups with a predominantly northern New Guinea distribution (e.g. the *viridis* group and the *guttulinervis* group) also have species in that area.

The distribution pattern of the *nasuta* group in its present concept is more in agreement with that of other groups of *Baeturia*, most of which seem to concentrate in northern New Guinea, while similarities with *Cosmopsaltria* have become less obvious and a paleobiogeographical comparison with that genus seems no longer relevant.

TAXONOMY

Description of the *nasuta* group

Species of the *nasuta* group are all very small sized. The specimens are shorter than 2.5 cm and generally do not exceed 2.0 cm. Males are easily recognized by their laterally transparent abdomen (this character is absent in *B. marmorata*). Body generally yellowish brown or reddish brown coloured and covered with many irregularly shaped brown speckles. Females generally darker coloured and more densely speckled (*B. splendida* unspeckled with greenish head and thorax).

Head (fig. 3a): Narrow, 2.3–2.8 x as wide as long. Vertex narrower than in most other *Baeturia* species, ocelli close together. Distance between lateral ocelli less than 2 x as wide as, and sometimes narrower than, frontal ocellus, and generally about as long (0.7–1.2 x) as distance between lateral ocellus and eye. Vertex 1.6–2.5 x as wide as postclypeus. Postclypeus in dorsal view narrow (1.1–2.2 x as wide as long) and triangularly protruding beyond vertex lobes, though with rounded anterior margin. Postclypeus distinctly swollen ventrally, its anterior margin (lateral view) often angularly bent (fig. 3b).

Legs: Fore femur (Fig. 6) with row of three erect and sharply pointed spines, diminishing in length towards tibia. The most distal spine often bicuspidate, forming a very small 4th spine. Most proximal spine slightly shorter than distance to middle spine. Middle spine triangular, very broad at its base.

Tegmina and wings: Hyaline, though tegmina sometimes with darkly suffused spots along veins. Tegmina with 8, wings with 6 apical areas. Hyaline border along hind margin of tegmen distinct, though narrow. This border slightly broader in wing. Veins

ochraceous, sometimes tinged with red, and set with many long setae.

Tymbals: With 3-5, generally 4, parallel sclerotized ridges from dorsal to ventral tymbal margin. Often traces of red between dorsal parts of tymbal ridges.

Opercula: Male operculum fairly small, its distal part not covering tymbal cavity in ventral view and nearly always shorter than meracanthus, generally not reaching to anterior margin of 2nd abdominal segment. Operculum in ventral view reaching to under, or medially of, meracanthus. Female operculum smaller than that of male, sickle-shaped and erect.

Abdomen: Male abdomen conspicuous by almost transparent sides, its dorsal and distal parts darkened and brown speckled, ventral parts unspeckled. Lateroventral row of dark spots generally very distinct. Hind margins of abdominal segments often reddish. First and second sternites adjacent. First tergite very short and often partly hidden under metanotum (in *B. arabuensis* distinctly longer than in other species). Second tergite medially with almost straight anterior margin. Auditory capules well developed, globularly swollen. Female abdomen more robust than that of male, darker coloured, and more densely speckled. Ovipositor sheaths sometimes reaching beyond apex of caudodorsal beak. Female caudodorsal beak often truncate at apex.

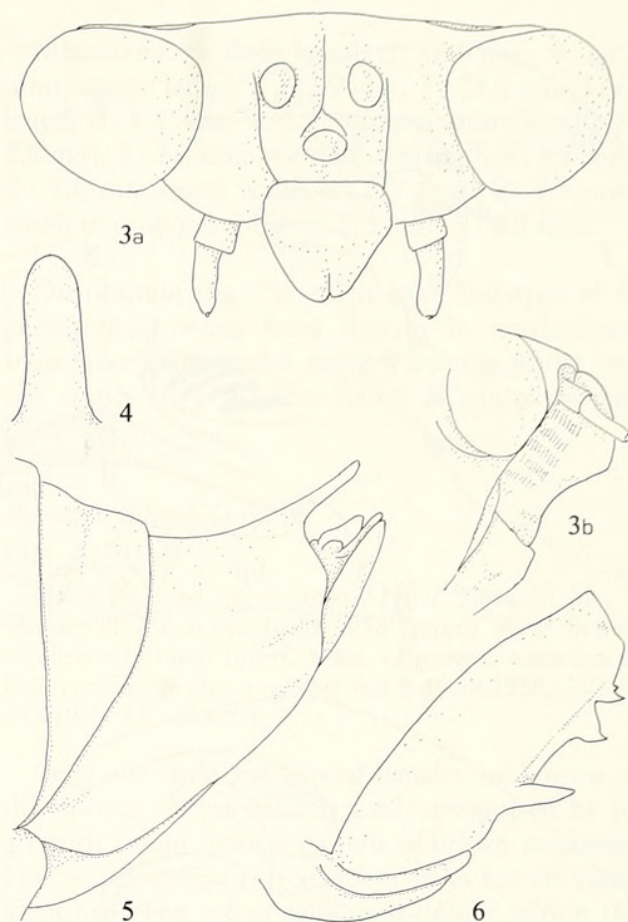
Male genitalia: Caudodorsal beak strongly bent, making an almost right angle with dorsal margin of pygofer. Dorsal margin of pygofer not continuously rounded into dorsal margin of beak, and weakly concave near apex of beak. Caudodorsal beak very broad and straight, dorsally flattened, and with bluntly rounded or truncate, often weakly concave, apex. Lateral lobe of pygofer with strongly swollen, often conically shaped, protuberance, projecting posteriorly beyond margin of pygofer. Claspers fairly long, parallel, and generally directed posteriad. Apical part of clasper hardly bent down, with large and sharply edged ventral hollow. Aedeagus S-curved with lateral lobes at basal curve. Apical part of aedeagus extremely long and slender (compared to other species of *Baeturia*). Aedeagal pore narrow and oval.

***Baeturia guttulipennis* Blöte**
(figs. 2-13)

Baeturia guttulipennis Blöte, 1960: 69, fig. 15; de Boer, 1994c.

Material examined: Bewani R. territ., 1200 m, 1939, W. Stüber, ♂ holotype, RMNH; Bivak 39A, Star Range, 1150 m, 6.vii.1959, 1 ♀ *Baeturia guttulipennis*? det. H.C. Blöte, RMNH.

B. guttulipennis is easily separated from other spe-



Figs. 3-6. *Baeturia guttulipennis* Blöte, 1960. – 3a, head in dorsal view, holotype; 3b, head in lateral view, holotype; 4, female caudodorsal beak in dorsal view; 5, female genital segment in lateral view; 6, fore femur, holotype.

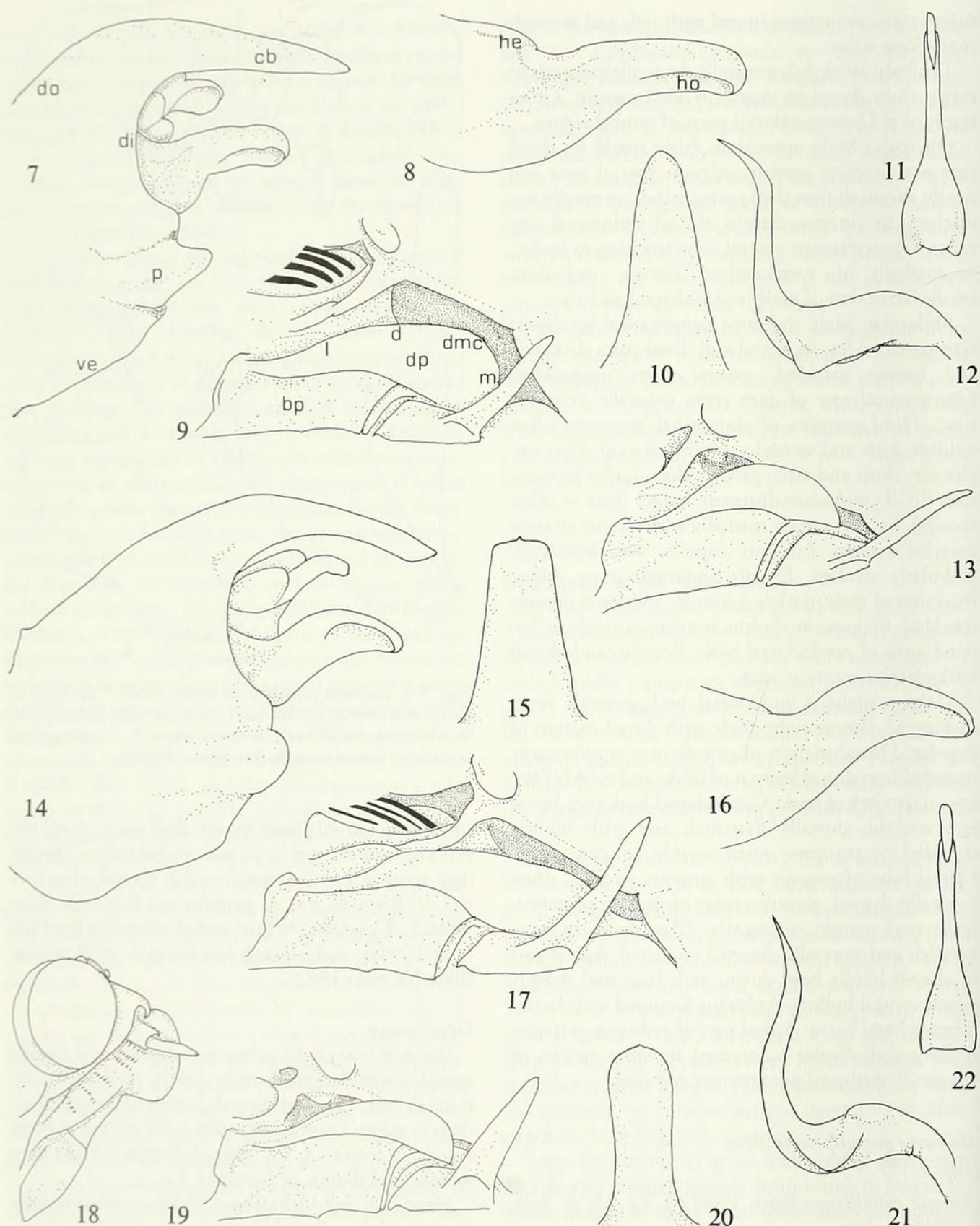
cies of the *nasuta* group by the dark spots along the veins of tegmina and by its five tymbal ridges. Similar dark spots in tegmina were found in several other species of *Baeturia*, e.g. *B. guttulinervis* Blöte (de Boer 1994c), *B. pigrami* De Boer and *B. silveri* De Boer (de Boer 1994a), and, though less distinct, in *B. nasuta* Blöte (de Boer 1982).

Description

Body of male light ochraceous brown and weakly speckled with brown. Female darker, red-brown and more densely speckled. Female head and thorax larger than in male. Tegmina of males 1.2 x as long as body length, of females 1.5 x. Male abdomen 1.3 x as long as head and thorax, of females 1.1 x.

Head (fig. 3a): Ochraceous, brown-stained mainly on vertex lobes. Postclypeus bluntly rounded anteriorly, weakly protruding in male, more strongly in female. Postclypeus 1.4-2.0 x as wide as long. Postclypeus in lateral view (fig. 3b) distinctly swollen, anterior margin forming an almost right angle at 1/2 its length, and concave to antedypeus.

Thorax: Pronotum ochraceous with dark speckling predominantly in medial band and on medial parts of



Figs. 7-13. *Baeturia guttulipennis* Blöte, 1960: 7, pygofer in lateral view, holotype; 8, clasper, holotype; 9, male operculum, holotype; 10, male caudodorsal beak in dorsal view, holotype; 11, aedeagus from behind, holotype; 12, aedeagus in lateral view, holotype; 13, female operculum. 14-22. *Baeturia splendida* sp. n.: 14, pygofer in lateral view; 15, male caudodorsal beak in dorsal view; 16, clasper; 17, male operculum; 18, head in lateral view; 19, female operculum; 20, female caudodorsal beak in dorsal view; 21, aedeagus in lateral view; 22, aedeagus from behind. Lettering: bp = basal part of operculum; cb = caudodorsal beak; d = distal margin of operculum; di = distal margin of pygofer; dmc = distomedial corner of operculum; do = dorsal margin of pygofer; dp = distal part of operculum; he = clasper heel; ho = clasper hollow; l = lateral margin of operculum; m = medial margin of operculum; p = protuberance on lateral lobe of pygofer; ve = ventral margin of pygofer.

pronotal lobes, unspeckled in and along its fissures. Mesonotum greenish brown, weakly brown speckled in male, but densely speckled in female. Male with two brown spots in front of cruciform elevation.

Legs: Ochraceous, often reddish towards tarsi, and brown speckled. Fore femur (Fig. 6) with row of three or four sharply pointed and erect spines.

Tegmina and wings: Tegmina with dark brown markings concentrated along veins. Wings hyaline. Veins ochraceous brown, densely set with setae.

Tymbal organ: Five darkly sclerotized parallel ridges spanning the tymbal from dorsal to ventral margin. Four intercalary ridges form a lateral band across tymbal.

Opercula: Male operculum (fig. 9) very small and not covering tymbal cavity. Distal part of operculum erect and reaching to about 2/3 the length of meracanthus, but not reaching to abdomen. Lateral margin of distal part short, concavely bent into crest around distolateral corner of basal part, and convexly bent into long and almost straight distal margin. Distomedial corner rounded, medial margin straight. Female operculum (fig. 13) almost as large as that of male, broadly sickle-shaped and curved to abdomen, with almost continuously rounded distal margin.

Abdomen: Male abdomen weakly inflated, yellow brown and brown speckled, though ventrally unspeckled. Tergites 3-6 almost transparent laterally. A distinct lateroventral row of brown spots on tergites 3-7. First tergite very short and medially partly hidden under metanotum. Female abdomen more robust than that of male, dark reddish brown, and densely speckled. Lateroventral spots on tergites 3-7 almost lost in speckling. Ovipositor sheaths not reaching to apex of caudodorsal beak (fig. 5). Female caudodorsal beak in dorsal view (fig. 4) sharply pointed at apex.

Male genitalia: Pygofer in lateral view as in fig. 7. Dorsal margin weakly convex, strongly bent into almost straight caudodorsal beak. Distal margin concave, gradually bent into straight margin of beak. Protuberance on lateral lobe of pygofer rounded and conically projecting posteriad. Pygofer lobe forming an angular corner just above this protuberance. Ventral margin almost straight, but angularly bent just under lateral protuberance. Ventral margins converge to sharp angle at base of pygofer opening. Caudodorsal beak in dorsal view (fig. 7) rounded at apex. Clasper (fig. 8) almost straight and directed posteriad, with long and slender, dorsally smoothly rounded, apical part. Basal part of clasper with weakly developed clasper heel. Clasper hollow fairly long. Aedeagus (fig. 12) with very long and slender apical part and well developed lateral lobes. Aedeagus from behind (fig. 11) very slender, aedeagal pore narrow, oval shaped and truncate at apex.

Measurements: Body length ♂: 18.6 mm, ♀: 18.2 mm; tegmen length ♂: 22.9 mm, ♀: 28.0 mm; head length ♂: 1.4 mm, ♀: 1.8 mm; pronotum length ♂: 2.4 mm, ♀: 2.8 mm; mesonotum length ♂: 3.8 mm, ♀: 4.8 mm; head width ♂: 3.7 mm, ♀: 4.3 mm; width of pronotal collar ♂: 5.3 mm, ♀: 6.5 mm.

Distribution (fig. 2). – The male holotype of *B. guttulipennis* comes from Bewani in northeastern Irian Jaya; a female that possibly belongs to the species comes from the Star Range in central eastern Irian Jaya.

Baeturia splendida sp. n. (figs. 2, 14-22)

Holotype male: 'NEW GUINEA NE / Torricelli Mts. / Mokai Vill. 750 m / xii-16-31-1958' (print); 'W.W. Brandt / Collector / Bishop' [print], BPBM. – Paratypes: same data as holotype 5 ♀, BPBM; same data but 8-15.xii.1958, 3 ♀; 1-23.i.1959, 1 ♀, all BPBM.

Only one male and several females are known of this species. *B. splendida* is easily recognized by its greenish colour, with a pattern of brown markings. Due to this colour pattern the females too are easily identified. The colour pattern is unique within the *nasuta* group.

Description

Head and thorax olive green, abdomen yellowish brown. Tegmina of male 1.2 x as long as body length, of females 1.3-1.4 x. Male abdomen 1.2 x as long as head and thorax, of females 0.9-1.1 x.

Head: Olive-green. Vertex lobe with dark brown spot between eye and lateral ocellus. Postclypeus distinctly protruding, bluntly rounded anteriorly, and 1.1-1.8 x as wide as long. Postclypeus in lateral view (fig. 18) distinctly and angularly swollen, anteriorly almost globularly inflated.

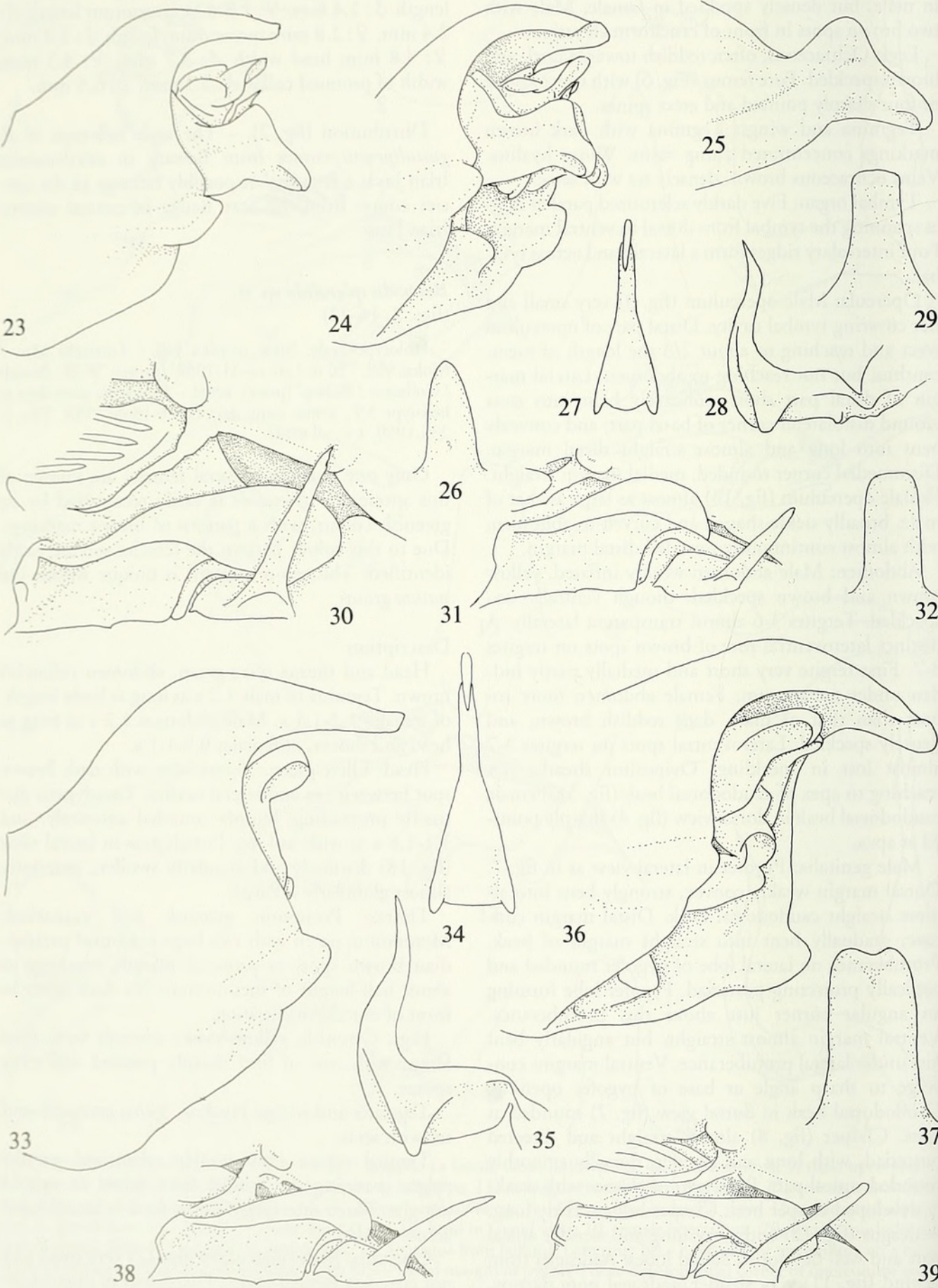
Thorax: Pronotum greenish and unmarked. Mesonotum green with two large semi-oval paramedian brown spots at pronotal margin, reaching to about half-length of mesonotum. No dark spots in front of cruciform elevation.

Legs: Greenish, yellow-brown towards tarsi. Fore femur with row of four sharply pointed and erect spines.

Tegmina and wings: Hyaline. Veins greenish, and set with setae.

Tymbal organ: Four weakly sclerotized parallel ridges spanning the tymbal from dorsal to ventral margin. Three intercalary ridges form a lateral band across tymbal.

Opercula: Male operculum (fig. 17) very small and not covering tymbal cavity. Distal part of operculum erect and reaching to about half-length of meracanthus.



thus, not reaching to abdomen. Lateral margin of distal part short, concavely bent into crest around distolateral corner of basal part, and convexly bent into long and almost straight distal margin. Distomedial corner rounded, medial margin straight. Female operculum (fig. 19) almost as large as that of male, broadly sickle-shaped and erect, with almost continuously rounded distal margin.

Abdomen: Male abdomen hardly inflated, yellow brown, darker brown in distal part. Third and 4th tergites almost transparent laterally. A distinct lateroventral brown spot on 3rd tergite and a slightly smaller lateral spot on 8th tergite. First tergite very short and medially partly hidden under metanotum. Female abdomen more robust than that of male, light brown, with a dark brown lateroventral spot on 3rd tergite. Ovipositor sheaths not reaching to apex of caudodorsal beak. Female caudodorsal beak in dorsal view (fig. 20) weakly convex, almost truncate, at apex.

Male genitalia: Pygofer in lateral view as in fig. 14. Dorsal margin weakly convex, angularly bent into almost straight caudodorsal beak. Distal margin concave, almost continuously bent with margin of beak. Protuberance on lateral lobe of pygofer bluntly rounded and weakly projecting posteriad. Pygofer lobe forming an angular corner just above this protuberance. Ventral margin angularly bent at about 1/3 its length and weakly concave towards base. Ventral margins converge to sharp angle at base of pygofer opening. Caudodorsal beak in dorsal view (fig. 15) almost truncate at apex, but ending in very small and sharply pointed medial thorn. Clasper (fig. 17) curving upwards with long and slender, dorsally smoothly rounded and recurving, apical part. Basal part of clasper without clasper heel. Clasper hollow fairly long. Aedeagus (fig. 21) with very long and slender apical part. Basal part of aedeagus with small and angular dorsolateral protuberances. Lateral lobes small, hardly projecting in lateral view. Aedeagus from behind (fig. 22) very slender. Aedeagal pore narrow, oval-shaped and truncate at apex.

Measurements: Body length ♂: 16.5 mm, ♀: 16.0-19.1 mm ($\bar{x}$ 18.0 mm $\pm$ 0.9); tegmen length ♂: 20.6 mm, ♀: 22.0-25.5 mm ($\bar{x}$ 24.6 mm $\pm$ 1.0); head length ♂: 1.5 mm, ♀: 1.6-1.9 mm ($\bar{x}$ 1.8 mm); pronotum length ♂: 2.3 mm, ♀: 2.8-3.2 mm ($\bar{x}$ 2.9 mm); mesonotum length ♂: 4.0 mm, ♀: 4.0-5.2 mm ($\bar{x}$ 4.8 mm); head width ♂: 3.3 mm, ♀: 4.0-4.8 mm ($\bar{x}$ 4.6 mm); width of pronotal collar ♂: 5.1 mm, ♀:

5.7-7.0 mm ($\bar{x}$ 6.6 mm).

Distribution (fig. 2). – *B. splendida* is only known from the Torricelli mountains in northern Papua New Guinea.

Etymology. – *Splendidus* (Latin) refers to the beautiful colour pattern of this species.

***Baeturia gibberosa* sp. n.**
(figs. 2, 23-31)

Holotype: 'New Guinea SE / Popondetta / 25 m vi.66' (-print); 'Shanahan- Lippert / Light Trap / Bishop Museum' (print), ♂, BPBM. – Paratypes: NEW GUINEA: Popondetta, 60 m, 1-4.ix.1963, J. Sedlacek, 2♂, BPBM; Popondetta, Inbora Plant'n, 23.ix.1963, P. Shanahan, 2♂, BPBM; NORMANBY: Wakaiuna, Sewa Bay, 5-9.xi.1956, W.W. Brandt, 1♀, BPBM; same data but 1-10.xii.1956, 1♀; 11-20.xii.1956, 1♀, both BPBM; Wamula, 400-500 m, 31.xii.1988, R. de Keyzer, 3♂, Moul.

B. gibberosa is easily recognized by the rectangular dorsal corner of its clasper.

Description

Body ochraceous brown, sometimes tinged with red, and densely speckled with brown. Tegmina of males 1.1-1.2 x as long as body length, of females 1.3 x. Male abdomen 1.3-1.5 x as long as head and thorax, of females 1.0 x.

Head: Ochraceous, brown speckled. Postclypeus weakly protruding and bluntly rounded anteriorly, 1.7-2.2 x as wide as long. Postclypeus in lateral view distinctly swollen with straight anterior margin, concave towards anteclypeus.

Thorax: Pronotum ochraceous, brown speckled. Mesonotum greenish brown, slightly brown speckled. Two dark spots in front of cruciform elevation.

Legs: Ochraceous and weakly speckled. Fore femur with row of four sharply pointed and erect spines.

Tegmina and wings: Hyaline. Veins ochraceous, moderately set with setae.

Tymbal organ: Four weakly sclerotized parallel ridges spanning the tymbal from dorsal to ventral margin. Three intercalary ridges form a lateral band across tymbal.

Opercula: Male operculum (fig. 30) small and only partly covering tymbal cavity. Distal part of operculum oval shaped, slightly erect and reaching to about 2/3 of length of meracanthus, in some specimens reaching to anterior margin of 2nd abdominal

Figs. 23-31. *Baeturia gibberosa* sp. n. – 23, pygofer in lateral view; 24, pygofer from aslant; 25, clasper; 26, female caudodorsal beak in dorsal view; 27, aedeagus from behind; 28, aedeagus in lateral view; 29, male caudodorsal beak in dorsal view; 30, male operculum; 31, female operculum

Figs. 32-39. *Baeturia retracta* sp. n. – 32, female caudodorsal beak in dorsal view; 33, pygofer in lateral view; 34, aedeagus from behind; 35, aedeagus in lateral view; 36, pygofer from aslant; 37, male caudodorsal beak in dorsal view; 38, female operculum; 39, male operculum.

segment. Lateral margin of distal part fairly long and directed mesiad, concavely bent into crest around distolateral corner of basal part, and forming an obtuse angle with straight distal margin. Medial part of operculum angularly rounded, extending medially of mercanthus. Female operculum (fig. 31) short, sickle-shaped and erect.

Abdomen: Male abdomen not inflated, ochraceous brown and brown speckled, though ventrally unspeckled. Segmental hind margins reddish. Tergites 3-6 almost transparent laterally. A distinct lateroventral row of brown spots on tergites 3-8. First tergite very short and medially partly hidden under metanotum. Female abdomen red-brown and densely speckled. Female caudodorsal beak (fig. 26) sharply pointed at apex.

Male genitalia: Pygofer in lateral view as in fig. 23. Dorsal margin weakly concave, but convexly bent into almost straight caudodorsal beak and concave near apex of beak. Distal margin concave, and continuously bent into margin of beak. Protuberance on lateral lobe of pygofer bluntly rounded and weakly projecting posteriad. Pygofer lobe forming a small angular corner just above this protuberance. Ventral margin almost straight, but convexly bent just under lateral protuberance. Ventral margins converge to sharp angle at base of pygofer opening (fig. 24). Caudodorsal beak in dorsal view (fig. 29) truncate at apex. Clasper (fig. 25) almost straight and directed posteriad. Apical part of clasper forming a distinct and angularly protruding dorsal crest, giving the clasper a humped appearance. Clasper hollow fairly short. Basal part of clasper gradually widening, not forming an angular clasper heel. Aedeagus (fig. 27) with fairly long and slender apical part, but much shorter than in most other species of this group, and well developed lateral lobes. Aedeagus from behind (fig. 28) very slender, aedeagal pore narrow, oval-shaped and truncate at apex.

Measurements: Body length ♂: 14.7-17.8 mm ($\bar{x}$ 15.9 mm $\pm$ 1.0), ♀: 16.5-17.7 mm ($\bar{x}$ 17.2 mm $\pm$ 0.5); tegmen length ♂: 17.1-19.1 mm ($\bar{x}$ 18.1 mm $\pm$ 0.8), ♀: 21.9-22.3 mm ($\bar{x}$ 22.1 mm $\pm$ 0.9); head length ♂: 1.2-1.5 mm ($\bar{x}$ 1.3 mm), ♀: 1.5-1.9 mm ($\bar{x}$ 1.7 mm); pronotum length ♂: 1.9-2.3 mm ($\bar{x}$ 2.1 mm), ♀: 2.6-2.9 mm ($\bar{x}$ 2.8 mm); mesonotum length ♂: 2.9-3.5 mm ($\bar{x}$ 3.2 mm), ♀: 4.1-4.6 mm ($\bar{x}$ 4.4 mm); head width ♂: 2.5-3.7 mm ($\bar{x}$ 3.3 mm), ♀: 4.0-4.3 mm ($\bar{x}$ 4.2 mm); width of pronotal collar ♂: 4.3-5.2 mm ($\bar{x}$ 4.6 mm), ♀: 5.9-6.4 mm ($\bar{x}$ 6.2 mm).

Distribution (fig. 2). – *B. gibberosa* is recorded from Popondetta on the Papuan Peninsula and from Normanby Island.

Etymology. – *Gibberosus* (Latin) humpbacked refers to the hump-shaped dorsal protrusion of the clasper.

Baeturia retracta sp. n.

(figs. 2, 32-39)

Holotype: 'PAPUA NEW GUINEA / Tabubil, Western Province / 5°15' S 140°13' E / 13 oct. 1992 / R.B. Lachlan' (print, day and month written); 'On loan from / M.S. Moulds / Sydney' [print, violet label], ♂, AMS). – Paratypes: same data as holotype but 17.x.1992, 1 ♂, Moul; same data but 29.xi.1992, 1 ♂, Moul; Garaina, 11-14.vii.1969, J.L. Gressitt, 1 ♂, BPBM; Gurakor, Wampit R. Valley, 45 mi from Lae, 670 m, 8.v.1959, L.J. Brass, Sixth Archbold Exped. to Papua New Guinea, 1 ♀, AMNH; Gurakor, 7.vii.1965, H. Pyka, 1 ♂, SMN; Iongai, 1700-1900 m, 9.xi.1965, J. & M. Sedlacek, 1 ♀, BPBM; Iongai, 10 km E of Mt. Albert Edward, 1450-1800 m, 8-10.xi.1965, J. Sedlacek, 1 ♂, BPBM; Kiunga, 18.vii.1970, O.K. McCaw, 1 ♂, AMS; Kiunga, 5°15' S 141°05' E, 2280 m, 25.v.1970, O.K. McCaw, 1 ♀, Moul; Kiunga, Fly River, 35 m, viii.1969, J. Sedlacek, 1 ♀, BPBM; Koitaki, 1500 ft, x-xi.1928, Pemberton, 1 ♂, BPBM; Wau, Morobe Distr., 1050-1100 m, 15.xii.1961, J., J.H. & M. Sedlacek, 1 ♂, BPBM; Yagaum, Madang, 3-5.vi.1965, H. Pyka, 1 ♂, SMN; MANUS: Manus isl., 24.i.1966, 1 ♂, SMN.

B. retracta can be recognized by its erect and retracted claspers, which lie for the greater part concealed within the pygofer. The species is closely related to *B. laminifer* Blöte, sharing a very similar clasper with a similarly square, laminiform, dorsal protrusion. This protrusion, however, is completely concealed within the pygofer, and therefore hardly visible in *B. retracta*. *B. retracta* is regarded as a separate species, since the retraction of the clasper appears to be a constant character. Furthermore, *B. retracta* tends to have a more strongly swollen postclypeus, while males have a slightly shorter operculum and a shorter, more rounded, protuberance on the lateral lobe of the pygofer.

Description

Body of males light yellow-brown or greyish brown and distinctly speckled with brown. Females more red-brown and more densely speckled. Female head and thorax larger than in male. Tegmina of males 1.1-1.3 x as long as body length, of females 1.2-1.4 x. Male abdomen 1.2-1.5 x as long as head and thorax, of females 1.0-1.3 x.

Head: Ochraceous, densely brown speckled. Postclypeus weakly protruding, almost oblong-shaped and bluntly rounded anteriorly. Postclypeus 1.4-2.0 x as wide as long. Postclypeus in lateral view distinctly swollen with strongly convex anterior margin.

Thorax: Pronotum ochraceous or greyish brown, with brown speckling concentrated in, often somewhat reddish, medial band and on medial parts of pronotal lobes. Mesonotum greenish brown, densely brown speckled. Two brown spots in front of cruciform elevation.

Legs: Ochraceous, often reddish towards tarsi, and weakly speckled. Fore femur with row of three or four sharply pointed and erect spines.

Tegmina and wings: Hyaline. Veins ochraceous, and densely set with setae.

Tymbal organ: Four weakly sclerotized parallel ridges spanning the tymbal from dorsal to ventral margin. Three intercalary ridges form a lateral band across tymbal.

Opercula: Male operculum (fig. 39) very small and not covering tymbal cavity. Distal part of operculum erect and reaching to about half-length of meracanthus, but not reaching to abdomen. Lateral margin of distal part short, concavely bent into crest around distolateral corner of basal part, and angularly bent into long and concave distal margin. Distomedial corner rounded, medial margin straight. Male from Iongai with larger, more oval-shaped, operculum. Female operculum (fig. 38) almost as large as that of male, broadly sickle-shaped and erect, with almost continuously rounded distal margin.

Abdomen: Male abdomen not inflated, ochraceous brown and brown speckled, though ventrally unspeckled. Segmental hind margins sometimes reddish. Tergites 3-6 almost transparent laterally. A distinct lateroventral row of brown spots on tergites 3-8. First tergite very short and medially almost completely hidden under metanotum. Female abdomen more robust than that of male, dark reddish brown, and densely speckled. Lateroventral spots on tergites 3-8 very distinct. Ovipositor sheaths not reaching to apex of caudodorsal beak. Female caudodorsal beak in dorsal view (fig. 32) truncate at apex (pointed in Iongai specimen).

Male genitalia: Pygofer in lateral view as in fig. 33. Dorsal margin concave, but convexly bent into almost straight caudodorsal beak and concave near apex of beak. Distal margin almost straight, but concavely bent into straight margin of beak. Protuberance on lateral lobe of pygofer bluntly rounded and weakly projecting posteriad. Pygofer lobe sometimes forming a small rounded corner just above this protuberance. Ventral margin almost straight, but convexly bent just under lateral protuberance and weakly concave near base. Ventral margins converge to sharp angle at base of pygofer opening (fig. 36). Caudodorsal beak in dorsal view (fig. 37) weakly bicuspidate at apex. Clasper strongly upcurved, reaching into basal part of caudodorsal beak. Dorsal part of clasper with lamini-form and square-shaped protrusion. Clasper hollow fairly short. Aedeagus (fig. 35) with long apical part, but shorter and broader than in most other species of this group, and with well developed lateral lobes. Basal part of aedeagus very stout. Aedeagus from behind (fig. 34) long and slender, though fairly broad between its lateral lobes. Aedeagal pore narrow, oval-

shaped and truncate at apex.

Measurements: Body length ♂: 14.9-19.6 mm ($\bar{x}$ 17.2 mm $\pm$ 1.4), ♀: 16.3-18.1 mm ($\bar{x}$ 17.5 mm $\pm$ 0.7); tegmen length ♂: 18.2-21.9 mm ($\bar{x}$ 20.6 mm $\pm$ 1.1), ♀: 21.4-25.9 mm ($\bar{x}$ 23.0 mm $\pm$ 1.7); head length ♂: 1.3-1.5 mm ($\bar{x}$ 1.4 mm), ♀: 1.6-1.8 mm ($\bar{x}$ 1.7 mm); pronotum length ♂: 2.1-2.5 mm ($\bar{x}$ 2.2 mm), ♀: 2.4-2.7 mm ($\bar{x}$ 2.6 mm); mesonotum length ♂: 3.2-4.1 mm ($\bar{x}$ 3.7 mm), ♀: 3.9-4.8 mm ($\bar{x}$ 4.2 mm); head width ♂: 3.4-3.8 mm ($\bar{x}$ 3.7 mm), ♀: 3.9-4.2 mm ($\bar{x}$ 4.1 mm); width of pronotal collar ♂: 4.7-5.6 mm ($\bar{x}$ 5.1 mm), ♀: 5.7-6.3 mm ($\bar{x}$ 5.9 mm).

Distribution (fig. 2). — *B. retracta* is widely distributed in Papua New Guinea, and also recorded from Manus Island of the Admiralty Islands.

Etymology. — *Retracta* refers to the retracted claspers of this species.

ACKNOWLEDGEMENTS

For the loan of material I am indebted to: Dr R.T. Schuh (AMNH); Mr. B.J. Day (AMS); Dr W.J. Knight and Mr. M.D. Webb (BMNH); Mr. G.M. Nishida and Mr. K. Arakaki (BPBM); Mr. J. van Tol (RMNH); Mr. F. Heller (SMN); and to Mr. M.S. Moulds for the loan of specimens from his private collection.

I would like to thank Mr. G. Verlaan for technical assistance and Mr. D.A. Langerak for preparing the map (fig. 2). I am indebted to Prof. Dr F.R. Schram and Dr J.P. Duffels (Institute for Systematics and Population Biology, University of Amsterdam) for their critical reading and comments on the manuscript.

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Received: 13 January 1994

Accepted: 11 April 1994



De Boer, A J. 1994. "Four species added to the *Baeturia nasuta* group, with notes on taxonomy and biogeography (Homoptera, Tibicinidae)." *Tijdschrift voor entomologie* 137, 161–172.

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