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TENTATIVE GROUPING OF THE TRYPOXYLON SPECIES BASED UPON THE STRUCTURE OF THE MALE GENITAL ORGANS WITH APPENDIX OF THE DISTRIBUTION TABLE (HYMENOPTERA, SPHECIDAE)

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By K. TSUNEKI

During the course of my first taxonomic study of the Japanese species of Trypoxylon in 1964 I was deeply impressed by the fact that the external resemblance between species did not always show the close affinity between them, because in the structure of their genital organs of the male they were not always consistent with each other as in the external characters. A good instance for such a disagreement is supplied by the comparison of T. malaisei and T. regium, both of which occur in the Ussuri region and Japan.

As was pointed out by Gussakovskij in his description of both the species, regium is very close to malaisei in the external morphology, differing in the form of the apical margin of the clypeus mainly. In the structure of the male genital organs, however, they differ markedly from each other, the former belongs to the primitive type, while the latter to the advanced one, and they are considered to be remotely separated in the phylogenetic relationships.

Such being the case, a doubt is thrown upon the grouping of the species that is made on the basis of the external morphology, because such an attempt has a danger to group together those species which are markedly different in the phylogenetic relationships. During my recent study of the southern species of the genus similar instances have successively been discovered.

At present, at the end of my study of the Indo-Australian and East Asiatic representatives of the genus, a considerable number of the species are investigated in regard to the structure of the male genital organs. I, therefore, try to group them together on the basis of the characters of the organs.

In classifying the morphological characters of the genitalia the first problem is that upon what part of the organs stress should be placed. By comparing the organs with the flower of the plant it is obvious that the penis valve should first be dealt with, since the paramere and volsella are only the supporting organs like the petals and stamens of the flower. Based upon the morphological difference of this organ three major groups are separated, the third one of which are further subdivided into three submajor groups. Then the character of the apical part of the paramere is examined, since the part is presumed to concern more directly with the copulation than the other parts. Then the various characters of basiparamere and volsella are compared. I attempted various grouping, because, in accordance with the part on which stress is placed, the system of the classification becomes considerably varied. As for instance I showed a different trial in major group 1, in addition to the formal grouping. The formal grouping is the final product which will be presented in the form of the key.

As to the result, however, there is a difficult problem. That is, what step of the classification should be considered "Group". I provisionally deal with the lowermost step as "Group", with a considerable query. Because, in many of my Groups the member is but a single and they may represent not the group- but the specific characters only.

CLASSIFICATION OF THE SPECIES

1. MAJOR GROUPS

A. Penis valve without shoulder and without sickle ..... Major-group 1.
B. Penis valve without shoulder, but with sickle ..... Major-group 2.
C. Penis valve with shoulder and with sickle ..... Major-group 3.

2. KEY TO THE GROUPS OF MAJOR GROUP 1

1 Paramere with apical part simple ..... Supergroup A .. 2
– Paramere bifurcate at apex ..... Supergroup B .. 10
2 Basiparamere with inner expansion marked 3
– Basiparamere with inner expansion weak 7
3 Volsella spatulate 4
– Volsella slender and attenuate apically 6
4 Outer area of basiparamere broadly expanded and rolled and overlapped with the rolled inner expansion (Figs. 2, ventral, and 3, dorsal)
Group of *prominens* (member 1)
– Not as above (outer area of basiparamere with triangular prominence on inner margin) 5
5 Apical part of paramere broad, lobiform, bearing a haired tubercle at base on inner margin (volsella broadest before apex (Figs. 4 and 5)
Group of *regium* (1)
– Apical part of paramere slender, inner margin smooth (volsella broadest near middle)(Figs. 6 and 7)
Group of *striolatum* (1)
6 Apical part of paramere broad, inner expansion with a haired inorassate part on inner margin (volsella elongate triangular, apical part of penis valve not blackish)
Group of *krombeini* (1)
– Apical part of paramere slender, inner expansion smooth (volsella at base triangular and then slender apically, apical part of penis valve blackish and sickle-shaped)(Figs. 9, 10 and 11)
Group of *bakeri* (1)
(hitherto belonged to Group of *scutatum*)
7 Volsella simple or nearly 8
– Volsella complicate and adorned with dense tufts of hair (paramere and volsella in *nodosicorne*: Figs. 19, 20 and 21; in *fletcheri*: Figs. 22, 23 and 24;

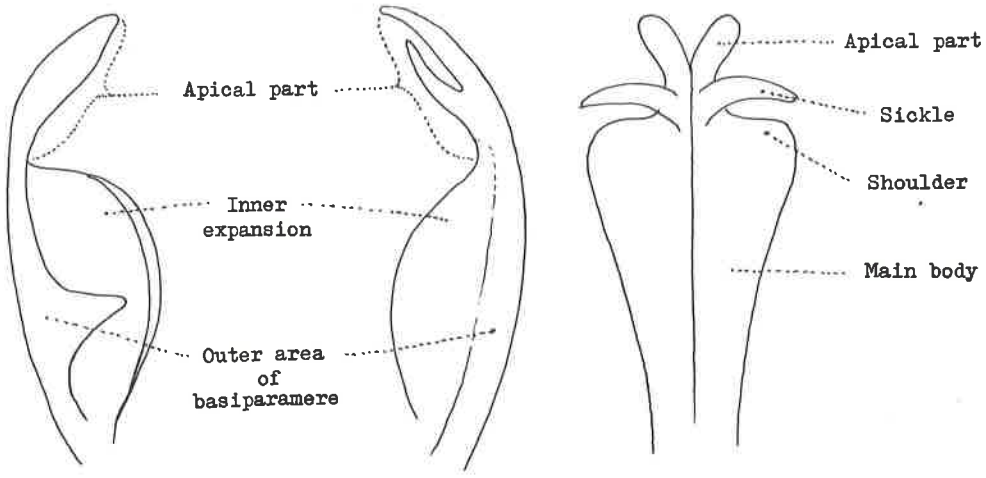


Fig. 1. Ventral view of paramere and penis valve

in shimoyamai: Figs. 25 A and B) Group of nodosicorne (3)

8 Apical parts of parameres broad and crossed at apical area with each other, with ventral surface densely covered with hair, penis valve laterally compressed, broad and at apex narrowed into bill-shape (volsella short, subquadrate, with ventro-apical corner pointed and at base provided with a tubercle) (Figs. 12 and 13) Group of paulum (1)

\- Apical parts of parameres and penis valve different 9

9 Apical part of paramere leaf-like, apical part of penis valve with a pair of pigmented lines (volsella short)(Figs. 14, 15 and 16) Group of curvicorne (1)

\- Apical part of paramere swollen into hemisphere before apex, penis valve without pigment lines (volsella except base slender)(Figs. 17 and 18) Group of sinuosiscutis (1) (hitherto belonged to Group of scutatum)

10 Basiparamere with inner expansion marked 11

\-- Basiparamere with inner expansion weak (volsella short triangular, with apex pointed, apical lobes of paramere very broad, similar in length and form, ventral one with a dense tuft of hair at base, penis at apical part laterally compressed, enlarged and at apex truncate)(Figs. 69, ventro-lateral; 70, apical lobes of paramere; 71, penis valve) Group of capillatum (1)

11 Volsella simple, spatulate or elongate triangular or subquadrate 12

\-- Volsella irregular in form (apical lobes of paramere similar in length or nearly) 22

12 Volsella spatulate 13

\-- Volseela not spatulate 18

13 Apical lobes of paramere similar in length or nearly 14

\-- Ventral one of apical lobes of paramere very short, triangular in form 17

14 Outer area of basiparamere more or less produced inwards 15

\-- Outer area not produced inwards (apical part of penis valve oviform, black pigmented except oval window, ventral lobe of paramere slightly shorter and distinctly broader than dorsal) (Figs. 38,A and B) Group of concinnum (1)

15 Apical split of paramere deep, inward prominence of outer area of basiparemere triangular 16

\-- Apical split of paramere shallow, not reaching inner expansion, inwards prominence of outer area more or less rounded (inner margin of outer area of basiparamere coarsely serrate and overlapped with roll of inner expansion, volsella broad spatulate)(genitalia in angoramum: Fig. 33, ventral; in popondettae: Fig. 35; in warisum: Fig. 36; apical split of paramere in angoramum: Fig. 34; in warisum: Fig. 37) Group of angoramum (3)

16 Inward prominece of basiparamere supporting an oblong membraneous septum on it like a flag (apical part of penis valve black pigmented and turned backwards!)(Figs. 26, dorsal; 27, lateral; 28, ventral; 29, dorso-lateral; 30, apical part of penis valve) Group of varipiloides (1)

\-- Inward prominence of basiparamere simple, but inner margin of ventral lobe of paramere strongly serrate (apical part of penis valve not black pigmented and normally curved ventrally)(Figs. 31 and 32, ventral) Group of taiwanum (1)

17 Longer one of apical lobes of paramere slender and smoothly attenuate apically, inner expansion of basiparamere strong and rolled (Figs. 39 and 40) Group of yogator (1)

\-- Longer one of apical lobes of paramere somewhat broad and parallel, but from about middle apically abruptly narrowed, inner expansion of basiparamere not rolled (Figs. 41, ventro-lateral; 42, penis) Group of fulviventre (1)

18 Volsella elongate triangular, smoothly attenuate towards apex, apex pointed 19

\-- Volsella different in form 21

19 Penis valve at base of apical part with a pair of sickle-shaped pigment collections (apical split of paramere deep, lobes resulted appr. similar in length and form, ventral one infuscated)(genitalia and apical part of penis valve in appendiculatum: Figs. 43, 44 and 45; in vicinum: Figs. 46 and 47; in basilanense: Fig. 48; in sibuyaense: Figs. 49 and 50 and in laeviceps Figs. 51 and 52) Group of appendiculatum (5)

\-- Penis valve without pigment collections 20

20 Ventral one of apical lobes of paramere emarginate at apex, with a long bristle near apex, inner margin of dorsal lobe fringed with thick curved hair (Figs. 53, 54 and 55, apical) Group of singaporense (1)

-- Paramere without apical seta, without strong inner fringe of thick hair (not well studied)(Fig. 56, lateral) Group of jacobsoni (1)

21 Volsella in ventral view subtriangular, with inner margin rounded, in vertical view nearly oblong (apical part of penis valve without pigment collection, apical part of paramere without apical seta, both lobes on ventral side covered with pubescence)(Figs. 57, 58 and 59) Group of suumi (1)

-- Volsella subquadrate, with postero-lateral angle produced (apical lobes of paramere slender and markedly different in length and at base widely separated, basiparamere with a longitudinal membraneous septum within, penis valve without pigment collection)(Figs. 60 and 61) Group of kambaitium (1)

22 Volsella emarginate at apex, apical lobes of paramere comparatively broad, both gently emarginate at spex (penis valve not particularly broad, apical part not particularly slender)(Figs. 62, 63 and 64, apical) Group of maai (1)

-- Volsella not emarginate at apex, apical lobes of paramere different in form, dorsal one not emarginate at apex (penis broad, well chitinized, with pale window, apical part particularly slender and long)(Figs. 65, 66, 67 and 68, penis valve, apical) Group of maculipes (1)

ANOTHER ATTEMPT OF GROUPING, EMPHASIZING THE CHARACTER OF VOLSELLA

Volsella is not so differently structured as paramere and apparently bears a more or less connection with the external characters; for instance, in the species having the flask-shaped gastral petiole the volsella is always spatulate, though somewhat variable in the strict form (but, notice, converse is not always true!). I, therefore, tried, among others, a grouping, placing emphasis upon the structure of this organ. The result seems somewhat interesting and so it will be given for reference in the following:

1. Volsella spatulate 2
- Volsella elongate triangular 9
- Volsella short, broad lobiform, or subquadrate 15
- Volsella somewhat complicate, irregular in form, but without dense tuft of hair attached 18
- Volsella elongate, apically strongly enlarged and flattened, at basal stalk area with a row of dense hair (Figs. 72, 73) Group of truncatum (1)
- Volsella very complicate, at least with two pair of prominences, each covered at apex with dense tuft of hair (paramere simple at apex) 20

2 Paramere simple at apex 3
- Paramere bifurcate at apex 5

3 Inner and outer margins of basiparamere broadly expanded, rolled and overlapped with each other, forming a complete cylindric pouch Group of prominens (1)

- Outer area of basiparamere only triangularly produced inwards, not forming a cylinder 4

4 Apical part of paramere broad, with a haired short prominence at base on inner margin Group of regium (1)

- Apical part of paramere slender, without prominence at base Group of striolatum (1)

5 Apical lobes of paramere markedly different in length, shorter one broad triangular 6
- Apical lobes of paramere similar in length or nearly 7

6 Inner margin of basiparamere not broadly expanded Group of fulviventre (1)

- Inner margin of basiparamere broadly expanded and rolled Group of yogator (1)

7 Outer area of basiparamere triangularly and strongly produced inwards, supporting an oblong flag-like membraneous expansion upon it, apical part of penis valve dusky and turned backwards Group of varipiloides (1)

- Outer area not carying flag-like membraneous expansion, apical part of penis

valve not turned backwards 8

8 Outer area of basiparamere broadly flattened, with inner margin strongly and coarsely serrate, each tooth topped with a bristle-like hair 9

\- Outer area not broad, with inner margin smooth (ventral one of apical lobes of paramere broad lobiform, dorsal one elongate) Group of concinnum (1)

9 Apical split of paramere deep, reaching inner expansion of basiparamere Group of taiwanum (1)

\- Apical split of paramere comparatively shallow, not reaching inner expansion of basiparamere Group of angoramum (3)

10 Apical part of paramere simple 11

\-- Apical part of paramere bifurcate 13

11 Volsella smoothly attenuate apically, inner expansion of basiparamere with an incrassate haired part on the margin Group of krombeini (1)

\-- Volsella at base triangular, from about middle apically slender and subparallel-sided 12

12 Apical part of paramere semispherically swollen on ventral surface Group of sinuosiscutis (1)

\-- Apical part of paramere simply slender Group of bakeri (1)

13 Volsella generally slender, but at apical third strongly narrowed and curved inwards, ventral lobe of paramere with a long bristle near apex, dorsal one fringed on inner margin with thick curved hair, penis valve with apical part very slender and long Group of singaporense (1)

\-- Volsella smoothly attenuate apically 14

14 Apical lobes of paramere moderately broad, ventral one dark pigmented, penis valve at apical part also partly dark pigmented to form a pair of dark lines Group of appendiculatum (5)

\-- Apical lobes of paramere and penis valve not so pigmented Group of jacobsoni (1)

15 Volsella subquadrate, postero-lateral angle roundly produced and covered with hair, paramere bifurcate at apex, with lobes slender, ventral one shorter, both at base somewhat separated from each other Group of kambaitium (1)

\-- Volsella slightly elongated and curved triangular 16

16 Volsella curved inwards, paramere bifurcate, both lobes very broad and lamellate Group of capillatum (1)

\-- Volsella curved outwards, apical lobe or lobes of paramere not so broad 17

17 Paramere bifurcate at apex Group of suumi (1)

\-- Paramere simple at apex Group of curvicorne (1)

18 Volsella at apex simple and slender, on inner margin near base strongly emarginate, paramere bifurcate at apex, dorsal lobe slender, ventral one deeply emarginate at apex to form a long and a short branches Group of maculipes (1)

\-- Volsella elongate subtriangular, apex when vertically seen truncate and emarginate 19

19 Volsella on inner margin medianly somewhat produced, paramere bifurcate at apex, both lobes moderately broad, similar in length, with apex emarginate, ventral surface of paramere broadly covered with hair Group of maai (1)

\-- Volsella with a short prominence near base, paramerees simple at apex, moderately broad and crossed at apex, ventral surface covered with hair, especially closely so on apical part, penis valve with apical part norrow and short, bill-shaped Group of paulum (1)

20 This may be a group, but when stress is placed on volsella the members must be separated at the group rank:

Two pair of prominences of volsella similar in form (apical lobe of paramere moderately broad and medianly weakly ridged) Group of shimoyamai (1)

\-- Two pair of prominences of volsella different in form 21

21 Basal pair of prominences slender and curved, apical one oval and suddenly narrowed at base) Group of fletcheri (1)

\-- Volsella very complicate in structure as given in Figs. 19 (ventral), 20 (apical, namely vertically seen from apex) and 21 (lateral) Group of nodosicorne (1)

Remarks. In relation to the present major group the two facts must particularly be mentioned. One is that one of the groups, namely the group of bakeri —— species bearing the frontal shield and has hitherto been placed within the so-called scutatum group ——is substantially different from others in the structure of the apical part of the penis valve. The apparent apical part in this group is considered to be the pair of the sickle appendages in reality and the true apical part is completely degenerated. As a result the sickle comes to appear like the curved apical part. The reasons for such a presumation are that among the members of the so-called scutatum-group the developmental degrees of the apical part of the penis valve are considerably variable either individually or specifically, and that in bakeri-group apical part is produced sideways and considerably pigmented as is usually the case in the sickle. While, the other is that some of the groups have the densely pigmented area in front of, or within, the apical part of the penis valve which frequently takes the form of pair of the sikles, though not as yet been produced, that is to say, groups that are on the way towards the development of the sickle-shaped appendages.

3. KEY TO THE GROUPS OF MAJOR GROUP 2

1 Sickle and apical part of penis valve compressed dorso-ventrally, flattened and widened (greater part of so-called scutatum group) See p. 8)
\- Sickle and apical part of penis valve not flattened dorso-ventrally 2
2 Paramere simple at apex ..... Supergroup C ... 3
\- Paramere bifurcate at apex ..... Supergroup D ... 9
3 Inner expansion of basiparamere weak 4
\- Inner expansion of basiparamere broad and more or less rolled 5
4 Sickle abnormally long extended, widened and rolled to form a large auricular ball on each side of apical part of penis valve which is laterally compressed and very broad dorso-ventrally, with dorsal angle produced in horn, with ventral, triangular; volsella elongate triangular, with apical area curved inwards (Figs. 74, nearly ventral; 75, penis and volsella ventro-lateral; 76, penis lateral, schematic), African species Group of catalactae (1)
\- Sickle not so markedly deformed, volsella not curved, penis markedly, broadly and roundly enlarged, appr. as wide as long, volsella in ventral view large elongate triangular, with inner margin rounded, in lateral view quadangular (Figs. 77, ventral; 76, dorsal; 78, nearly lateral) Group of chosenense (1)
5 Volsella subquadrate, apical part of paramere broad and very long, apex enlarged with a large oviform membraneous window within (Figs. 80, ventral; 81, lateral; 82, penis, lateral) Group of nilgiriense (1)
\- Volsella elongate triangular or spatulate 6
6 Volsella elongate triangular 7
\- Volsella spatulate 8
7 Volsella rounded at apex (marked in lateral view), apical part of paramere without dense hair on ventral surface, sickle long and distinct, obliquely standing (Figs. 83 and 84) Group of mediator (1)
\- Volsella pointed at apex, apical part of paramere on ventral surface densely covered with hair, sickle not well developed, rather tuberculate (in pygmaeum: Figs. 85 and 86; in mandibulatum: Figs. 87 and 88) Group of pygmaeum (2)
8 Volsella subparallel-sided and rounded and pointed at apex, basiparamere with a two horned membraneous septum within, apical part of penis valve turned laterally, sickle not well developed, short (Figs. 89, 90 and 91) Group of laosianum (1)
\- Volsella nearly lobiform, basiparamere without septum within, outer area triangularly produced inwards, apical part of penis valve stretched nearly straight and enlarged to oviform, sickle not well developed, shortly toothed (Figs. 92, 93 and 94) Group of lumpurense(1)
9 Inner expansion of basiparamere broad and rolled 10
\- Inner expansion weak (from figures undecided) ..... None
10 Volsella comparatively short, mostly subquadrate 11

-- Volsella, at least its main body, long, makedly longer than wide (sometimes with secondary expansion at side, when apparently wider than long as a whole) 18

11 Sickle not well developed, small, not markedly produced 12

-- Sickle well developed 14

12 Two pair of sickle present (Figs. 95, 96 and 97)
Group of koikense (1)

-- Sickle one pair (apical part of penis valve stretched straight, bufurcation of paramere deep) 13

13 Both apical lobes of paramere lobiform, without ridge, volsella in lateral view slightly elongate, subtriangular (Figs. 98, 99)
Group of testaceicorne (1)

-- Ventral one of apical lobes of paramere longitudinally ridged in middle, volsella in lateral view not subtriangular (Figs. 100, 101)
Group of crassiventre (1)

14 Sickle standing oblique 15

-- Sickle produced towards sides .....

15 Sickle slender, normal sickle-shaped (Figs. 102, 103 in vechti; Fig. 104 in burmaense)
Group of vechti (2)

-- Sickle thick and strongly narrowed apically, subtriangular (Figs. 105, 106 in varipes; Figs. 107, 108 in kansitakum; Figs. 109, 110 in javanense and Figs. 111 and 112 in luzonense)
Group of varipes (4)

16 Apical lobes of paramere broadly rounded or gently emarginate at apex (Figs. 113 and 114)
Group of imayoshii (1)

-- Apical lobes of paramere always pointed at apex (Figs. 115, 116)
Group of pacificum (15).. 17

17 Ventral one of apical lobes of paramere with a tooth near its base, sometimes taking a form of short shelf (Figs. 117, kodamanum; 118 chingi; 119 sextum; 120 tengmen; 121 panjabense)
Subgroup pacificum (5)

-- Ventral lobe of paramere smooth on inner margin or at base (Figs. 122, 123 124, monticola; 125, koreanum; 126, 127, 128, nambui; 129, 130, parvulum; 131, himachalense; 132, rubrocaudatum; 133, 134, okeanskayanum; 135, quadriceps; 136, fenchihuense; 137, 138, scitulum)
Subgroup monticola (10)

18 Sickle not well developed, either shortly hooked, toothed or roundly lamellate, apical part of penis valve stretched straight or only gently bent ventrally 19

-- Sickle normal, apical part of penis valve distinctly bent ventrally 23

19 Volsella distinctly spatulate, thin and apically widened and rounded, no distinct sickle, but with rounded lamellate expansion along apical part of penis valve in place (Figs. 139, 140 and 141)
Group of rufigaster (1)

-- Volsella not spatulate, apical structure of penis valve different 20

20 Volsella broad, transversely expanded (apical lobes of paramere broad, subparallel-sided, ventral one with a short tooth on inner margin, penis shortly hooked)(Figs. 142, dorso-lateral; 143, paramere ventral; 144, volsella ventral in buddha; Figs. 145 and 146 in propinquum)
Group of buddha (1)

-- Volsella long, standing 21

21 Volsella subspatulate, surface sometimes flat, but always narrowed apically and thickened basally, apical lobes of paramere similarly fairly broad, ventral one frequently medianly ridged, penis valve standing straight and hooked in place of sickle (Figs. 147, karimui; 148, straatmani and 149, 150, kuchingense)
Group of kuchingense (3)

-- Volsella elongate triangular or elongate lobiform, sometimes somewhat deformed 22

22 Volsella lobiform, sometimes slightly deformed, always deep pigmented, with dorsal margin closely fringed with hair, apical part of penis valve comparatively short and thick, also deeply pigmented, sickle replaced with triangular tooth-shaped process (sometimes two), always produced ventrally, apical lobes of paramere broad, lamellate, similar in form (Figs. 151, 152, flavipes; 153, 154, 155, panitianum; 156, 157 and 158, tadaonis)
Group of flavipes (3)

-- Volsella elongate triangular, apex pointed, apical part of penis valve long, attenuate apically, at base shortly toothed ventrally, apical lobes of paramere asymmetric, with ventral surface covered with hair (Figs. 159, 160,

161, bifoveatum; 162 and 163, biputeolum) Group of bifoveatum (2)

23 Volsella subspatulate, thin, sickle comparatively short, laterally produced but its apex not reaching side of main body of penis valve, apical lobes of paramere very broad, simmetrically facing to each other, with faced surfaces covered with short setae (Figs. 164, 165 and 166) Group of planifrons (1)

-- Volsella elongate triangular, sickle longer, apical lobes of paramere narrower and not so setaceous 24

24 Volsella at base thicker and somewhat rounded, sickle shorter, not markedly produced beyond side of main body of penis valve, apical lobes of paramere with apices pointed, outer area of basiparamere shortly triangularly produced, with margin fringed with thick hair (Figs. 167, 168 and 169) Group of ambiguum (1)

-- Volsella elongate triangular, sickle longer, producing beyond side of main body of penis valve, apical lobes of paramere with apices rounded, outer area of basiparamere unarmed (Figs. 170 and 171) Group of clavicerum (1)

ON THE SO-CALLED SCUTATUM GROUP

According to the structure of the male genital organs the members of the Trypoxylon species bearing the shield-shaped enclosure on the frons can not be accepted within a single group. The greater part of them belong certainly to Major group 2, but some belong to different groups of Major group 1. Those which belong to Major group 2 do not concentrate upon a single group. They can be classified as follows:

1 Penis valve without shoulder and without sickle (Major group 1) 2
- Penis valve without shoulder but with sickle (Major group 2) 3
2 Simple apical part of paramere hemispherically swollen on ventral surface before apex Group of sinuosiscutis Arnold (1)
- Simple apical part of paramere slender and smoothly attenuate apically (apparent apical part of penis valve directed sideways and somewhat black pigmented, see Remarks on p. 6) Group of bakeri Tsuneki (1)
3 Paramere simple at apex (Supergroup C) 4
- Paramere bifurcate at apex (Supergroup D) 5
4 Apical part of paramere considerably broad and subparallel-sided Group of abdidum Arnold (1)
- Apical part of paramere slender, (volsella subtriangular at base and narrowed to finger-shape at apex) Group of tainanense Strand (1)
5 Apical split of paramere shallow, not reaching inner expansion of basiparamere, ventral lobe narrower than dorsal Group of scutatum Chevrier (7)
- (including pileatum, thaianum, papuanum arnoldi, kohli, stroudi)
- Apical split of paramere deep 6
6 Ventral one of apical split of paramere slender and much narrower than dorsal Group of melanurum Cameron (2)
(including schmiedeknechti)
8 Ventral lobe of paramere broader, lobiform, only slightly narrower than dorsal Group of scutifrons Saussure (1)

Remarks.

Of the groups above keyed groups of sinuosiscutis and bakeri belong to Major group 1, while all the others to Major group 2 and none to Major group 3.

Apical part of penis valve that is produced beyond base of the sickle-shaped appendage varies more or less in relative length with the species, but this is also variable locally within a single species, for instance schmiedeknechti (see SPJHA, 7: 35, 1978) and can not be used for species grouping.

In the following Old World species the male remains unknown:

T. peltopsis Kohl*, aegypticum Kohl*, seneganbicum Kohl*, quartinae Gribodo*, seyrigi Arnold*, funatui Tsuneki, interruptum Tsuneki, longiscutis Tsuneki, cucurbitinum Tsuneki and chinense Gussakovskij

While, in the following the genitalia in the male have not been observed:
T. scutigerum Taschenberg*, magrettii Gribodo*, arabicum Gussakovskij*.

Of the species listed above those with an asterisk must be reinvestigated to clarify their specific characters, because some of them at least may possibly be synonymized with some of the species dealt with by me.

4. KEY TO THE GROUPS OF MAJOR GROUP 3

1 Shoulder of penis valve distinctly curved down .... Submajor group 1 2
\- Shoulder of penis valve almost horizontal ..... Submajor group 2 12
\- Shoulder of penis valve distinctly raised ..... Submajor group 3 39
2 Paramere simple at apex (sometimes with a very short prominence near apex) Supergroup E 3
\- Paramere bifurcate at apex (sometimes one of the lobes very short) Supergroup F 4
3 Apical part of paramere comparatively long and completely simple (outer area of basiparamere not expanded inwards, with inside densely covered with hair) (Figs. 174 and 175) Group of rutilans (1)
\- Apical part of paramere comparatively short, bearing a short tooth near apex (outer area of basiparamere triangularly expanded inwards, without dense hair) (Figs. 176-177, 178-180) Group of insulare (2)
4 Apical split of paramere shallow, not reaching inner expansion of basiparamere 5
\- Apical split of paramere deep, reaching inner expansion of basiparamere 10
5 Sickle broad at the base and strongly narrowed towards apex (apical lobes of paramere similar in length, outer area of basiparamere triangularly produced inwards)(Figs. 181-182) Group of apicatum (7). 6
\- Sickle not as above 7
6 Apical two lobes similar in form (Figs. 183-185, 186-187) Subgroup apicatum (3)
\- Dorsal one of apical two lobes narrower than ventral (Figs. 188-190, 191-193, 194) Subgroup silvicola (4)
7 Sickle widened towards apex, apex truncate (ventral one of apical lobes of paramere short, like a long tooth, outer area of basiparamere slightly expanded inwards)(Figs. 19 -197) Group of rufiventre (1)
\- Sickle not as above, normal 8
8 Ventral one of apical lobes of paramere is a flag-shaped appendage near apex (apical part of paramere short, outer area of basiparamere produced inwards)(Figs. 198-200) Group of varicolor (1)
\- Ventral lobes not as above, both lobes similar in length and nearly so in form 9
9 Sinus of bifurcation of paramere rounded, inner expansion of basiparamere unarmed (Figs. 201-202) Group of luteocollare (1)
\- Sinus of bifurcation acute, inner expansion provided with a haired triangular prominence on inner margin near base (Figs. 203-204) Group of giganteum (1)
10 Outer area of basiparamere very narrow, not produced inwards in triangle, inner expansion also weak, apical lobes of paramere comparatively broad and short (Figs. 205-207) Group of albitarsatum (1)
\-- Outer area broader, inner expansion very broad and rolled, apical lobes comparatively narrower and longer 11
11 Paramere with a broad blackish stripe on outer area along outer side, outer area not distinctly produced inwards, but with a tuft of hair on its inner margin near middle (Figs. 208-209) Group of antennatum (1)
\-- Paramere without blackish stripe, outer area somewhat triangularly produced inwards, with apex broadly rounded, without tuft of hair (Figs. 210-211) Group of maculiventre (1)

12 Paramere simple at apex (sometimes with a very minute prominence near apex) Supergroup G 13

-- Paramere bifurcate at apex (sometimes one of the lobes very short) Supergroup H 21

13 Apical part of paramere with a short prominence near apex (sometimes prominence very minute and vestigial) Group of mindanaonis (5). 14

-- Apical part of paramere without prominence 15

14 Prominence is a minute tooth or tubercle, without carina attached (Figs. 212-215) Subgroup mindanaonis (1)

-- Prominence is a short tooth, but its base long slenderly extended towards base like a high carina (inward expansion of basiparamere sometimes broad triangularly produced, sometimes long slenderly extended)(Figs. 216, 217-218, 219-221) Subgroup albispinosum (3)

15 Inward prominence of outer area of basiparamere broad triangular as in albispinosum (apical part of paramere leaf-like, but without tooth near apex) (Figs. 222-223) Subgroup nishidai (1)

-- Inward prominence of outerarea of basiparamere different in form 16

16 Outer area of basiparamere not markedly expanded inwards Group of errans (2). 17

-- Outer area of basiparamere expanded inwards 18

17 Inner margin of outer area of basiparamere withoug serrate hair fringe (Fig. 224) Subgroup errans (1)

-- Inner margin of outer area of basiparamere with serrate hair fringe (Fig. 225) Subgroup miniovatum (1)

18 Inner margin of outer area of basiparamere broadly roundly expanded inwards (apical part of paramere comparatively slender and covered with hair) (Fig. 226) Group of semperi (1)

-- Inner margin of outer area of basiparamere not roundly expanded inwards 19

19 Inner margin of outer area of basiparamere broadly expanded inwards in flag-shape, supported beneath with a slender prominence from outer area (apical part of paramere lobiform, fringed with hair) 20

-- Inner margin of outer area of basiparamere without flag-shaped expansion, but markedly produced inwards, sometimes in an elongated triangle, but most usually more slenderly long extended (apical part of paramere more or less varied among members)(Figs. 229, 230-231, 232, 233, 234, 235, 236-237, 238-239) Group of coloratum (8)

20 Flag-shaped expansion very broad, inner margin of apical part of paramere with haired triangular prominence at base, apical part comparatively narrow (Fig. 227) Group of amatorium (1)

-- Flag-shaped expansion narrower, inner margin of apical part of paramere without prominence (Fig. 228) Group of nipponicum (1)

21 Apical lobes of paramere markedly different in length 22

-- Apical lobes of paramere appr. similar in length 28

22 Bifurcation in full length of apical part of paramere, reaching top of inner expansion of basiparamere 23

-- Bifurcation only at apical area of apical part of paramere 26

23 Both lobes slender, finger shaped or nearly (Figs. 240-241, 242-244) Group of takasago (2)

-- Both lobes broader, shorter one either triangular or subquadrate 24

24 Shorter lobe of paramere quadrate (longer one narrowed apically)(Figs. 245-246) Group of formosicola (1)

-- Shorter lobe triangular in ventral view 25

25 Longer lobe of paramere narrowed apically, shorter one standing, with top directed towards apex (Figs. 247-249, 250-251) Group of kepongianum (2)

-- Longer lobe lobiform, shorter one curved, with top directed inwards (Figs. 252-253) Group of atricorne (1)

26 Apical parts of both parameres slender and crossed in front of penis valve, basiparamere with broad apical area membraneous and translucent (apical bifurcation at extreme apical area only)(Figs. 254-256) Group of spangleri (1)

-- Parameres not crossed 27

27 Bifurcation in apical half only of comparatively long apical part of paramere (inner expansion of basiparamere broad and rolled, inner margin of outer area broad-roundly expanded inwards)(Figs. 257-259) Group of menkei (1)

-- Bifurcation in apical third of fairly long and slender apical part of paramere (inner expansion of basiparamere broad and rolled, inner margin of outer area more markedly expanded inwards in oviform)(Figs. 260-261)

Group of auropilosum (1)

28 Bifurcation at apical part of paramere shallow, not reaching top of inner expansion of basiparamere 29

-- Bifurcation deep, reaching top of inner expansion of basiparamere 36

29 Paramere provided with an extra branch at base of apical part (outer area of basiparamere broadly, rectangularly expanded inwards)(Figs. 262-265)

Group of sayabouryense (1)

-- Paramere without a third branch 30

30 Outer area of basiparamere broadly, roundly expanded inwards, split of apical part of paramere very shallow 31

-- Outer area of basiparamere triangularly or much more slenderly produced inwards 32

31 Apical lobes of paramere in ventral view leaf-like and comparatively long, inward expansion of outer area stronger (Figs. 266-267)

Group of melanocorne (1)

-- Apical lobes of paramere short, finger-shaped, split like that of thumb and index finger, inward expansion of outer area of basiparamere comparatively less (Figs. 268-269) Group of membranaceum (1)

32 Ventral one of apical lobes of paramere enlarged at base, bearing a line, zone or area covered with short strong hair on ventral surface, often the area excavated into hollow or coarsely granulate (spatulate volsella broader than usual)(Figs. 270-272, 2 3-274, 275-276, 277-280, 281)

Group of vardyi (5)

-- Ventral one of apical lobes of paramere not as above 33

33 Volsella broader than usual, approximately twice as wide at maximum as at minimum 34

-- Volsella normal, Ma:Mi≒3:2, inward triangular prominence of outer area of basiparamere strong and marked (Figs. 289, 290-292, 293-294)

Group of tawitawiense (3)

34 Dorsal-outer margin of basiparamere roundly expanded outwards, inward triangular expansion of outer area of basiparamere with apex pointed, ventral lobe of paramere broader than dorsal, broad lobiform (Figs. 282-284)

Group of anamalaiense (1)

-- Dorsal-outer margin of basiparamere not expanded outwards 35

35 Inward triangular prominence of outer area of basiparamere somewhat weaker, inner margin of ventral one of apical lobes of paramere smooth (Figs. 285) Group of srilankum (1)

-- Inward prominence of outer area of basiparamere stronger, inner margin of ventral lobe of paramere with a somewhat swollen haired area at base (Figs. 286, 287, 288) Group of trituberculatum (1)

36 Ventral one of apical lobes of paramere much broader and slightly shorter than dorsal 37

-- Apical lobes of paramere similar in length and not so different in form ... 38

37 Inner margin of ventral lobe of paramere and that of outer area of basiparamere in a line running straight (Figs. 295-296, 297-298)

Group of fulvocollare (1)

-- Inner margin of ventral lobe of paramere and that of outer area of basiparamere each distinctly emarginate, outer area, beside, slenderly and long produced inwards below the emargination (Figs. 299-301)

Group of orientale (1)

38 Sickle slender, typical in form, volsella subparallel-sided spatulate, dorsal lobe of paramere with a triangular prominence before apex (outer area of basiparamere narrow, not produced inwards)(Figs. 302-304)

Group of ornatigaster (1)

-- Sickle broad and acutely narrowed towards apex, subtriangular, volsella at base broad and narrowed till about middle, thence parallel-sided and narrowed and pointed at apex, with inner margin nearly straight, outer margin of dorsal lobe of paramere smooth (Figs. 305-307) Group of attenuatum (1)

39 Paramere simple at apex ..... Supergroup I

Shoulder very narrow, strongly and straightly raised outwards, apex pointed, sickle broad flat elongated triangular, not formal sickle-shaped (inner expansion of basiparamere very short, but broadly expanded and rolled, outer area not triangularly extended inwards, volsella normally spatulate)(Figs. 308-310)

Group of sapporoense (1)

-- Paramere bifurcate at apex ..... Supergroup J 40

40 Apical split of paramere deep, reaching top of inner expansion of basipara-

mere 41

-- Apical split of paramere deep but not reaching top of inner expansion of basiparamere. Shoulder roundly impressed on dorsal side, sickle exceptionally long and slender producing sideways far beyond lateral angle of shoulder, apical part of paramere slender and very long, covered with long hair, both lobes appr. similar in length and form, inner expansion of basiparamere comparatively short, but broad and rolled, outer area moderately broad, roundly expanded inwards at median area (Figs. 311-313) Group of salween (1)

41 Both lobes of apical part of paramere markedly different in length, shorter one frequently triangle in form 42

-- Both lobes similar in length 47

42 Shoulder of penis valve transversely roundly impressed on dorsal side as in salween-group (shorter one of apical lobes of paramere almost equilateral triangle in form, topped with one or two hair)(Figs. 314-316) Group of viridaricola (1)

-- Shoulder of penis valve without impression on dorsal side 43

43 Shorter one of apical lobes of paramere expanded lamellately towards base, turning into a flag-like expansion of outer area of basiparamere (Figs. 317) Group of hyperorientale (1)

-- Shorter lobe of paramere and outer area of basiparamere not forming such an expansion 44

44 Shorter lobe of paramere about half the length of longer one, elongate triangular and distinctly curved 45

-- Shorter lobe similar, but not curved 46

45 Basiparamere without any appendage at base (Figs. 318-321, 322-324, 325, 326-327) Group of bicolor (4)

-- Basiparamere with a small lobiform appendage at base on inner margin (Figs. 327B-327D) Group of myitkyinae (1)

46 Shorter lobe of paramere triangular, with apex pointed (Figs. 328-329, 330-331, 332-333, 334) Group of sacinasium (4)

-- Shorter lobe much broader rounded triangular, with apex always rounded (Figs. 335-338, 339-341 and 342-343) Group of eximium (3)

47 Shoulder of penis valve transversely roundly excavated on dorsal side, apical margin roundly raised, apical part of paramere broad and comparatively short (Figs. 344-346) Group of malaisei (1)

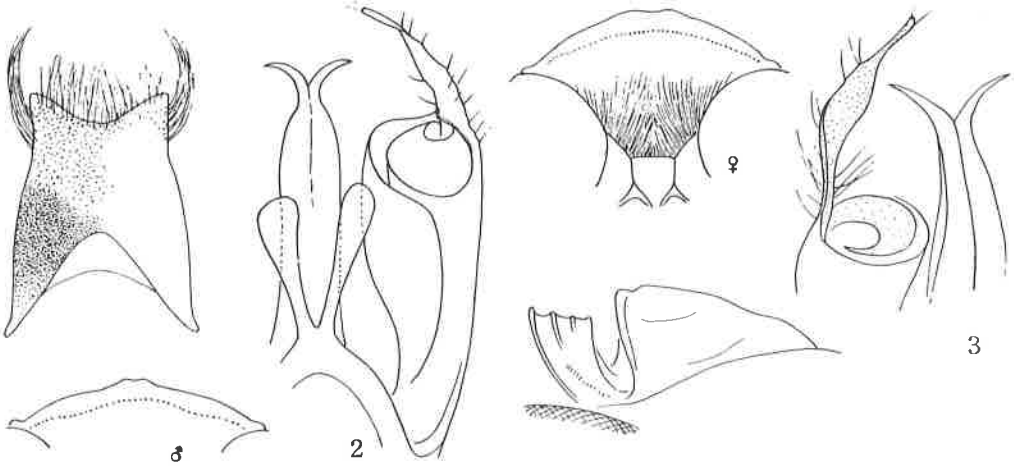
-- Shoulder of penis valve not excavated on dorsal side, apical margin of shoulder straightly raised towards side, apical part of paramere comparatively slender and longer, volsella slender triangular, markedly contrasted to spatulate volsella of all other groups (Figs.347-349, 350-352, 353-355, 356-357, 358-359) Group of figulus (4)

EXPLANATION TO EACH GROUP

I. GROUPS OF MAJOR GROUP 1

1. Group of prominens Tsuneki

Known member 1. Genitalia seen from beneath: Fig. 2, from above: Fig. 3.
Characteristic is the strong roll of inner and outer expansions of basiparamere, the inner deeply overlapping the outer, volsella spatulate. Sternite 8 as figured.



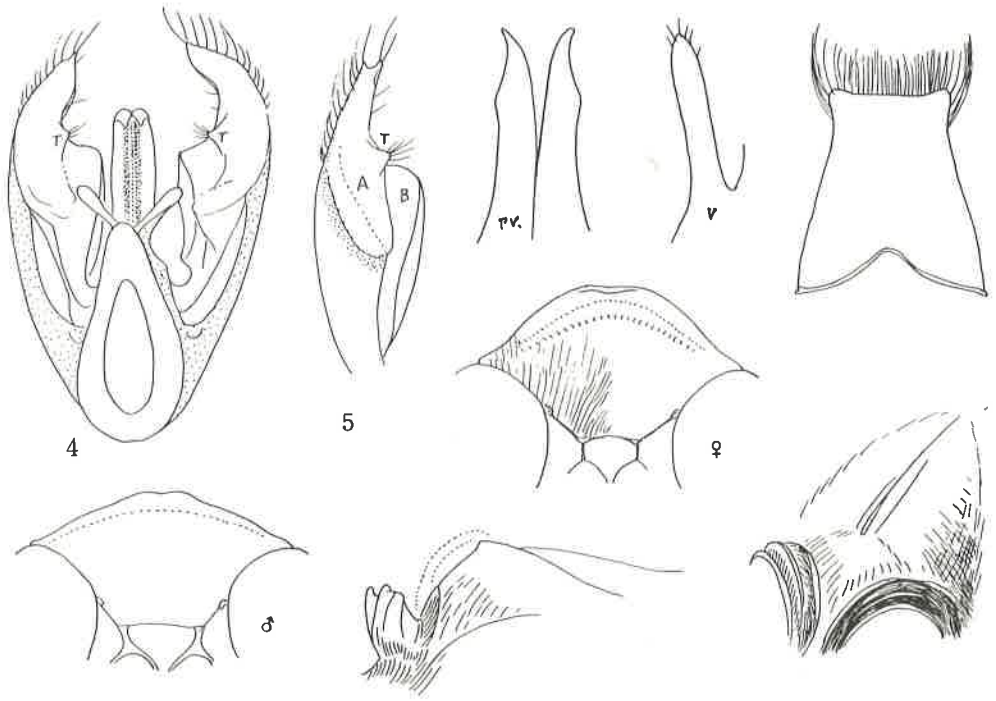
Externally, head seen from above transverse, Gl flask-shaped, =Max5. SAT low nasiform, with apical margin transversely acutely edged, PAF deep, flat-bottomed, U-shaped in cross section, clypeus (♀, ♂) as figured. Propodeum without lateral carinae, area dorsalis enclosed with furrow, mesoscutum without microsculpture, IODs≒3:2 (♀), A3≒AWx5.5 (♀), ≒AWx3 (♂), Al3=BWx2.7 and ≒Al0-12. RC in fore wing C, Rl short, 10-12 mm.

2. Group of regium Gussakovskij

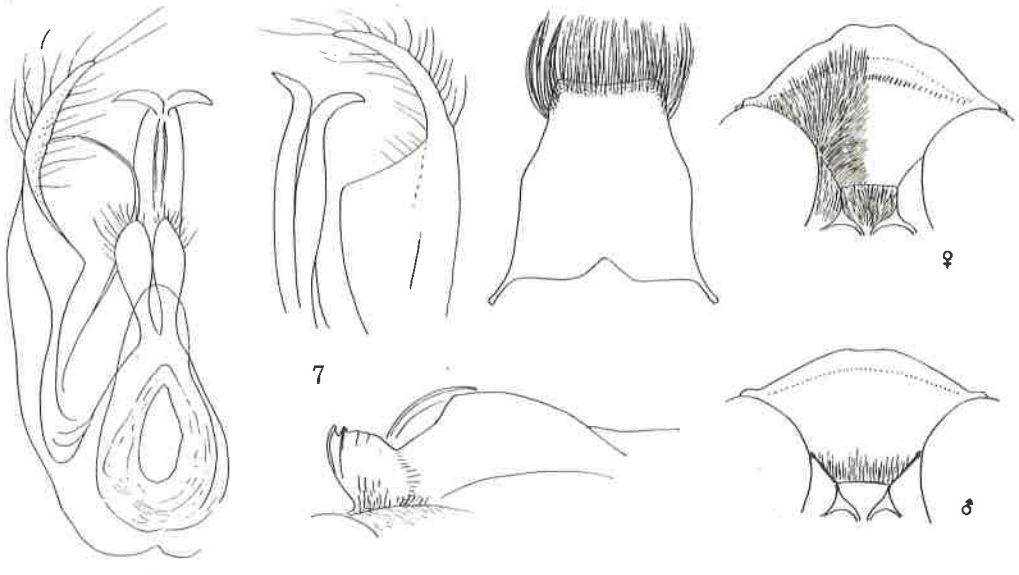
Known member 1. Genitalia: Fig. 4 (ventral), paramere: Fig. 5 (lateral), A is outer area, B inner expansion, T basal haired tubercle or short tooth. Penis in dorso-vertical view, volsella in vertical view and sternite 8 as given with figures.
Externally, head transverse, Gl flask-shaped, =Max3-5. SAT moderately high nasiform, PAF deep, flat-bottomed, U-shaped in cross section. Clypeus as figured. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum without microsculpture, IODs≒4:3 (♀ ♂), A3=AWx4 (♀), x1.7 (♂), Al3=BWx1.8 and ≒Al0-12. RC=C, 12-15 mm.

3. Group of striolatum Tsuneki

Known member 1. Genitalia: Figs. 6 (ventral) and 7 (dorsal). Volsella spatulate. Sternite 8, SAT-ASR, clypeus (♀ ♂) as given with figures.
Externally, head transverse, Gl flask-shaped, =Max5, SAT low nasiform, PAF shallow, wide V-shaped in cross section, bottom line upcurved, apical form of clypeus is characteristic. Propodeum with lateral carinae, area dorsalis enclosed with furrow, and distinctly transversely striate, mesoscutum shining, but under high magnification



Figs. 4 and 5. Group of <u>regium</u> Gussakovskij



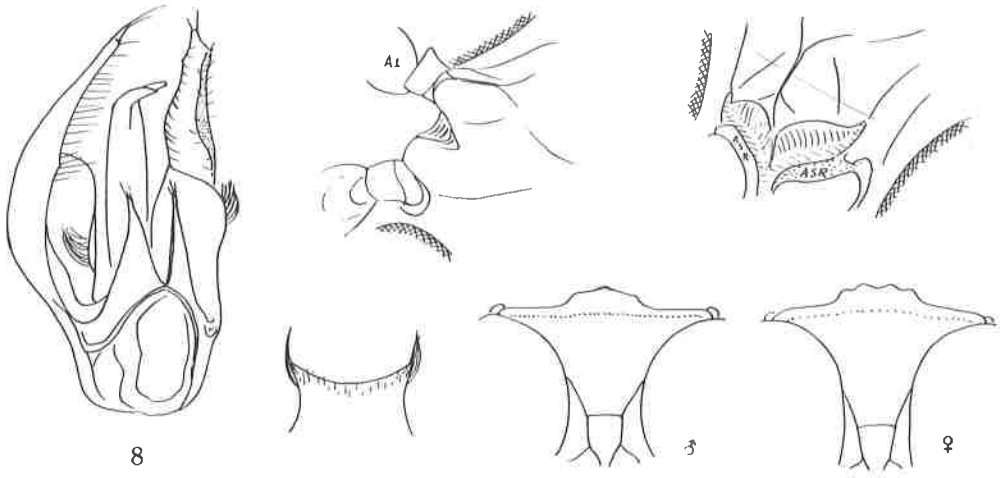
Figs. 6 and 7. Group of <u>striolatum</u> Tsuneki

PIS feebly microcoriaceous. IODs≒5:4 (♀), ≒4:3 (♂). A3≒AWx4 (♀), =AWx2.2 (♂). A13=BWx1.7 and ≒A10-12. In fore wing RC=C, R1 short. 12-13 mm.

4. Group of krombeini Tsuneki

Known member 1. Genitalia in ventro-lateral view: Fig. 8. Volsella elongated triangular, margin of inner expansion of basiparamere somewhat incrassate at median area and fringed with hair.

Apical part of sternite 8, SAT-ASR and clypeus (♀ ♂) shown with figures.

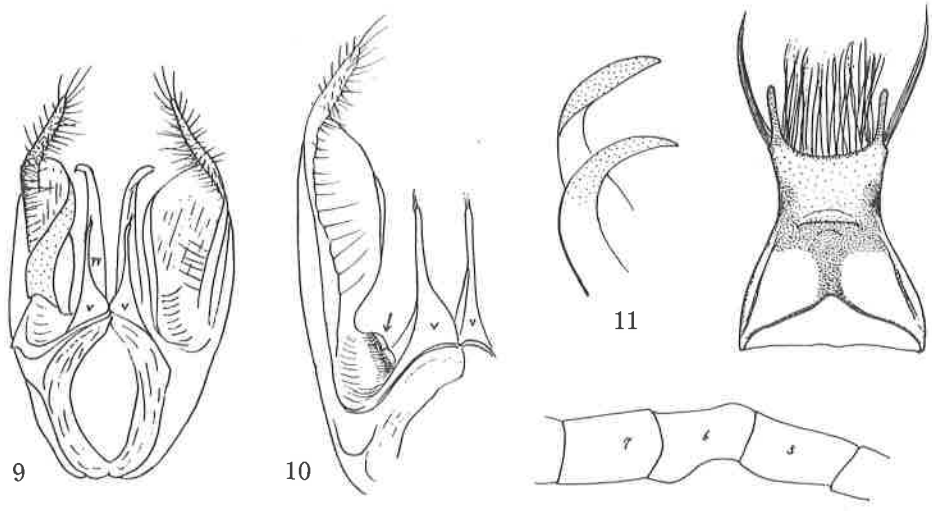


8

Externally, head thick, subquadrate, Gl long clavate, =Ma×4-5. SAT low broad round tuberiform, PAF deep, broad, but not cutting through postantennal area, clypeus (♀ ♂) as figured. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum microcoriaceous and punctured, IODs≒2:1 (♀), ≒5:3 (♂), A3≒AW×2.5 (♀), ×2.2 (♂), A13=BW×2 and ≒A10-12. RC=C, R1 moderately long. 6-7 mm.

5. Group of bakeri Tsuneki

Known member 1. Genitalia: Figs. 9 (ventral), 10 (somewhat from lateral) and 11 (penis valve in oblique lateral view). Volsella as in most of the members of so-



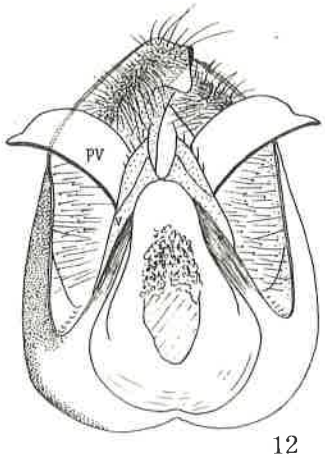
9 10 11

called scutatum-group, but simple apical part of paramere is rather exceptional. Penis valve is completely aberrant, apparently without sickle-shaped appendages. It seems to me, however, that the apparent apical part of penis valve is in reality the sickle and the true apical part of penis valve is completely degenerated and disappeared. Because, in some allied species of so-called scutatum-group the apical part of penis valve is considerably variable in development locally and in some others it is very short, only in broad triangle in form and close to disappearance, showing the possibility of complete degeneration. Moreover, in bakeri the apparent apical part of penis valve is directed sideways and more or less pigmented as in members of so-called scutatum-group. That is to say, it seems that in this instance the simple apical part of penis valve does not indicate the primitive state of development, but represents a case of convergence in evolution due to degeneration.

Externally, dorsal carina of frontal shield horizontal, upper lateral carinae vertical to dorsal carina, bearing short inward branch carinae; bristles on enclosed area and IAA 6-7. Gl long clavate, ≒Max5, IODs≒3:2 (♀ ♂). Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum microcoriaceous and finely punctured, A3=AWx3.3 (♀), x2 (♂), A6 in ♂ distinctly excavated beneath, Al3≒BWx2 and ≒ Al0-12. 13-15 mm.

6. Group of paulum Tsuneki

Known member 1. Genitalia very characteristic, ventral view: Fig. 12, ventro-lateral view: Fig. 13. Sternites 7 and 8, SAT-ASR in dorso-lateral view and clypeus



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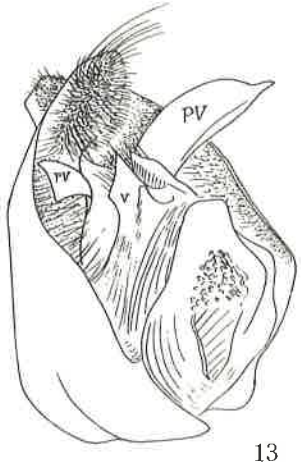

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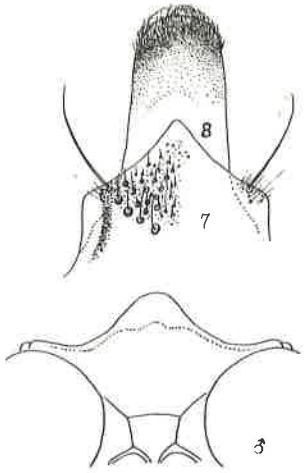
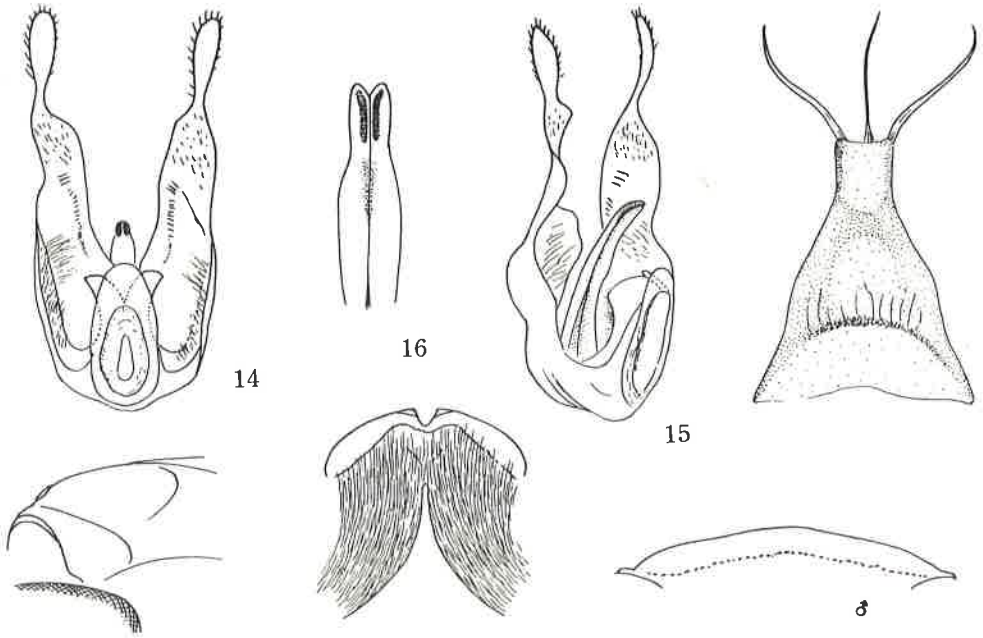


are further given with figures here.

Externally, head from above thick, subcubic, Gl clavate, =Max2.3, SAT low tuberiform, PAF shallow, broad and down-curved in cross section, clypeus strongly roundly produced anteriorly in middle. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum strongly punctured and under high magnification punctures are connected with each other with microstriae. IODs≒3:2 (♂), A3=AWx2.3 (♂), Al3=BWx 1.5 and =All+12. RC=B. 5 mm. ♀ unknown.

7. Group of curvicorne Tsuneki

Known member 1. Genitalia: Figs. 14 (ventral) and 15 (ventro-lateral) and penis valve: Fig. 16 (ventral). Apical part of penis valve with a pair of black pigmented lines. Sternite 8, SAT-ASR in vertical and lateral views and apical margin of clypeus are given with figures in the following page.

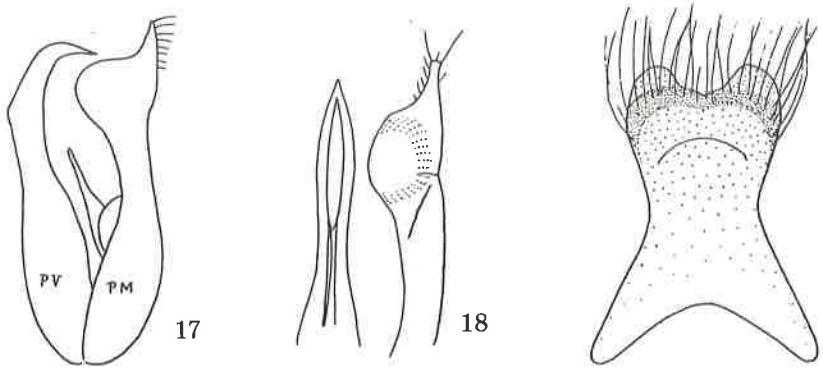


Head transverse, Gl clavate, Ma x 4-5, SAT low broad nasiform, nearly tuberiform, anteriorly with transverse carina intersepting PAF, clypeus simply rounded out anteriorly, antenna in ♂ medianly crooked upwards. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum microcoriaceous and punctured. IODs≒2:1 (♀ ♂), A3=AWx3.5 (♀), x2.2 (♂), Al3≒BWx3 and ≒A9-12. RC=B, somewhat close to C. 7-8 mm.

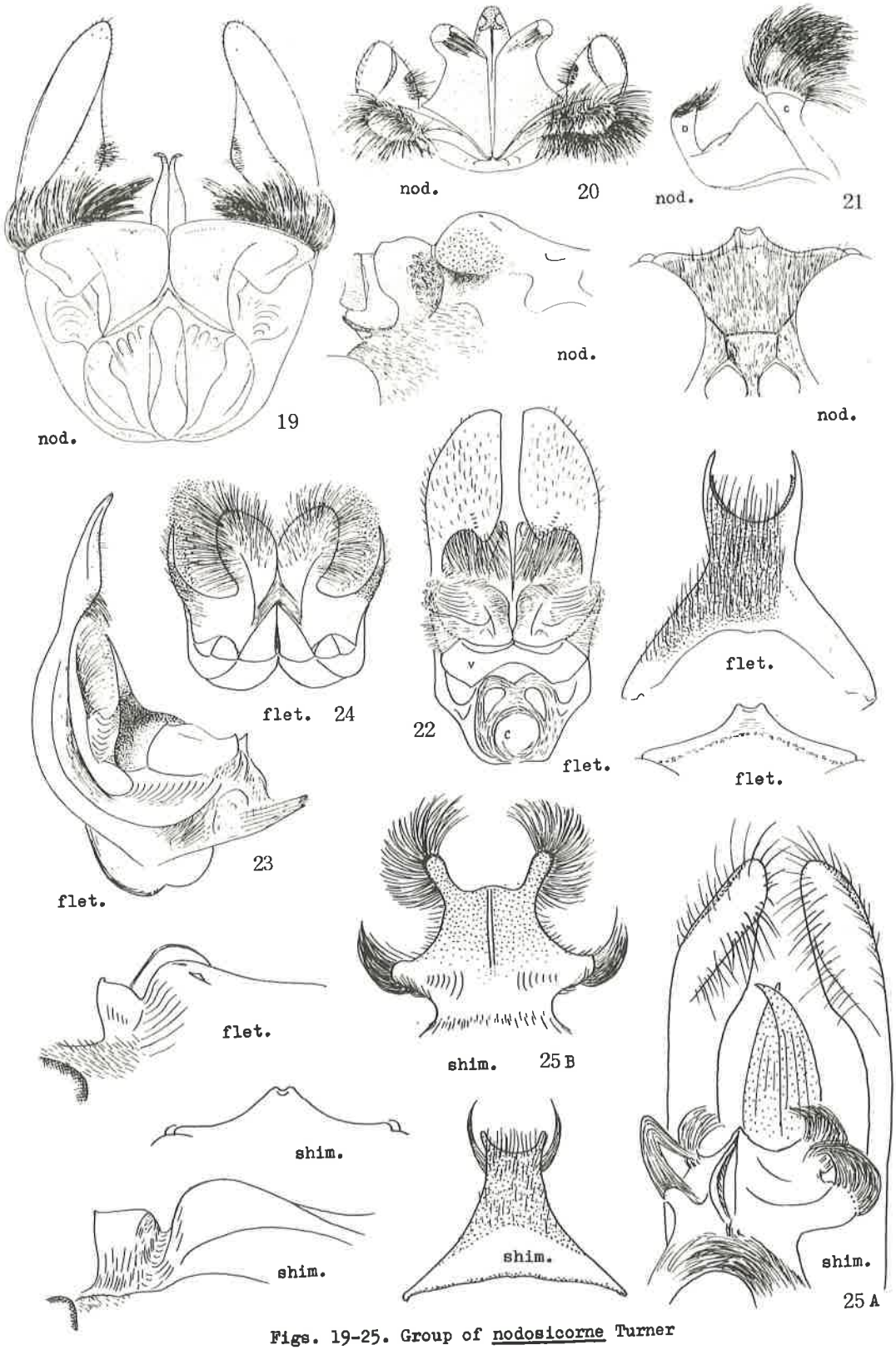
8. Group of sinuosiscutis Arnold

Known member 1. Genitalia in lateral view: Fig. 17, in dorsal view: Fig. 18 (volsella and left paramere omitted). Characterisitic is the simple apical part of penis valve and the hemisperically swollen apical area of paramere. Sternite 8 is given with figure.

Frontal enclosure frequently with a part of dorsal half of the carinae feeble and indistinct, always without outward branch carinae completely; bristles on IAA 5, of which 2 on enclosed space. Gl long clavate, ≒Max5. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum smooth and shining, IODs=10:7 (♀), 10: 8-9 (♂). A3=AWx2.7 (♀), x1.6 (♂), Al3≒BWx2.8, slightly >A9-12. 10-12 mm.



Figs. 17-18. Group of sinuosiscutis Arnold



Figs. 19-25. Group of nodosicorne Turner

9. Group of nodosicorne Turner

Known members 3: nodosicorne Turner, fletcheri Turner and shimoyamai Tsuneki.

Genitalia with paramere always simple at apex, considerably varied among members in width and form, volsella also markedly different in form among them, but always very complicate and provided with dense tufts of long curved hair: in nodosicorne Figs. 19 (ventral), 20 (volsella, vertical), 21 (ditto, lateral); in fletcheri Figs. 22 (ventral), 23 (lateral), 24 (volsella, vertical) and in shimoyamai Figs. 25,A (ventro-lateral) and 25,B (volsella, vertical). Sternite 8 all very similar (see Figures).

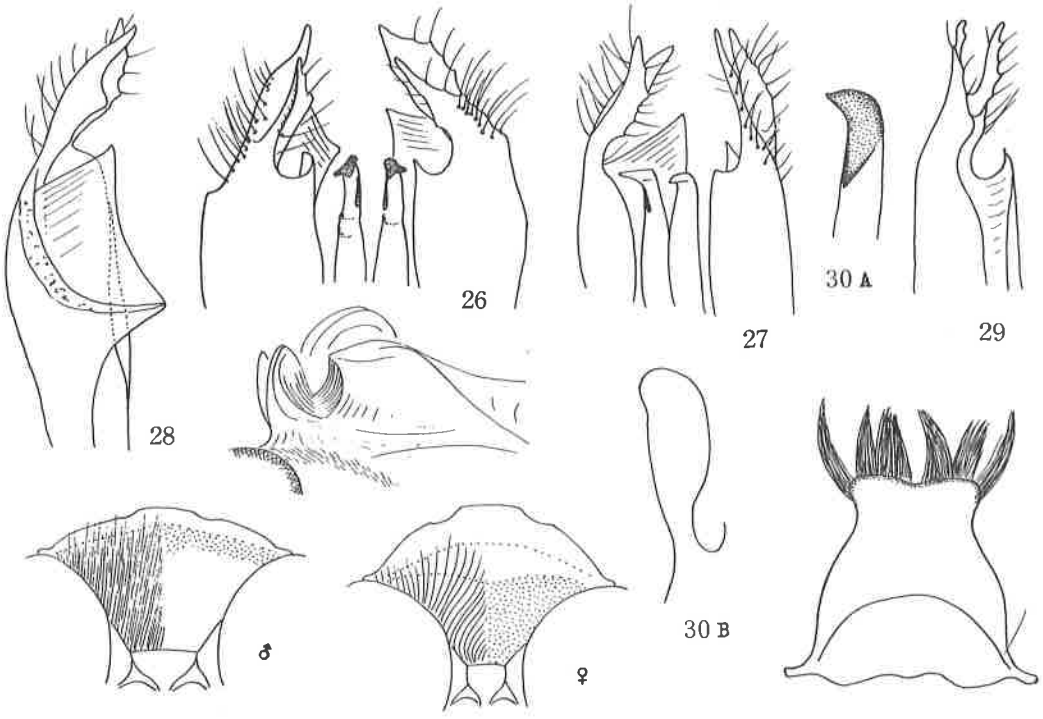
Externally, head transverse, Gl clavate, ≒Ma×3. SAT low broad nasiform, almost tuberiform, PAF shallow or moderately deep, down-curved or wide shallow V-shaped in cross section, clypeus triangularly produced anteriorly, with apex bidentate as given in figures. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum microcoriaceous. IODs=10 : 7-8 (♀ ♂ similar), A3≒AW×2 (♀), ×1 (♂), A6 or A6-7 distinctly deeply excavated beneath, Al3=BW×1.7 and = or > All+12. RC=B, sometimes close to C. 6-8 mm.

Remarks. According to the standard of classification of other groups the present group can be separated into three distinct groups, judging by the marked differences in the form of paramere and in the structure of volsella.

10. Group of varipiloides Tsuneki

Known member 1. Genitalia (apical half): Figs. 26 (dorsal), 27 (dorso-lateral), left paramere: Fig. 28 (ventro-lateral), right paramere from inside: Fig. 29. Penis valve with apical part dusky in colour and, strange to say, turned backwards (Figs. 26, 27 and 30,A); volsella somewhat irregular spatulate (Fig. 30,B). Sternite 8 also shown with figure.

Head transverse, Gl flask-shaped. Hair brassy to golden, Gl long, =Ma× 5-7. SAT high nasiform, PAF moderately deep, flat-bottomed, U- or V-shaped in cross section. Clypeus as figured (♀ ♂). IODs≒2:1 (♀ ♂), A3=AW×5 (♀), ×3 (♂), Al3=BW×2.6, slightly shorter than A9-12. RC=B. 9-12 mm.

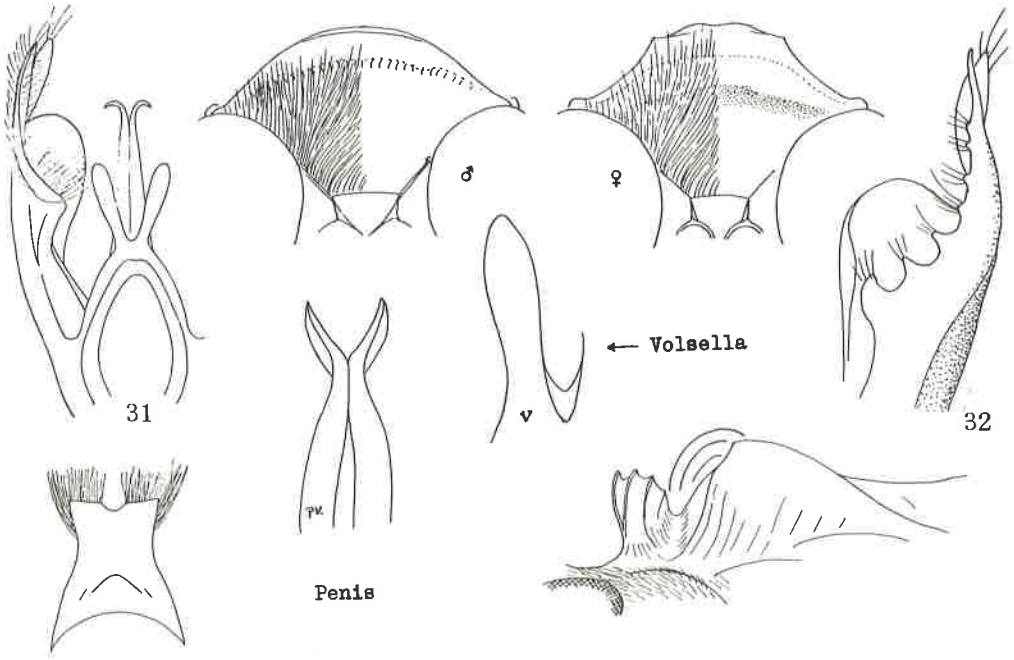


11. Group of taiwanum Tsuneki

Known member 1. Genitalia: Figs. 31 (ventral), 32 (right paramere from beneath). Penis and volsella figured.

Head transverse, Gl flask-shaped, =Max5-7. SAT moderately high nasiform, PAF deep flat-bottomed, V-shaped in cross section. Clypeus as figured. Propodeum with lateral carinae, area dorsalis with feeble lateral furrows, mesoscutum shining, without microsculpture. IODs≒5:4 (♀ ♂), A3≒AWx5 (♀), x2.3 (♂), A13=BWx2.2 and slightly shorter than A10-12. RC=C, but somewhat close to B. 15-18 mm.

Remarks. Externally this group is very close to that of regium, but to receive them together within the same group we must neglect the difference in the structure of the apical part of the paramere and the inner margin of the outer area of basiparamere.



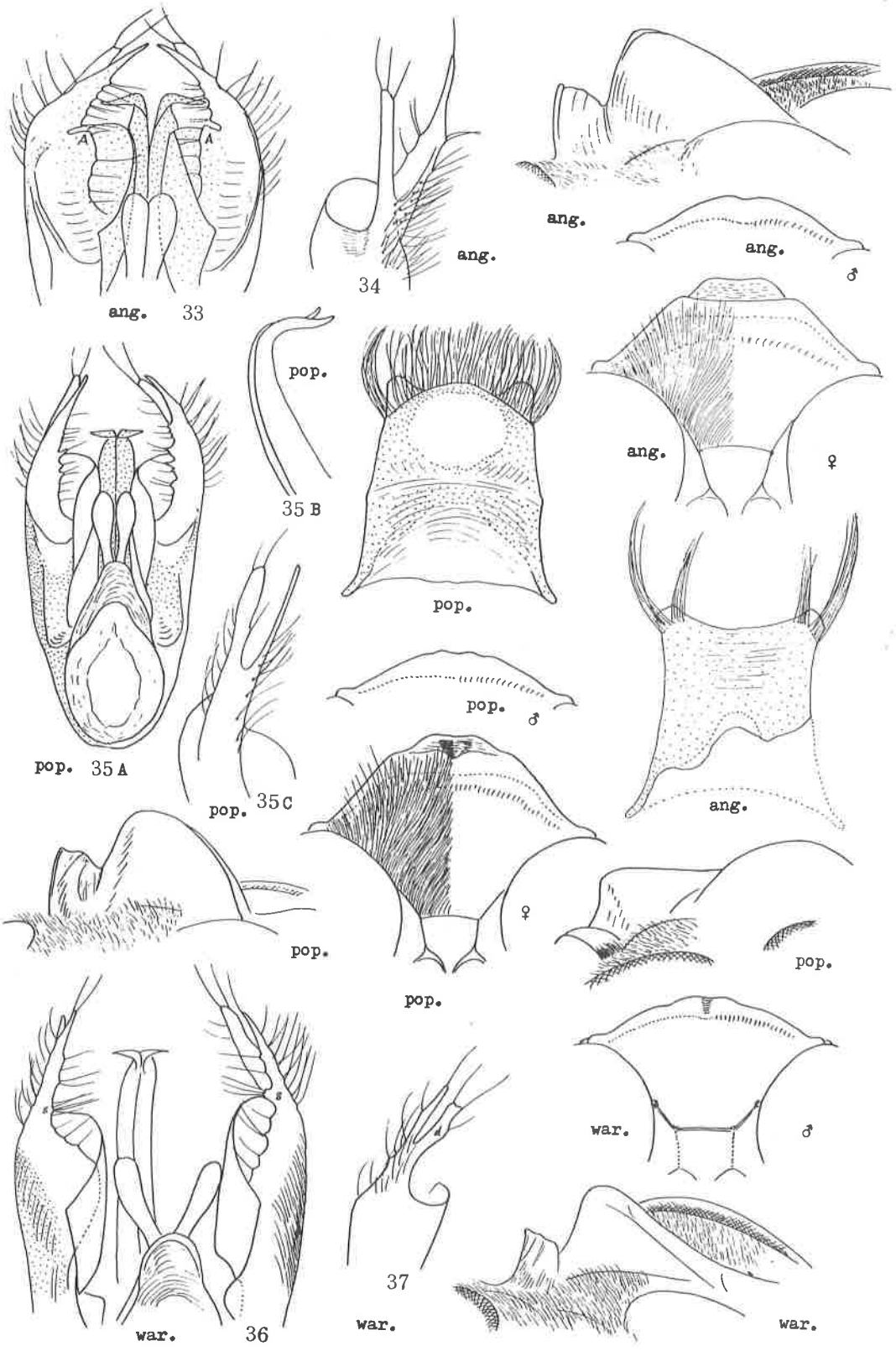
12. Group of angoramum Tsuneki

Known members 3: angoramum Tsuneki, popondettae Tsuneki and warisum Tsuneki.

In angoramum genitalia: Fig. 33, apical part of left paramere (dorso-lateral): Fig. 34; in popondettae genitalia: Fig. 35,A (ventral), penis valve: Fig. 35,B (lateral), apical part of left paramere (lateral): Fig. 35,C; in warisum genitalia: Fig. 36 (ventral), apical part of left paramere: Fig. 37 (lateral). Characteristic is that inner margin of ventral lobe of paramere strongly serrate with haired teeth (similar in this character to taiwanum); volsella spatulate. Sternite 8 in angoramum and warisum very similar as figured (in popondettae not examined).

Externally, head transverse, frons on each side of medial furrow very strongly roundly elevated, Gl flask-shaped, =Max4-5. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum shining, without microsculpture. SAT nasiform, PAF moderately deep and shallow-V-shaped in cross section, bottom line up-curved. IODs =4:3 (♂), 3:2 (♀). Clypeus as shown with figures. A3=AWx4-4.5 (♀), ≒AWx3 (♂), A13≒ BWx2 and ≒A10-12. RC=B-C. 10-13 mm.

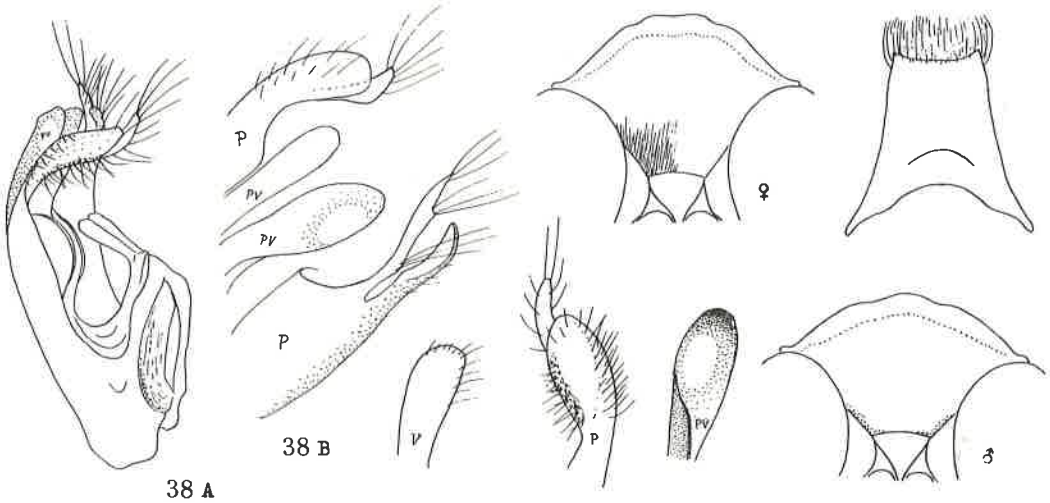
Remarks. It seems possible to me that some at least of other New Guinean species that have the highly raised rounded tubercles on the frons and have been known by the females only, such as placidum Smith, tengu Tsuneki, oriomonis Tsuneki, chimbum Tsuneki, bituberculatum Tsuneki, olthofi Tsuneki, hollandiae Tsuneki, mafuluense Tsuneki and kaitum Tsuneki may belong to this group.


ang. 33
ang. 34
ang.
ang.
♂
pop.
35 B
pop.
ang.
♀
pop. 35 A
pop. 35 C
pop.
♂
ang.
pop.
♀
pop.
pop.
pop.
war.
36
37
war.
war.
♂
war.

13. Group of concinnum Tsuneki

Known member 1. Genitalia: Figs. 38,A (ventro-lateral) and 38,B (apical part, dorso-lateral, P: Paramere, PV: Penis valve). Apical part of paramere and penis valve, and volsella are also figured.

Externally, head transverse, Gl flask-shaped, hair golden, propodeum with lateral carinae, area dorsalis without lateral furrows, mesoscutum without microsculpture, IODs =1:1 (♀ ♂). SAT moderately high nasiform, medio-apical area roundly flattendd, but without hollow, PAF deep, flat-bottomed, oval in cross section. Clypeus (♀ ♂) as figured. A3=AW×5 (♀), ×2.3 (♂), Al3=BW×3.3 and ≒A9-12. RC=C, but close to M. 12-13 mm.

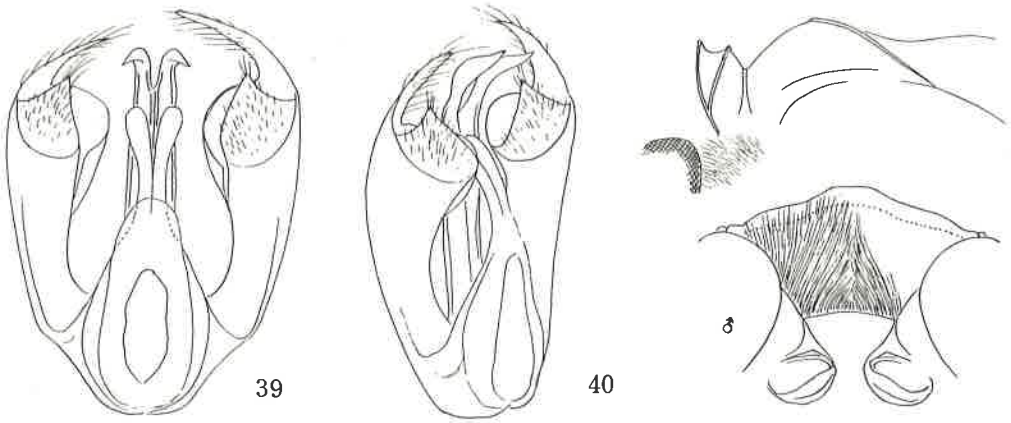


38 A 38 B

14. Group of yogator Tsuneki

Known member 1. Genitalia: Figs. 39 (ventral) and 40 (ventro-lateral). Volsella spatulate.

Head transverse, Gl flask-shaped, =Max5. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum without microsculpture, shining and punctured. IODs=5:4 (♂). SAT low, broad and round nasiform, PAF moderately deep, shallow V-shaped in cross section, bottom line up-curved. Clypeus figured. A3=AW×2.2, Al3=BW×2 and slightly shorter than Al0-12. RC=C. About 9 mm. ♀ unknown.

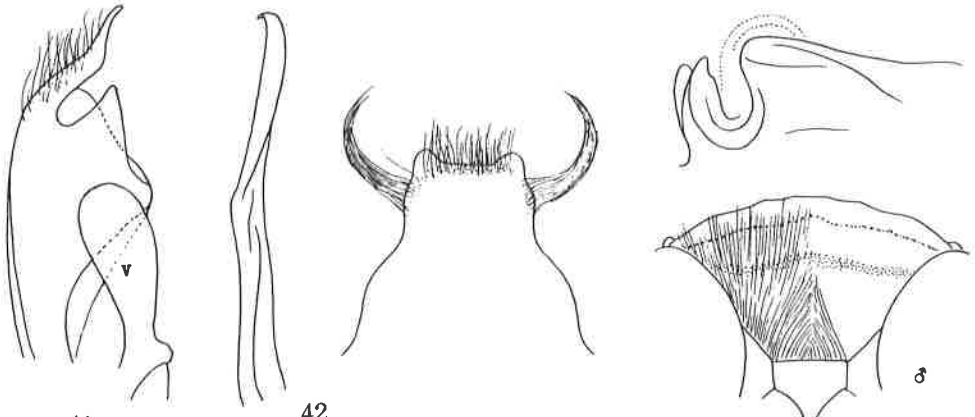


39 40

15. Group of fulviventre Tsuneki

Known member 1. Left paramere and volsella: Fig. 41 (ventral), penis valve: Fig. 42 (dorsal). Sternite 8, SAT-ASR (dorso-lateral) and clypeus (♂) figured.

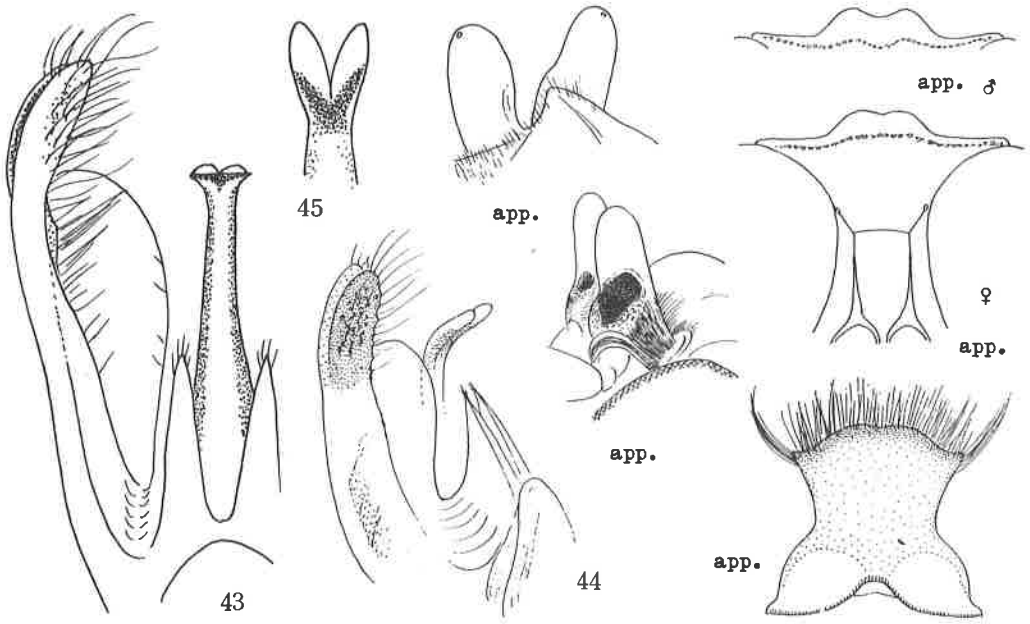
Head transverse, Gl flask-shaped, =Max6. Hair silvery. Propodeum without lateral carinae, area dorsalis enclosed with furrow, mesoscutum shining. SAT moderately high nasiform, PAF deep, flat-bottomed, oval in cross section, clypeus as figured. IODs≒ 5:4 (♂), A3=AWx2.3, Al3=BWx3 and ≒Al0-12. RC=C. 12 mm. ♀ unknown.



41 42

16. Group of appendiculatum Tsuneki

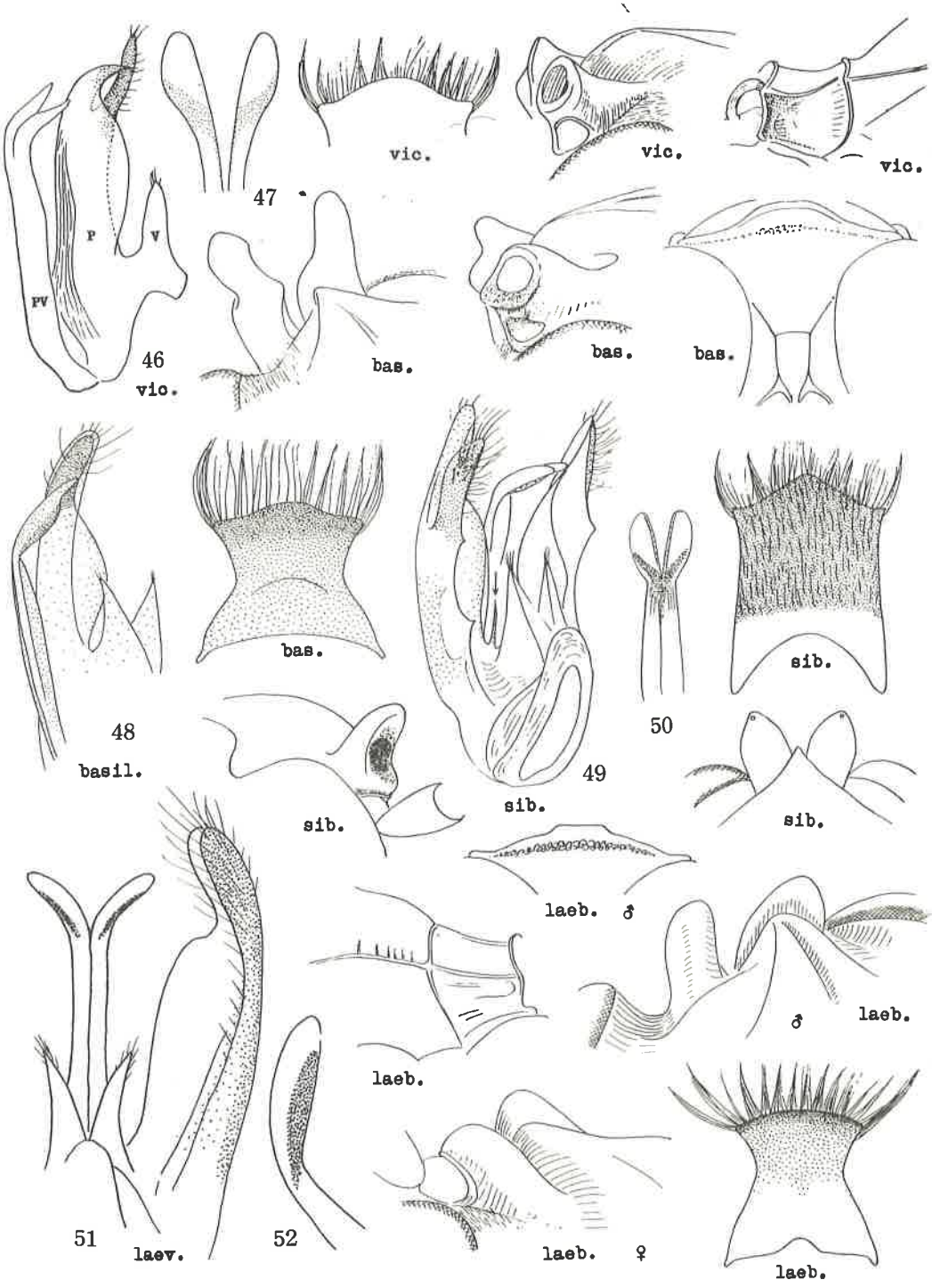
Known members 5: vicinum Tsuneki, basilanense Tsuneki, subuyaense Tsuneki and laeviceps Tsuneki. Genitalia in appendiculatum: Figs. 43 (ventral, right paramere omitted), 44 (ventro-lateral, do.) and 45 (apical part of penis valve, ventral); in vicinum: Figs. 46 (dorso-lateral), 47 (apical part of penis valve, lateral); in basi-



45 43 44

lanense: Fig. 48 (lateral); in sibuyaense: Figs. 49 (ventro-lateral), 50 (penis, ventral); in laeviceps: Figs. 51 (ventral, left paramere omitted) and 52 (apical part of penis valve, lateral). Volsella always elongated triangular. Apical part of penis valve always with a pair of sickle-shaped, black pigmented lines on ventral surface. Apical lobes of paramere comparatively broad, similar or nearly similar in length.

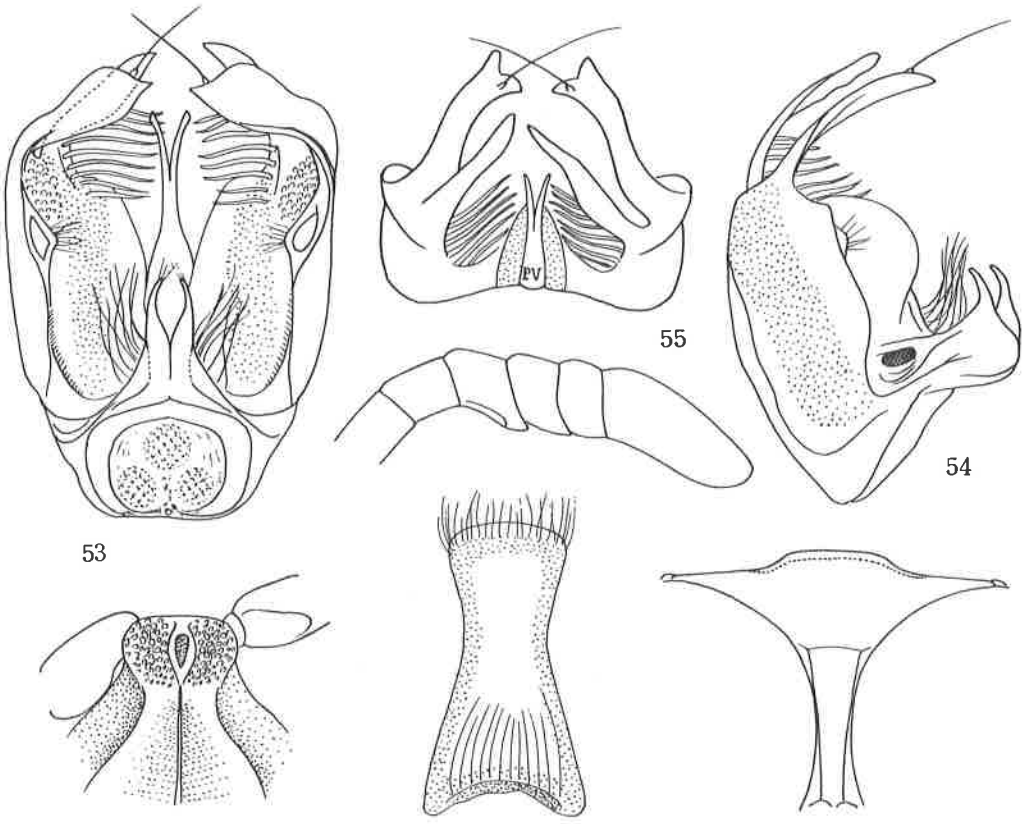
Head from above thick, subquadrate, Gl long clavate, 4Max5. Propodeum posterior-



ly extended, extended part bordered with transverse carina in front, propodeal sternite present, but short, lateral carinae of propodeum distinct, reaching till apex of the extended part, area dorsalis enclosed with furrow, the furrow weak, mesoscutum shining, sometimes under high magnification feeble microsculpture can be seen. SAT low broad nagiform, sometimes moderately high, PAF fairly deep, V- or U-shaped or oval in cross section, with outer end closed with elevation extended from ASR, ASR highly raised above level of SAT, sometimes column-shaped, always with a large fovea at base in front. clypeus with apical margin rounded and medianly recurved (see figures). A3=AW×1.5-2 (♂), ×2.5-3 (♀), Al3=BW×1.7-2 and ≒All+12. RC=B, sometimes close to C. Rl moderately long. 6-7 mm.

17. Group of singaporense Tsuneki

Known member 1. Genitalia: Figs. 53 (ventral), 54 (lateral) and 55 (apical).



Apical bristle of paramere very remarkable; outer area of basiparamere shortly produced inwards in triangle, the produced area carrying a membraneous window within and fringed with hair on the margin, a line of bristles on inner margin of dorsal lobe of paramere very strong and marked, fringe of hair on dorsal margin of volsella also exceptionally long. Sternite 8, SAT-ASR and clypeus figured.

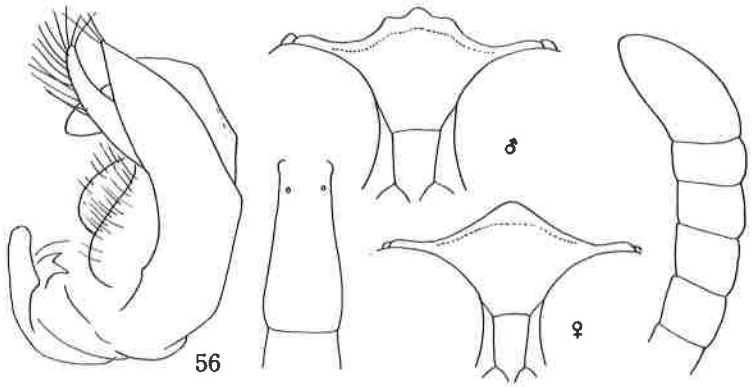
Head from above thick, subquadrate, G1 clavate, =Max3, G2 and 3 each with a fovea at apex in middle. Propodeum fairly markedly extended posteriorly, but without propodeal sternite, lateral carinae of the segment distinct, area dorsalis enclosed with furrow, mesoscutum microcoriaceous. IODs=10:1 (♀), 6:1 (♂). SAT round flat, not particularly raised, producing anteriorly and antero-laterally, covering PAF, clypeus as figured. A3=AW×3 (♀ ♂), A10 in ♂ excavated beneath, Al3=BW×2.5 and ≒A10-12. RC=B,

somewhat close to C, R1 long, reaching close to wing apex. 7-8 mm.

18. Group of jacobsoni Tsuneki

Known member 1. The genitalia were produced and attached to the end of the abdomen of the specimen which was very small and appeared likely to break if manipulated; so the organs were observed in situ. The detailed structure, therefore, could not be observed. Confirmed characters are that penis valve is simple at apex, paramere deeply bifurcated at apex, with lobes similar in length, but different in width, and that volsella is elongate triangular (Fig. 56).

Externally, head from above thick, subquadrate, Gl clavate, =Max2.5. Propodeum with lateral carinae, area dorsalis with weak lateral furrows, mesoscutum microcoriaceous and punctured, SAT low broad nasiform, gently tectate, PAF covered with expanded part of SAT, clypeus as figured (♀ ♂). IODs=3:1 (♀), 5:2 (♂), A3=AWx2 (♂), A13=BWx2 and slightly shorter than A10-12. RC=B, R1 markedly long, reaching close to wing apex. 5-6 mm.

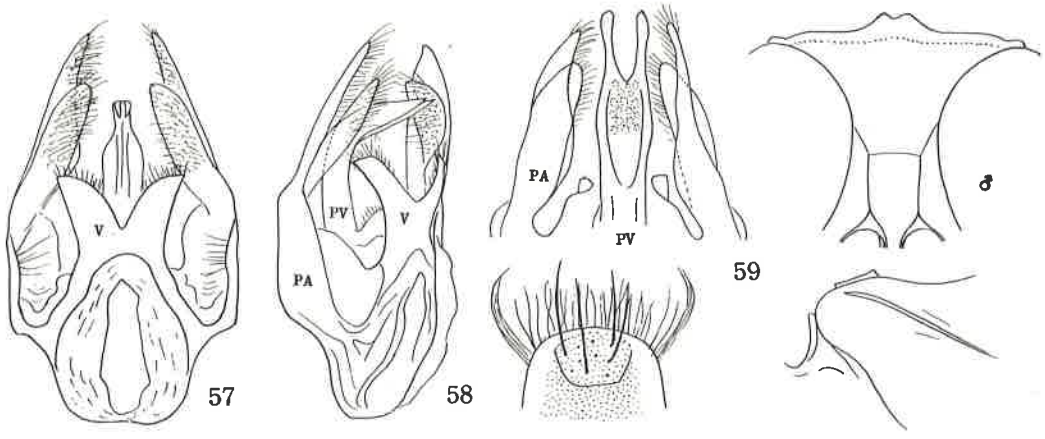


56

19. Group of suumi Tsuneki

Known member 1. Genitalia: Figs. 57 (ventral), 58 (ventro-lateral) and 59 (apical portion, dorsal). Penis valve somewhat approaching the development of shoulder. Figures of sternite 8 (apical portion only given) is considered to show overlapping sternite 7 in reality, with bundles and fringe of hair of sternite 8 produced.

Externally, head from above very thick, subquadrate, Gl clavate, but slender and



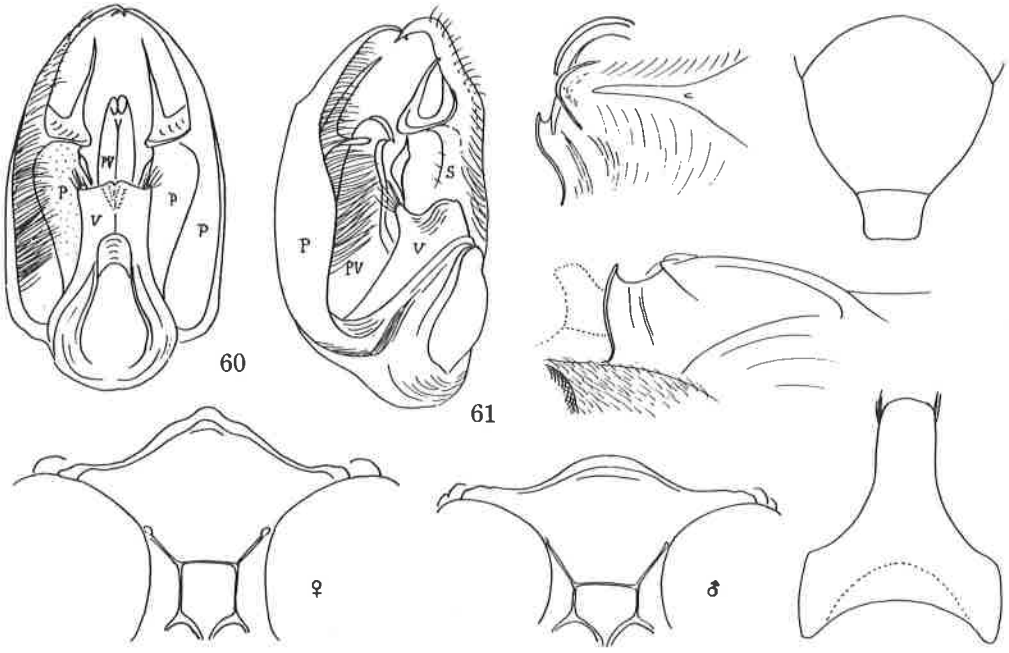
57 58 59

long, ≒Ma×4, Gl, 2 and 3 each with a fovea at apex; propodeum strongly extended posteriorly and provided with propodeal sternite, lateral carinae distinct, area dorsalis without distinct lateral furrows, mesoscutum microcoriaceous, IODs=2:1, SAT low, round and flat, extending antero-laterally, covering PAF. Clypeus as figured, A3=AW× 1.7, A7-8 gently excavated beneath, A13 slightly longer than A11+12. RC=B, R1 considerably long. About 7 mm. ♀ unknown.

20. Group of kambaitium Tsuneki

Known member 1. Genitalia: Figs. 60 (ventral) and 61 (ventro-lateral). Notice that base of apical lobes of paramere is expanded ventrally to form a shelf. Sternite 8 as figured.

Head transverse, but somewhat thick, Gl clavate, ≒Ma×3. Propodeum with lateral carinae, area dorsalis with lateral furrows, mesoscutum microcoriaceous, IODs=3:2 (♀) 10:9 (♂). SAT moderately high nasiform, anteriorly with bifurcate transverse carina one of which interrupting PAF. Clypeus (♀ and ♂) as figured. A3≒AW×3 (♀), ×2.5 (♂), A13=BW×2.4 and ≒A9-12. RC=B, R1 moderately long. About 10 mm.



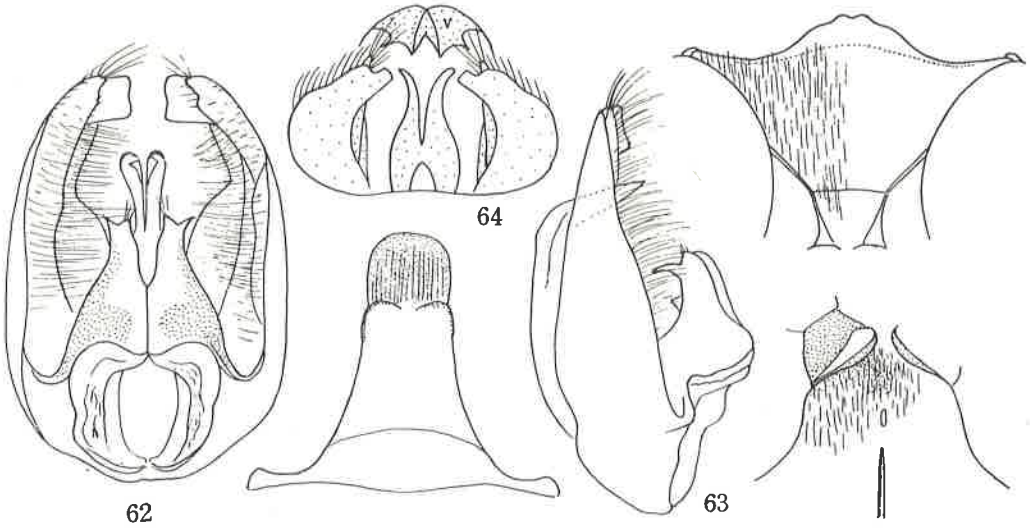
21. Group of maai Tsuneki

Known member 1. Genitalia: Figs. 62 (ventral), 63 (lateral) and 64 (apical, v: volsella). Volsella special in form, sternite 8 also curious (figured).

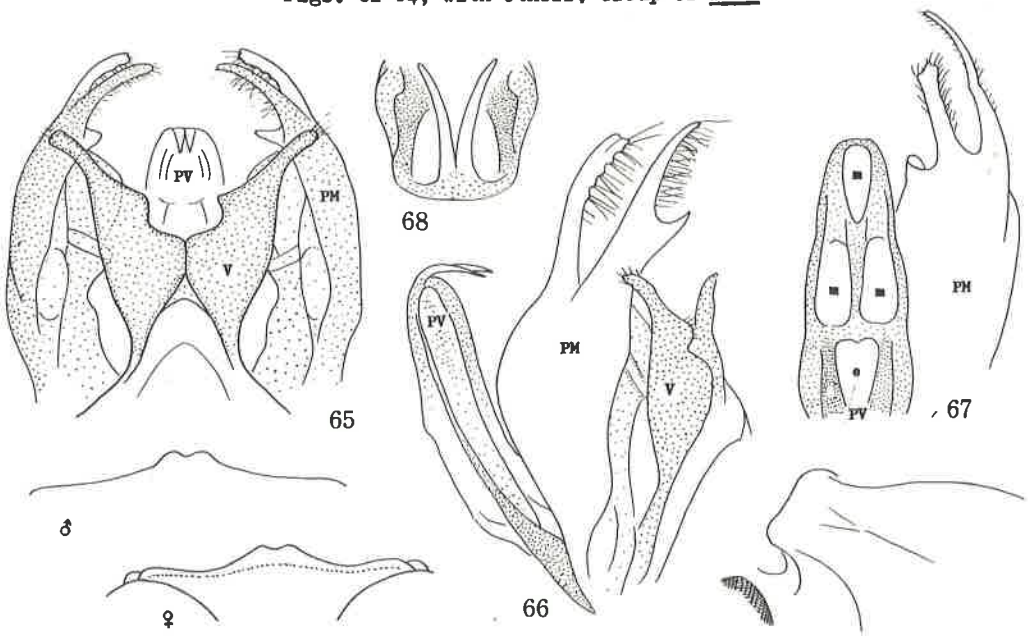
Head thick, subcubic, Gl clavate, ≒Ma×2.5. Gl, 2, 3 without fovea at apex. Propodeum with lateral carinae, area dorsalis with lateral furrows, mesoscutum shining. IODs≒3:2, SAT low broad round tuberiform, anteriorly margined with transverse carina, the carina interrupting PAF. Clypeus as figured. A3=AW×2.5, A13≒A11+12. RC=B, R1 moderately long. About 5 mm. ♀ unknown.

22. Group of maculipes Tsuneki

Known member 1. Genitalia: Figs. 65 (ventral), 66 (lateral), 67 (dorsal, right paramere omitted) and 68 (apical part of penis seen vertically). PM paramere, PV penis



Figs. 62-64, with others. Group of maai



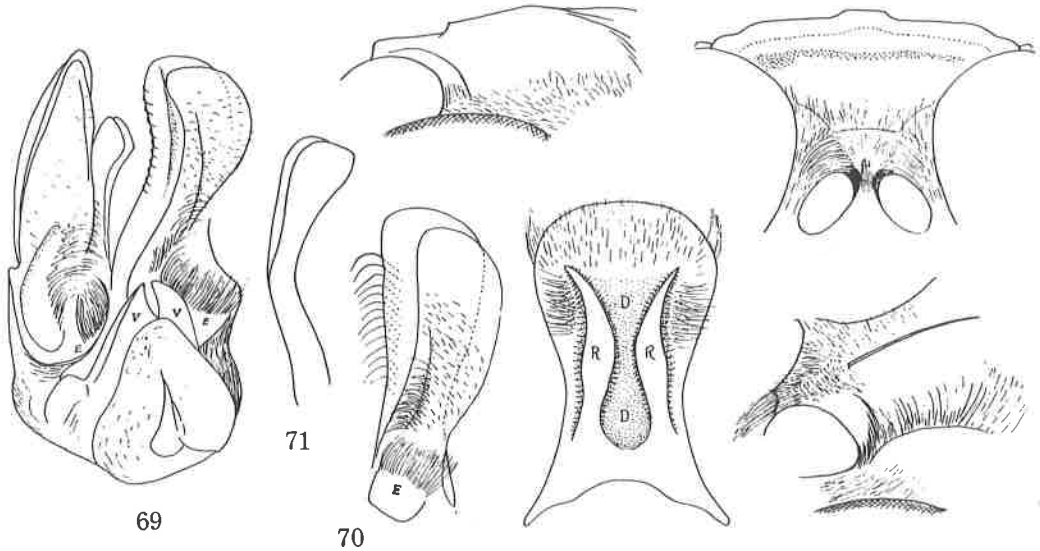
Figs. 65-68, with others. Group of maculipes

valve, V volsella, dotted area well chitinized, m : translucent membraneous area, e: empty space. Penis and volsella strange in form.

Head thick, subcubic, Gl clavate, comparatively long and slender, ≒Ma×5, Gl, 2, 3 each with a fovea at apex. Propodeum extended posteriorly, with distinct propodeal sternite, lateral carinae of propodeum distinct, area dorsalis without lateral furrows, mesoscutum microcoriaceous, IODs=2:1 (♀), 3:1 (♂), SAT low, surface nearly flat, subquadrate in form, covering PAF. Clypeus as figured. A3=AW×2 (♂), Al3 slightly longer than All+12, A8 in ♂ gently excavated beneath. RC=B, Rl moderately long. 7 mm.

23. Group of capillatum Tsuneki

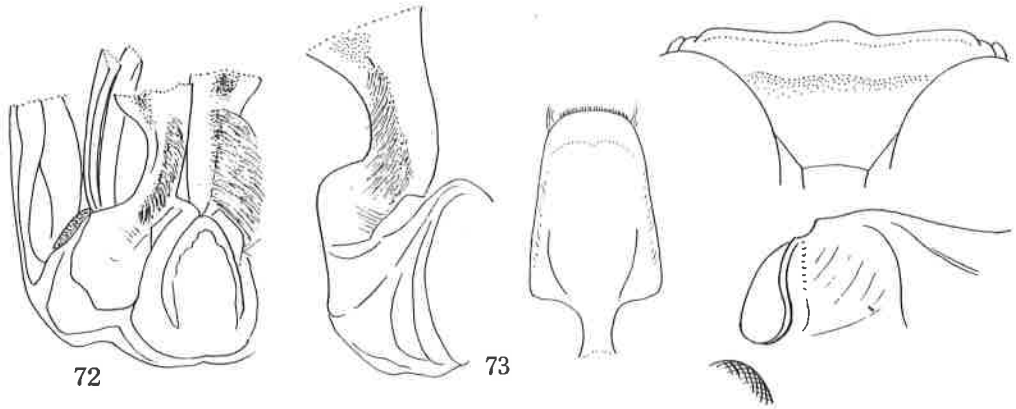
Known member 1. Genitalia: Figs. 69 (ventro-lateral), 70 (rihgt paramere, ventral), 71 (panis valve lateral). Paramere at base with a small subquadrate appendage, dorsal margin of which is densely fringed with hair; medial short ridge on ventral side at base of inner lobe of paramer also fringed with hair. Sternite 8 very characteristic. Head transverse, Gl clavate, ≒Max3. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum microcoriaceous, IODs≒3:2 (♀ ♂), SAT low broad nasiform, medio-apical part produced on IAA, with apex covered with a tuft of hair, without distinct PAF. Clypeus as figured (♂). Antenna apically and fore and hind legs (♂) considerably modified. A3=AW×2.5 (♀), ×2 (♂), Al3 modified, Al0-12. 10 mm.



69 71 70

24. Group of truncatum Tsuneki

Known member 1. Genitalia only incompletely observed, apical half is missed and important characters of the organs unknown. From the basal characters, however, the following facts are presumed: (1) Penis valve simple at apex, because it is laterally compressed and slender just as in capillatum; (2) paramere deeply bifurcate till near base; (3) volsella well developed, possibly apically markedly enlarged, with a longitudinal row of hair on ventral side at base. Observed parts: Figs. 72 (ventro-lateral) and 73 (volsella, do.). Sternite 8 remarkable. Head transverse, Gl clavate, Max3. Propodeum with lateral carinae, area dorsalis with lateral furrows, mesoscutum microcoriaceous, SAT moderately high broad nasiform, PAF shallow, down-curved in cross section. ASR very short. Clypeus gently rounded out in ♀, in ♂ as figured. IODs≒3:2(♂ ♀), A3=AW×2 (♂), ×3(♀), Al3 and legs in ♂ modified. RC=B, Rl short.



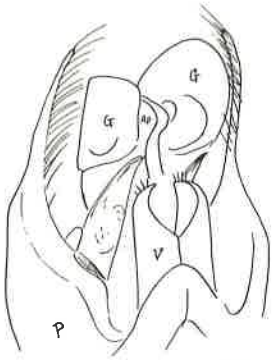
72 73

II. GROUPS OF MAJOR GROUP II

1. Group of catalactae Arnold

Known member 1. Genitalia: Figs. 74 (ventro-lateral), 75 (penis and volsella, do.) and 76 (penis valve, lateral, schematic).

Head transverse, somewhat thick, HW:HL=100:55. Gl flask-shaped, ≒Max5. SAT wide round tuberiform, apical margin transversely carinated, interrupting true PAF. Propodeum without lateral carinae, area dorsalis enclosed with furrow, mesoscutum without microsculpture, clypeus medianly widely produced. IODs=10:8-9 (♂), A3=AW×3 (♂), Al3=BW×2 and slightly longer than Al2. 13 mm.



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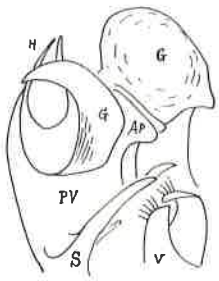

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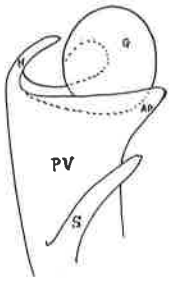

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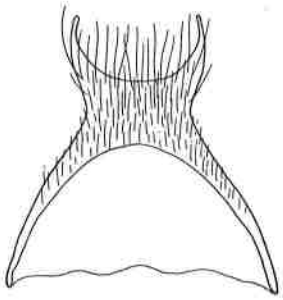
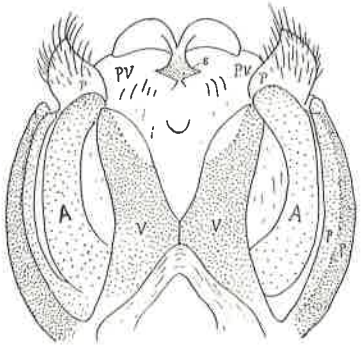


2. Group of chosenense Tsuneki

Known member 1. Genitalia: Figs. 77 (ventral), 78 (dorsal) and 79 (ventro-lateral).

Head transverse, HW:HL=100:56. Gl clavate, ≒Max2.5. SAT low broad tuberiform, apical margin transversely carinated, carina interrupting PAF. Clypeus medianly with



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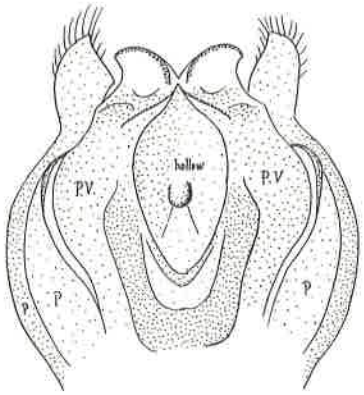

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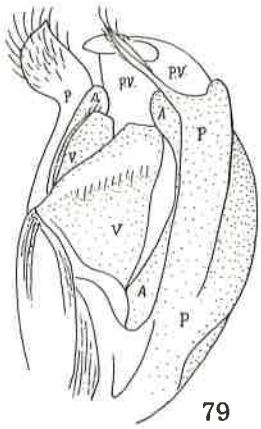

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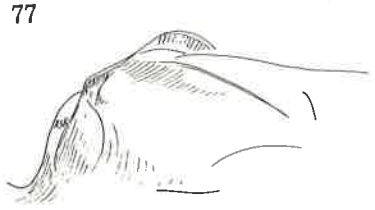
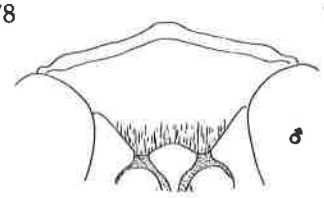


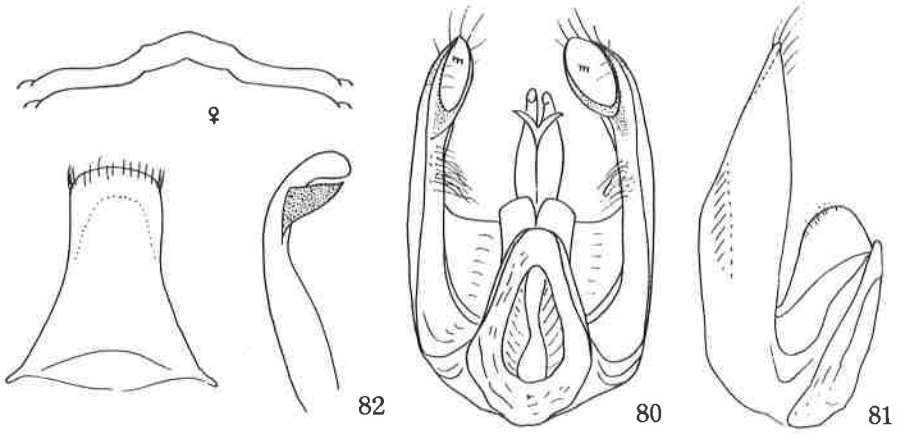


a short prominence. Propodeum with lateral carinae, area dorsalis without lateral furrows, mesoscutum microcoriaceous, IODs=10:9 (♂), 4:3 (♀), A3=AW×1.8 (♂), ×2.2 (♀), Al3 =BW×2 and ≒All+12. RC=B, Rl short. 7.5-8 mm.

3. Group of nilgiriense Tsuneki

known member 1. Genitalia: Figs. 80 (ventral), 81 (lateral), 82 (penis valve, lateral). Sternite 8 figured. Apical part of paramere characteristic.

Head transverse. Gl long clavate, ≒Max4.5. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum microcoriaceous. SAT high narrow nasiform, apical margin transversely carinated, carina interrupting PAF, antero-lateral area of SAT just behind transverse carina very deeply excavated. Apical margin of clypeus as figured. IODs=2:1 (♀), 10:9 (♂). A3=AW×3.5 (♀), ×2.7 (♂), Al3=BW×2 and ≒A9-12. RC=B, Rl moderately long. ♀ 12-13 mm, ♂ 7-9 mm.

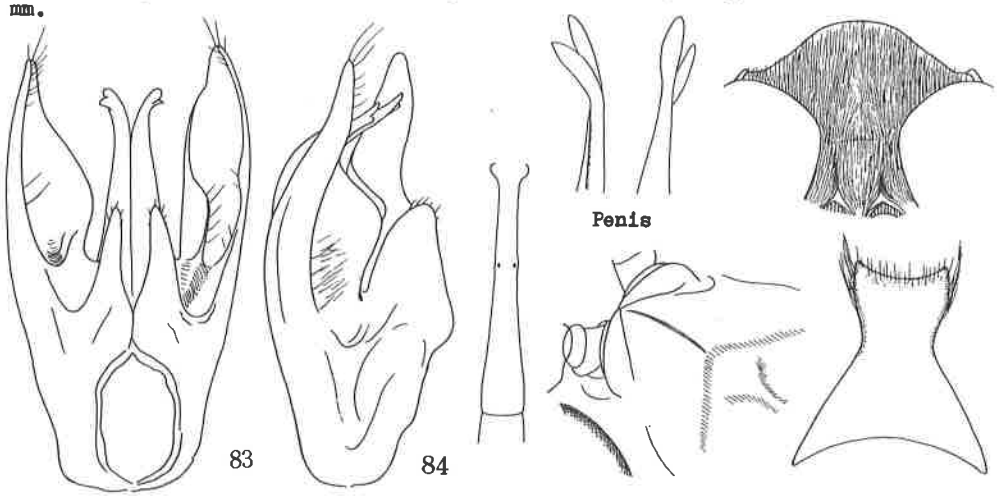


82 80 81

4. Group of mediator Nurse

Known member 1. Genitalia: Figs. 83 (ventral), 84 (lateral). Penis valve (dorsal and ventral) and sternite 8 as figured.

Head transverse, Gl long clavate, ≒Max6. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum without microsculpture, SAT low broad round nasiform, expanded antero-laterally, covering PAF. Clypeus rounded out anteriorly. IODs =2:1 (♀ ♂), A3=AW×3 (♀), ×2.3 (♂), Al3=BW×2 and slightly longer than Al2. RC=B. 8-12 mm.

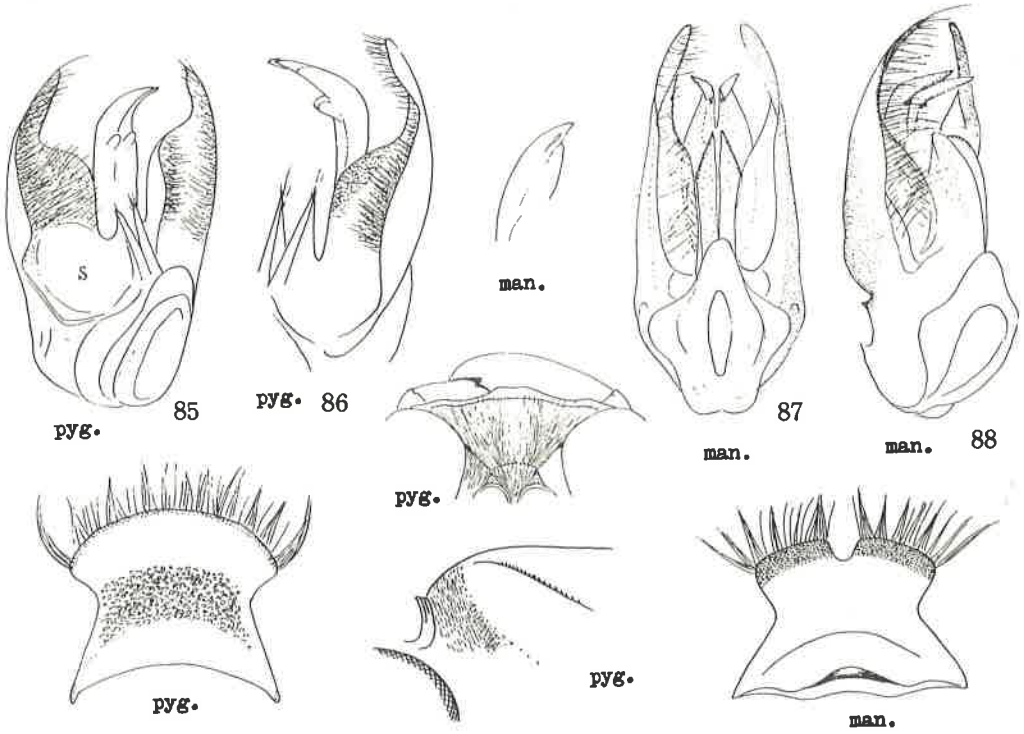


83 84

5. Group of pygmaeum Cameron

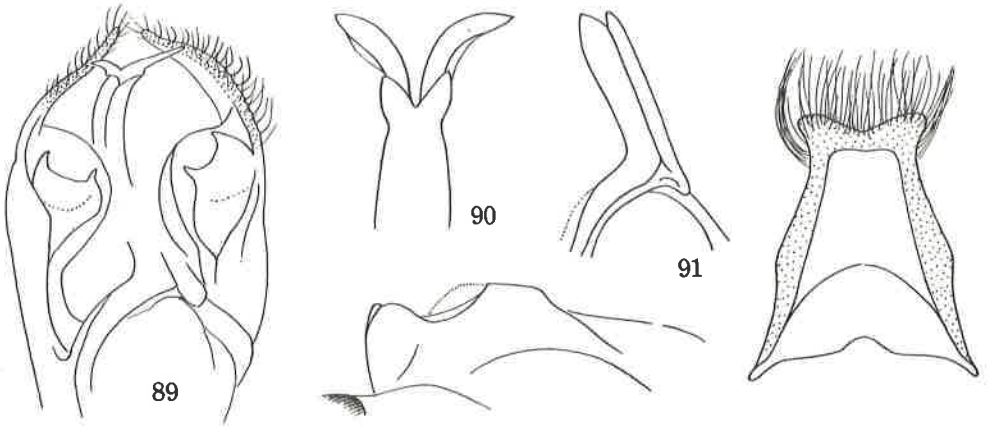
Known members 2. Genitalia in pygmaeum: Figs. 85 (nearly ventral), 86 (lateral); in mandibulatum: Figs. 87 (ventral) and 88 (lateral). Sternite 8 of both figured.

Head thick, subcubic. IODs=3:2 (in both, ♀ ♂). Gl clavate, =Max2-3. Propodeum with lateral carinae, area dorsalis with feeble lateral furrows, mesoscutum microcoriaceous. Antenna in ♂ also 12-jointed. Mandible with a short tooth near apex on inner margin. SAT low rounded, without medial carina, ASR very short, PAF small and shallow. RC=B, Rl short. 4-7 mm.



6. Group of laosianum Tsuneki

Known member 1. Genitalia: Fig. 89 (ventro-lateral), penis: Fig. 90, volsella: Fig. 91. Sternite 8 of both also figured. Characteristic is the expansion of outer area



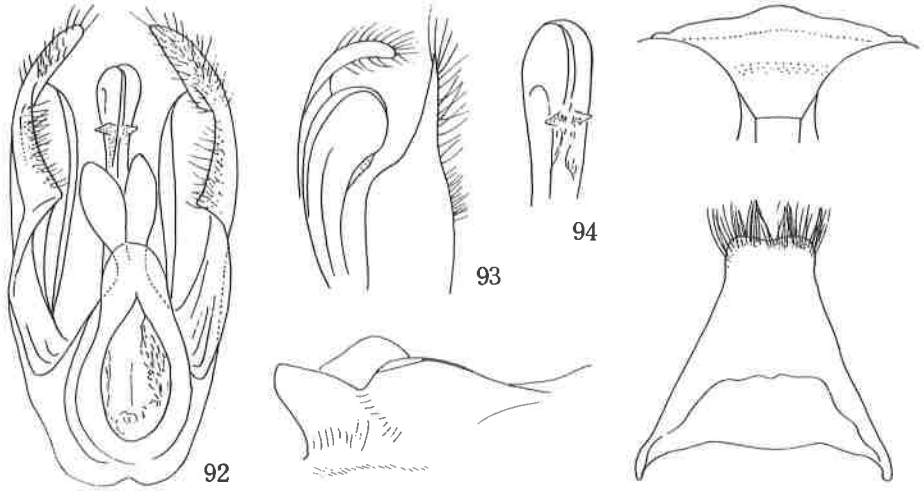
of basiparamere which is strange in from.

Head transverse, Gl flask-shaped, ≒ Ma×3. IODs=5:4. Propodeum without lateral carinae, area dorsalis without lateral furrows, mesoscutum shining. SAT low broad tuberiform, medio-anteriorly with a round flat area, but without hollow on it, PAF shallow, down-curved in cross section. RC=C, Rl short. 10-11 mm.

7. Group of lumpurense Tsuneki

Known member 1. Genitalia: Figs. 92 (ventral), 93 (dorso-lateral), 94 (penis, ventro-lateral). Apical part of penis valve not turned ventrally. Sternite 8 figured.

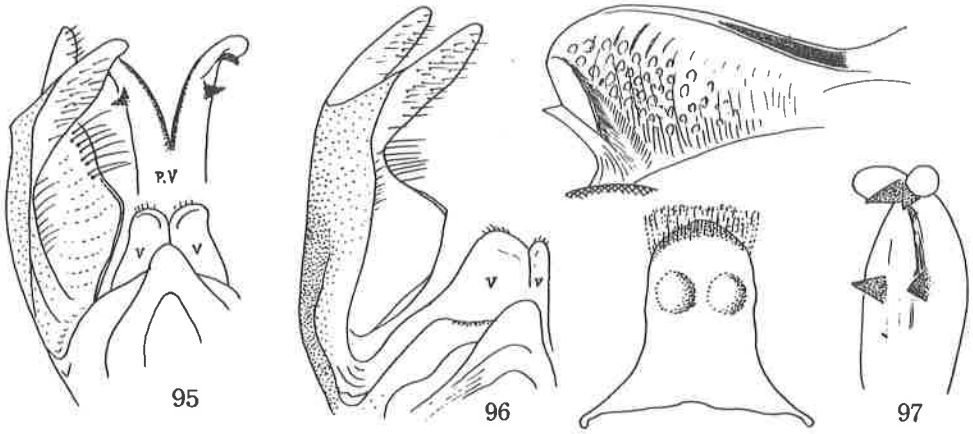
Head considerably thick, HW:HL=100:60. Gl flask-shaped, =Max4-5. Propodeum with lateral carinae, area dorsalis without lateral furrows. IODs=2:1 (♂), =3:1 (♀). SAT moderately high nasiform, PAF broad and shallow, wide-V-shaped in cross section, ASR broadly expanded anteriorly, smooth. RC=C, somewhat close to B, Rl long, reaching close to wing apex. 7-8 mm.



8. Group of koikense Tsuneki

Known member 1. Genitalia: Figs. 95 (ventral), 96 (lateral); penis valve: Fig. 97 (ventro-lateral). Sternite 8 figured.

Head thick, HW:HL=100:60. Gl clavate, ≒Ma×3. Propodeum with lateral carinae,

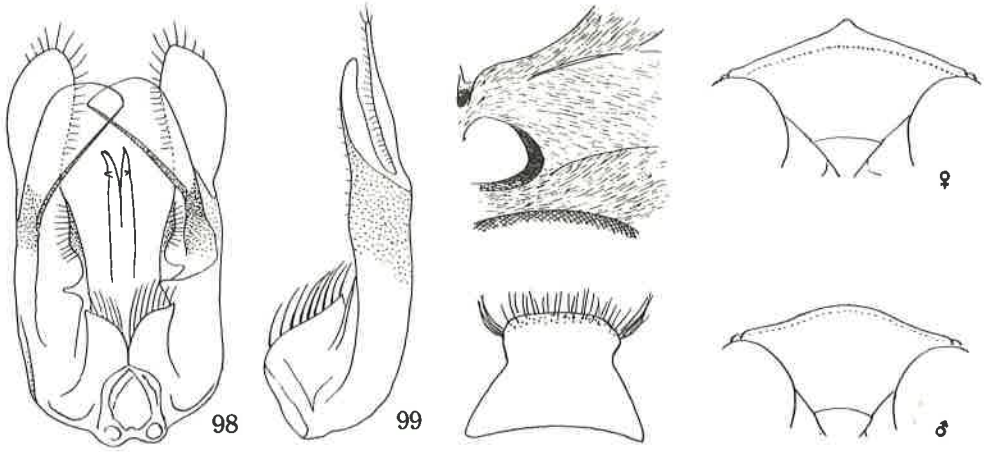


area dorsalis enclosed with furrow, mesoscutum microcoriaceous. IODs=2:1 (♀), 3:2 (♂). SAT high narrow nasiform, apical margin transversely carinated, carina interrupting PAF, ASR short. RC=C, R1 moderately long. 5-8 mm.

9. Group of testaceicorne Cameron

Known member 1. Genitalia: Figs. 98 (ventral) and 99 (lateral).

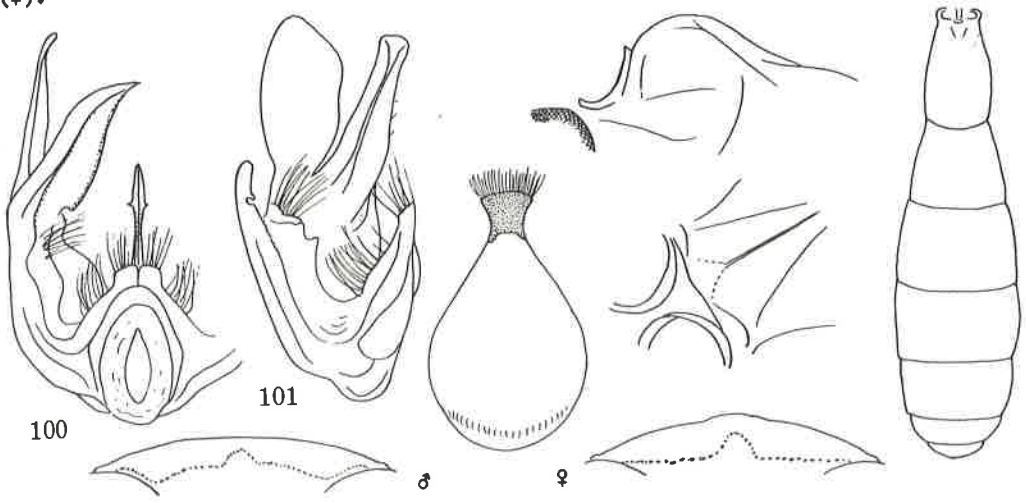
Head transverse. Gl clavate, =Max3.5-4. Propodeum with lateral carinae, area dorsalis with lateral furrows, mesoscutum microcoriaceous. IODs≒3:2 (♂), ≒2:1 (♀). SAT low rounded and gently roundly inclined laterally, without PAF. Clypeus (♀ ♂) as figured. RC=C, somewhat close to M. R1 short. About 6 mm.



10. Group of crassiventre Tsuneki

Known member 1. Genitalia: Figs. 100 (ventral, right paramere omitted) and 101 (lateral). Strange sternite 8 is figured.

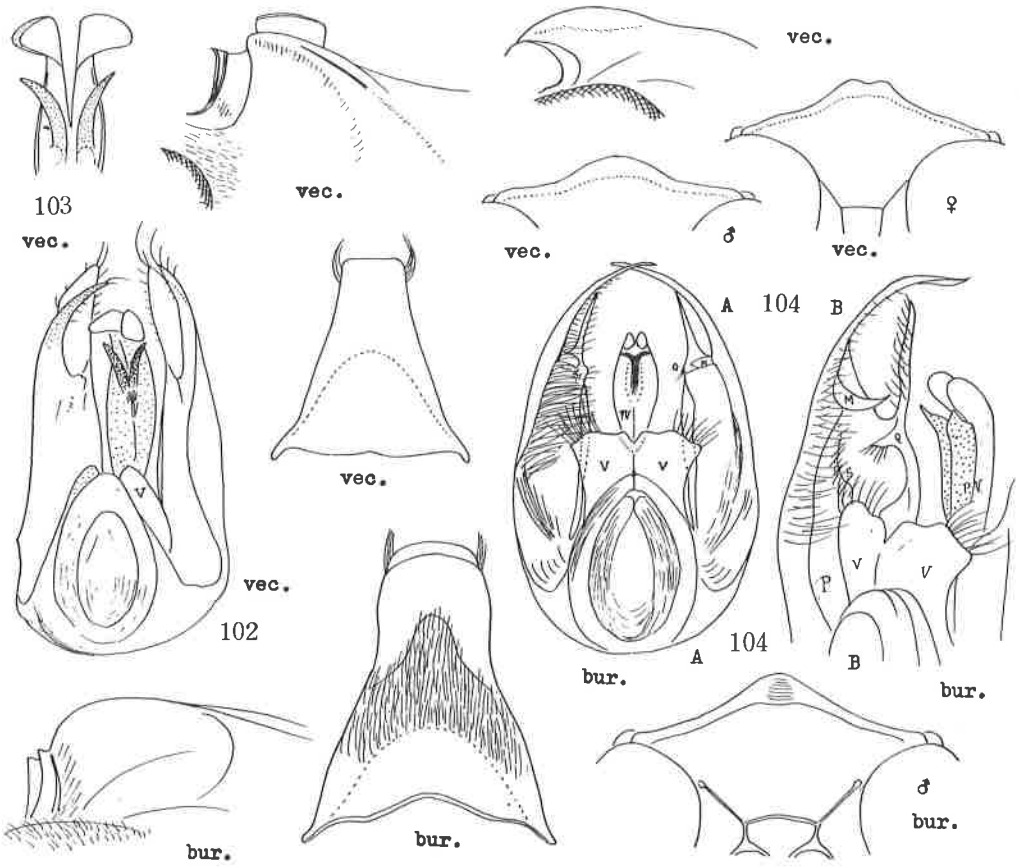
Head transverse, HW:HL=100:54. Gl thick and short, almost sessile (figured), = Max2. SAT moderately high nasiform, apical margin acutely edged and carinated, carina reaching ASR, interrupting PAF. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum smooth, densely covered with fine punctules. Clypeus as figured. Antenna in ♂ markedly modified. RC=B, R1 short. About 6 mm. IODs=2:1 (♂), 5:3 (♀).



11. Group of vechti Tsuneki

Known members 2. Genitalia in vechti: Figs. 102 (ventral), 103 (penis, ventral); in burmaense: Figs. 104, A (ventral) and B (ventro-lateral, from right side, right paramere omitted). Sternite 8 of both figured.

Head transverse, Gl clavate, =Ma×2.5-3. Propodeum with lateral carinae, area dorsalis with lateral furrows, mesoscutum microcoriaceous. SAT moderately high rounded nasiform, without anterior transverse carina, PAF shallow, wide-V-shaped in cross section, ASR not long. IODs=10:8-9 (♂), =2:1 (♀). Clypeus medianly more or less produced anteriorly. RC=B-C. Rl rather short. 6-10 mm.

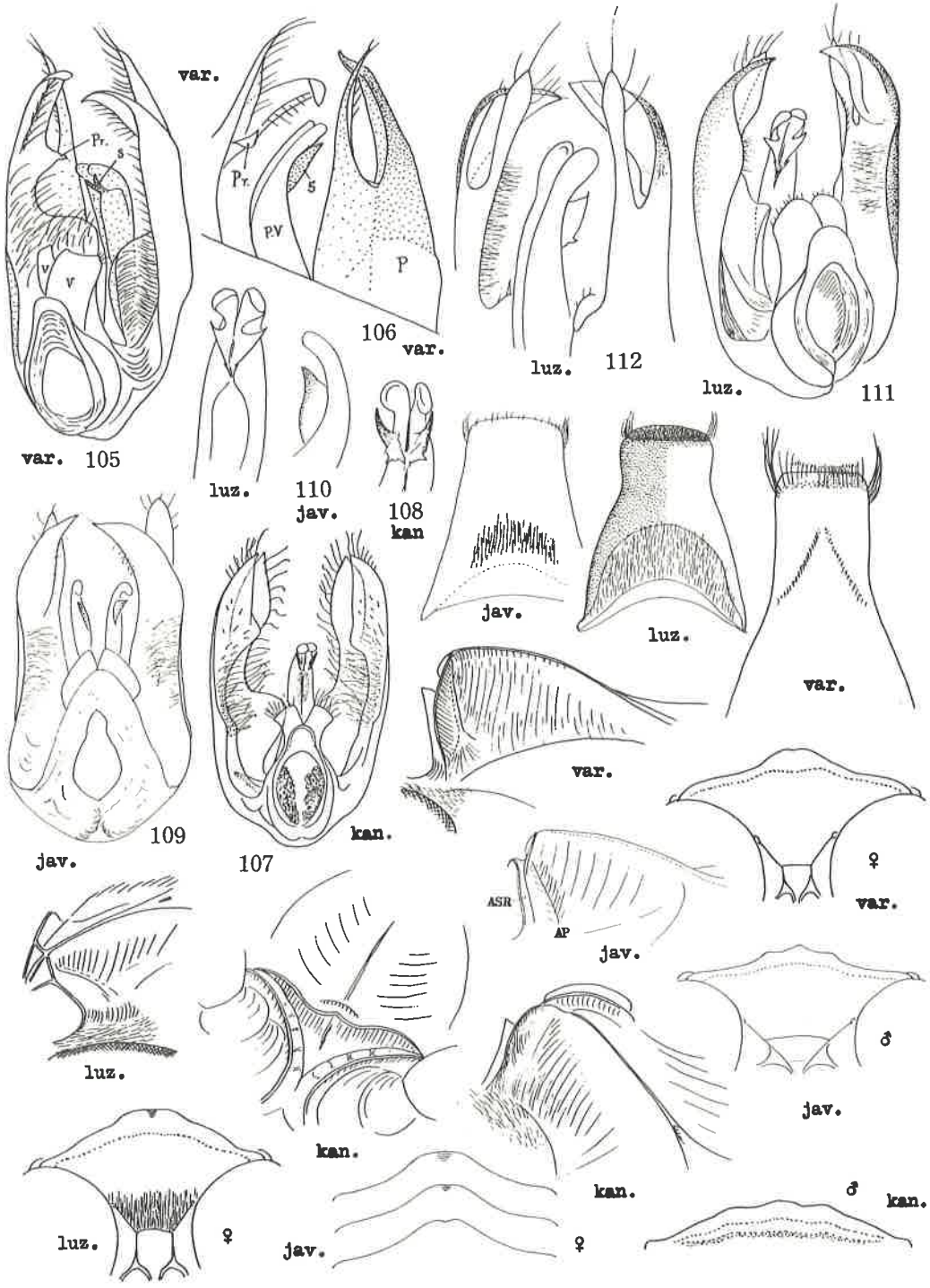


12. Group of varipes Pérez

Known members 4. Genitalia in varipes: Figs. 105 (ventro-lateral), 106 (dorso-lateral); in kasitakum: Figs. 107 (ventral), 108 (penis, ventral); in javanense: Figs. 109 (ventral), 110 (Penis, lateral); in luzonense: Figs. 111 (ventro-lateral) and 112 (dorso-lateral). Sternite 8 also figured.

Head transverse, sometimes somewhat thick (HW:HL=100:60). Gl clavate, =Ma×2.5-4. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum microcoriaceous. SAT always moderately high, rather long nasiform and anteriorly margined with transverse carina, the carina reaching ASR, interrupting PAF. Clypeus medianly more or less produced anteriorly, sometimes recurved, sometimes bluntly tridentate. A3=AW×2.2-3.3 (♂), ×3.3-4 (♀). Al3=BW×2 and ≒A9-12, sometimes (in varipes) =A10-12. RC=C or B. Rl short or moderately long. Length ♂ 7-9 mm, ♀ 9-11 mm.

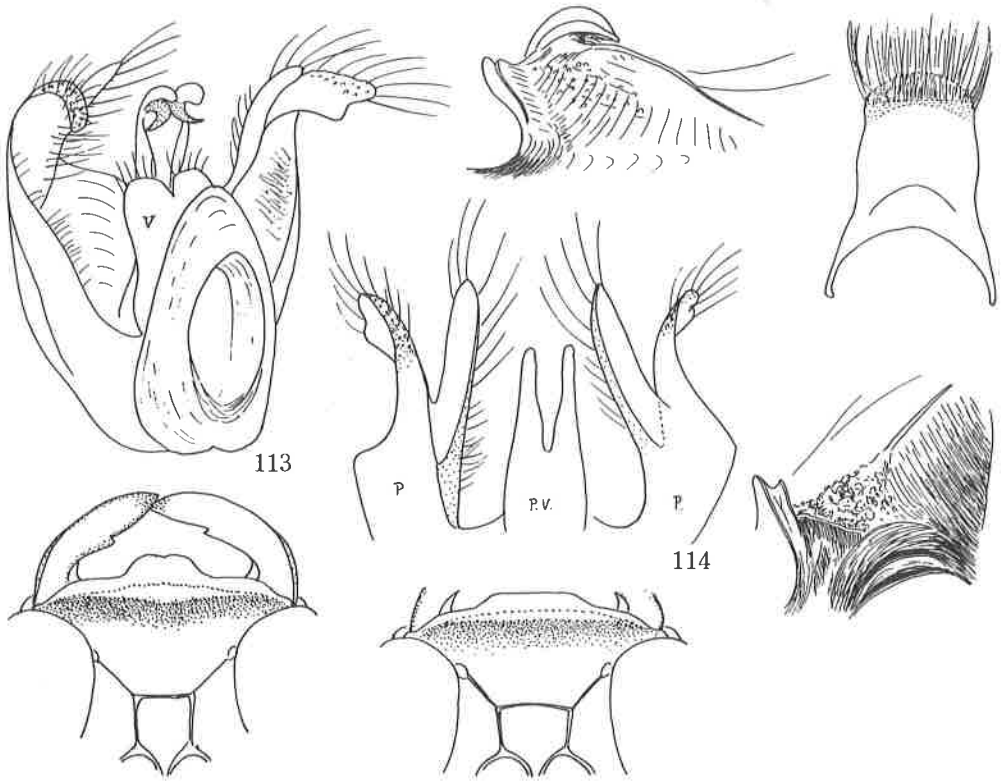
In the figures given on the following page var. shows varipes, luz.=luzonense, jav.=javanense and kan.=kansitakum.



13. Group of imayoshii Yasumatsu

Known member 1. Genitalia: Figs. 113 (ventro-lateral) and 114 (dorsal).

Head transverse, Gl flask-shaped, = Max5. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum microcoriaceous. SAT moderately high tuberiform, or low broad nasiform, apical margin transversely rugoso-carinate, carina sometimes indistinct. PAF shallow, broad, down-curved in cross section. Clypeus medianly produced. IODs=10:8-9 (♀ ♂), A3=AW×2.5 (♂), ×4.3 (♀). RC=C, somewhat close to B. 8-10 mm.



14. Group of pacificum Gussakovskij

Known members 15. This group is divided into two subgroups based on the structure of apical part of paramere.

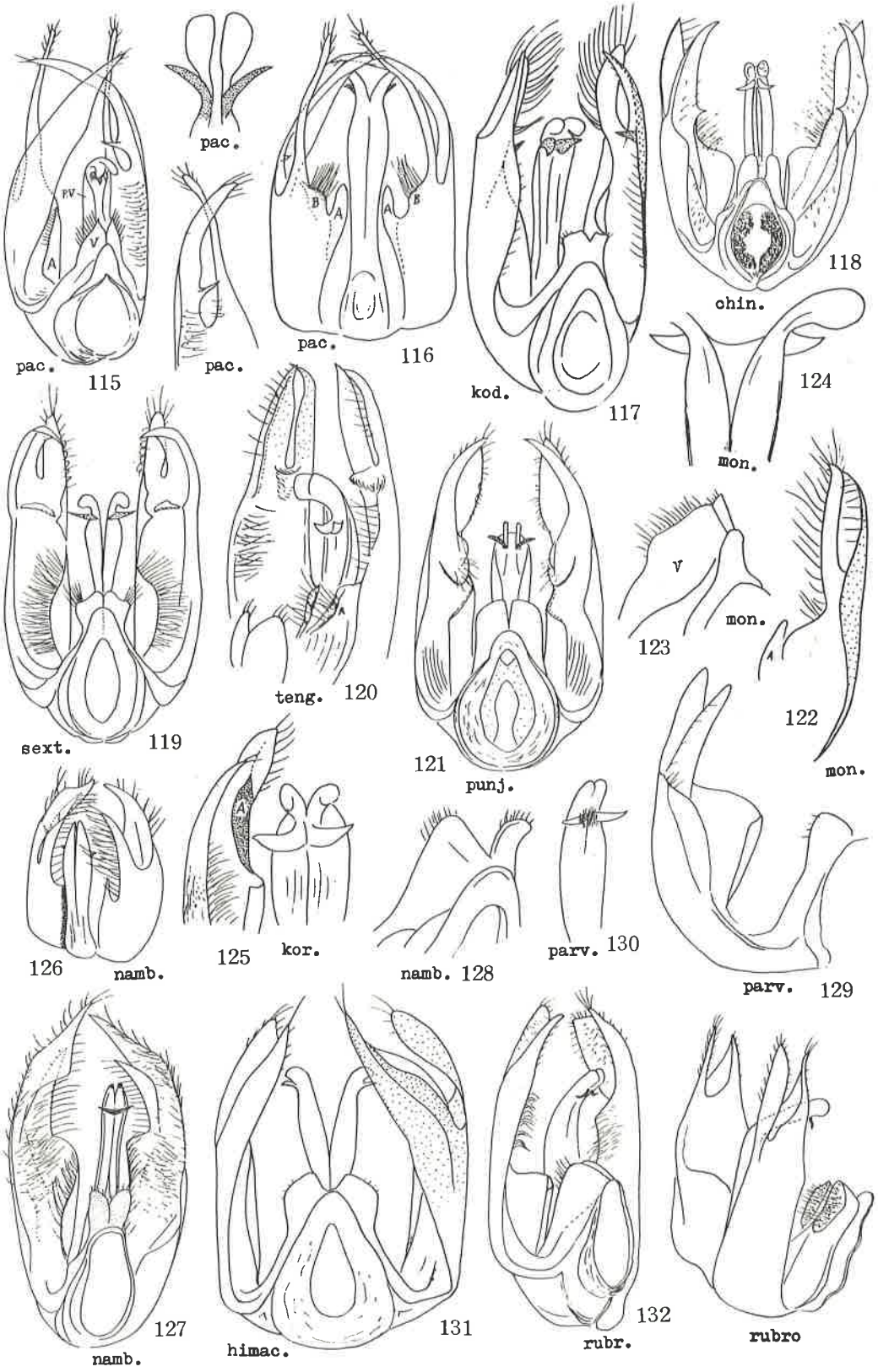
A. Subgroup pacificum Gussakovskij

Known members 5. Genitalia in pacificum: Figs. 115 (ventro-lateral), 116 (dorsal); kodamanum: 117 (ventro-lateral); sextum: 119 (ventral); tengmen: 120 (ventro-lateral); punjabense: 121 (ventral).

B. Subgroup monticola Tsuneki

Known members 10. Genitalia in monticola: Figs. 122 (right paramere, ventral); 123 (volsella, ventro-lateral), 124 (penis valve, dorsal); koreanum: 125 (ventral, right paramere omitted), nambui: 126 (dorso-lateral), 127 (ventral) and 128 (volsella ventro-lateral); parvulum: 129 (lateral), 130 (penis valve, ventro-lateral); himachalense: 131 (ventral), rubrocaudatum: 132 (ventro-lateral), okeanskayanum: 133 (ventral), 134 (ventro-lateral); quadriceps: 135 (ventro-lateral), fenchihuense: 136 (ventro-lateral), scitulum: 137 (ventral) and 138 (ventro-lateral).

Remarks. Each of the two subgroup include considerably different states in the relative depth of the apical split of the paramere. (Continued on p. 91)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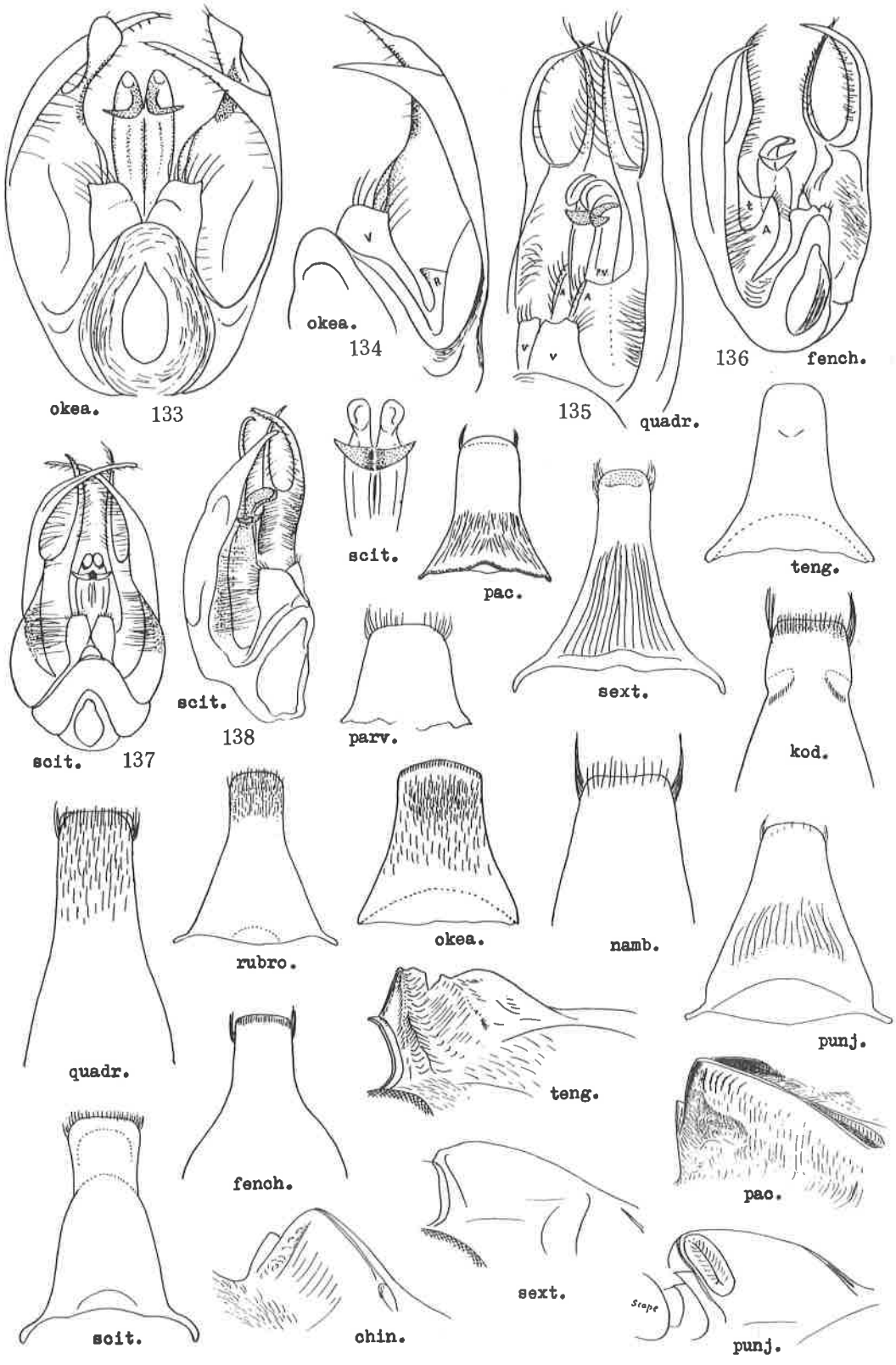
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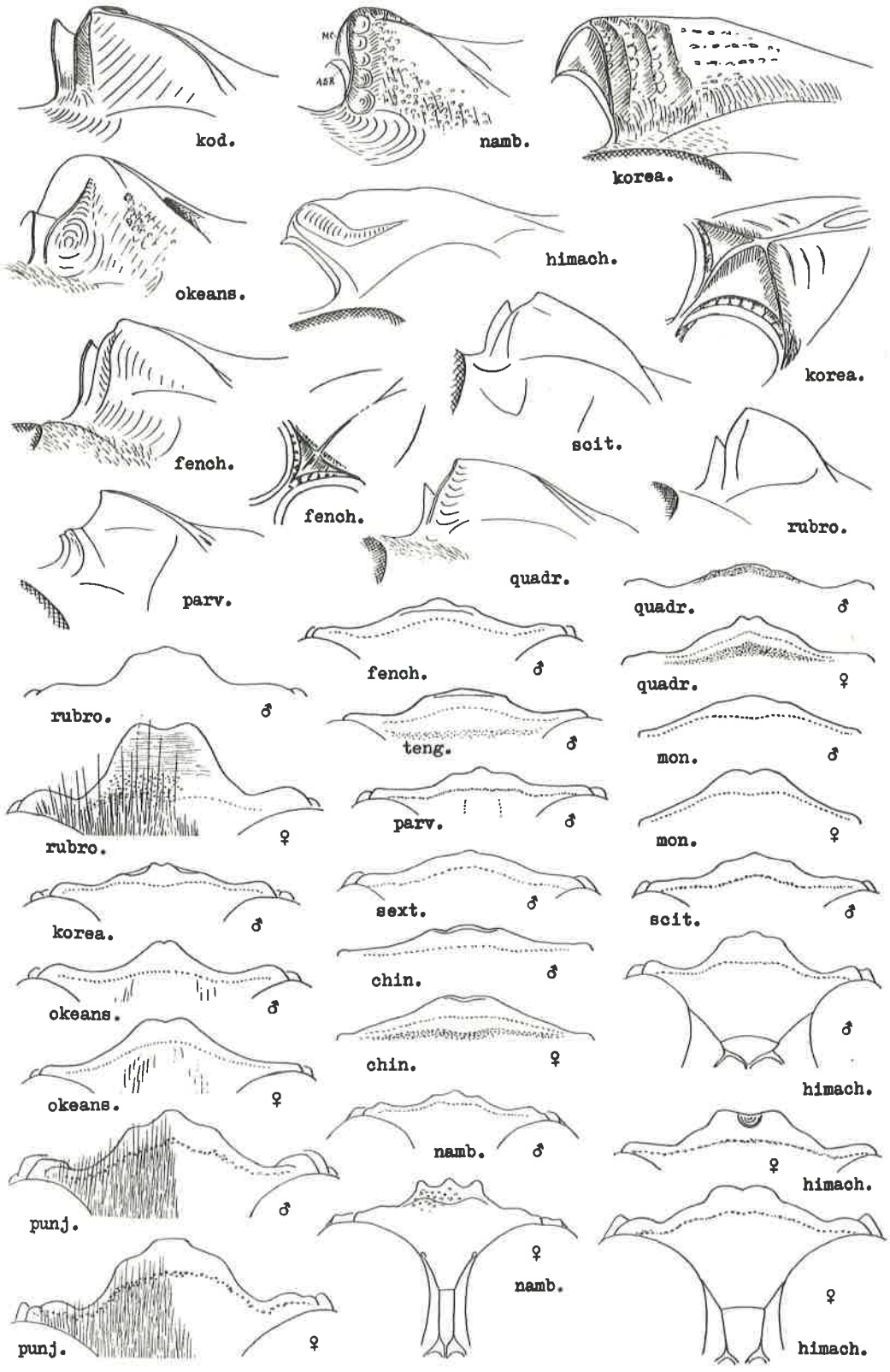
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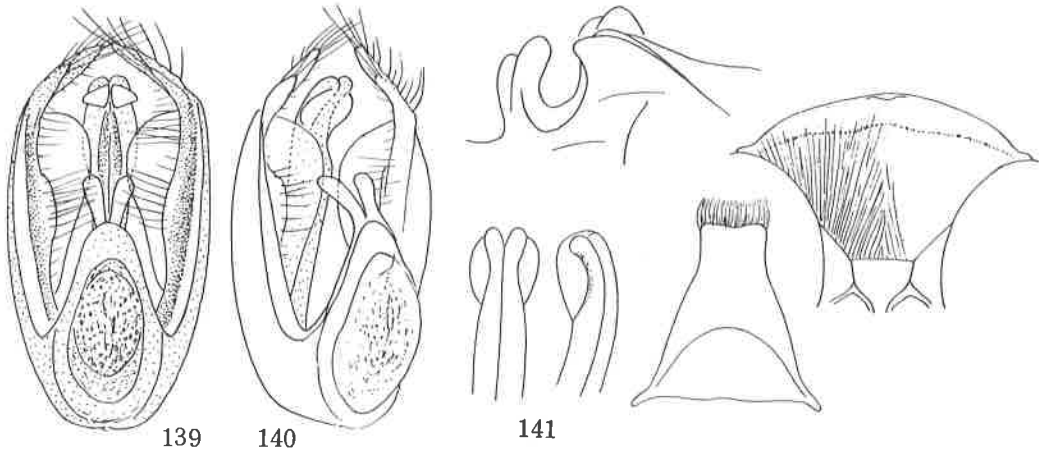
15. Group of rufigaster Tsuneki

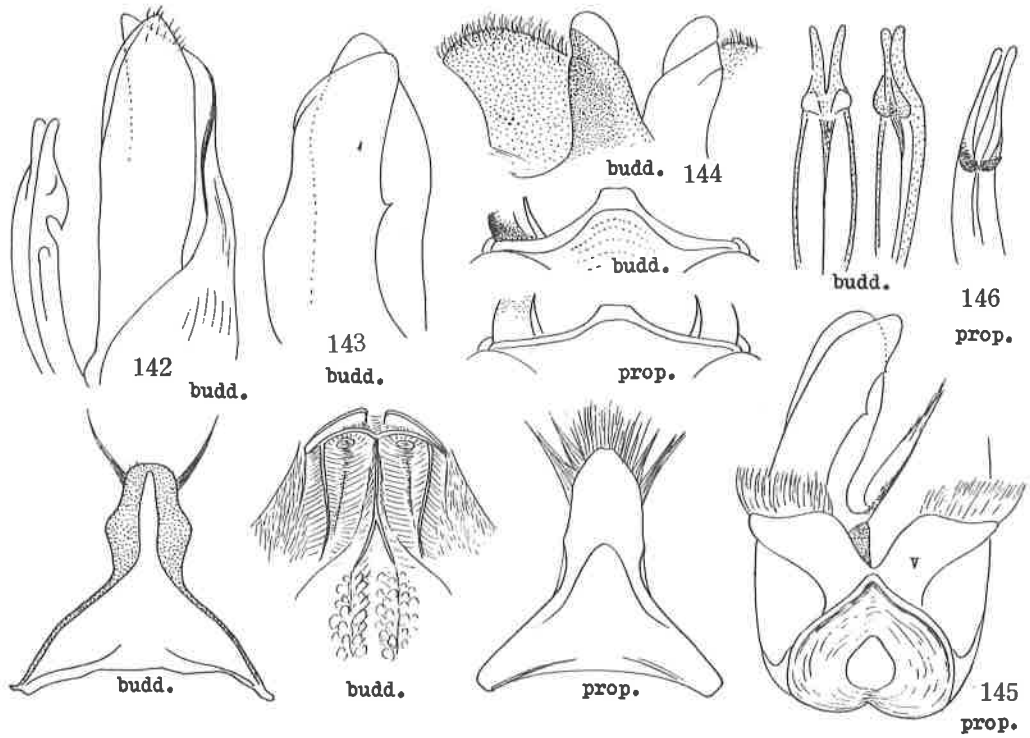
Known member 1. Genitalia: Figs. 139 (ventral), 140 (ventro-lateral), 141 (penis dorsal and lateral). There is no formal sickle, but apical sides of penis lamellately rounded out laterally instead. Sternite 8 as figured.

Head transverse. Gl flask-shaped, =Ma×4-5. Propodeum with lateral carinae, area dorsalis with lateral furrows, mesoscutum shining. SAT low nasiform, PAF deep, flat-bottomed, oval in cross section. Clypeus with apical margin gently rounded. A3=AW×2.5 (♂), ×6 (♀), Al3=A9·10-12. RC=C, Rl short. IODs≒4:3 (♀ ♂). Length 10-11 mm.



16. Group of buddha Cameron

Known members 2. Genitalia in buddha: Figs. 142 (dorso-lateral), 143 (paramere,



vertical), 144 (volsella, ventro-lateral); in propinquum: Figs. 145 (ventral), 146 (penis vlave, ventral). Sternite 8 also figured.

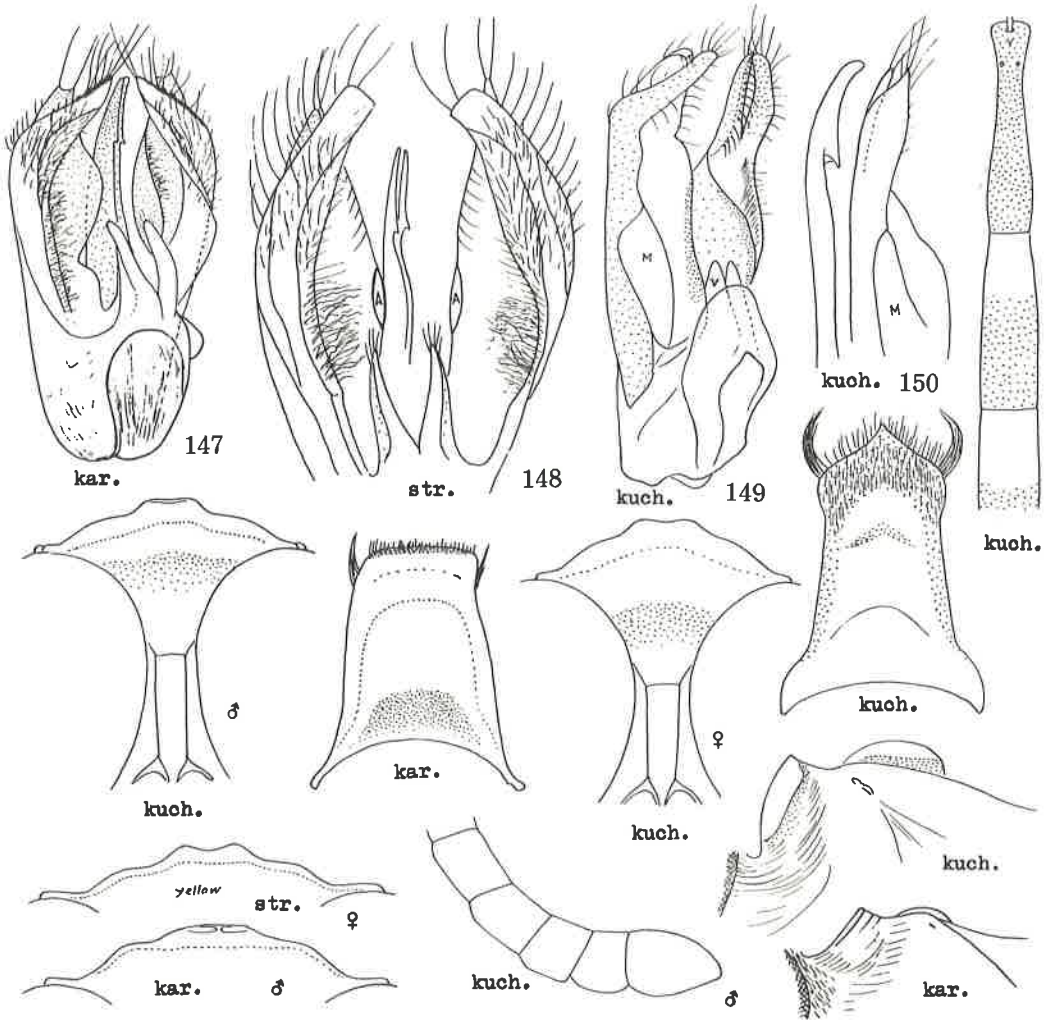
Head thick, subquadrate from above. G1 long clavate, ≒Ma×5, G2 and 3 also slender and long, each with a fovea at apex. Propodeum with lateral carinae, dorsal aspect very coarsely rugoso-striate, area dorsalis enclosed with strong furrow, frons and mesoscutum without microsculpture, shining and coarsely punctured. Frons highly raised and deeply furrowed in middle, SAT high nasiform, strongly carinated in middle, with apical margin also transversely carinated, carina reaching ASR. Clypeus triangularly produced and shortly truncate at apex. Antenna and legs in ♂ strongly modified. IODs=4:3 - 5:4. RC=C, somewhat close to B. 9-11 mm.

Remarks. Sickle appendage is here only a thick short hook, in some direction very indistinct, sometimes appearing like a thick pigmented line, as if to belong to Major group I. At any rate, this group is very close to Major group I. Paramere at base always with queer appendage on inner margin.

17. Group of kuchingense Tsuneki

Known members 3. Genitalia in karimui: Fig. 147 (ventro-lateral), in straatmani Fig. 148 (ventral) and in kuchingense: Figs. 149 (ventro-lateral) and 150 (lateral).

Head transverse, G1 long clavate, =Ma×4-5. G2 and G3 also slender and long, but each without fovea at apex. Propodeum with lateral carinae, area dorsalis enclosed with

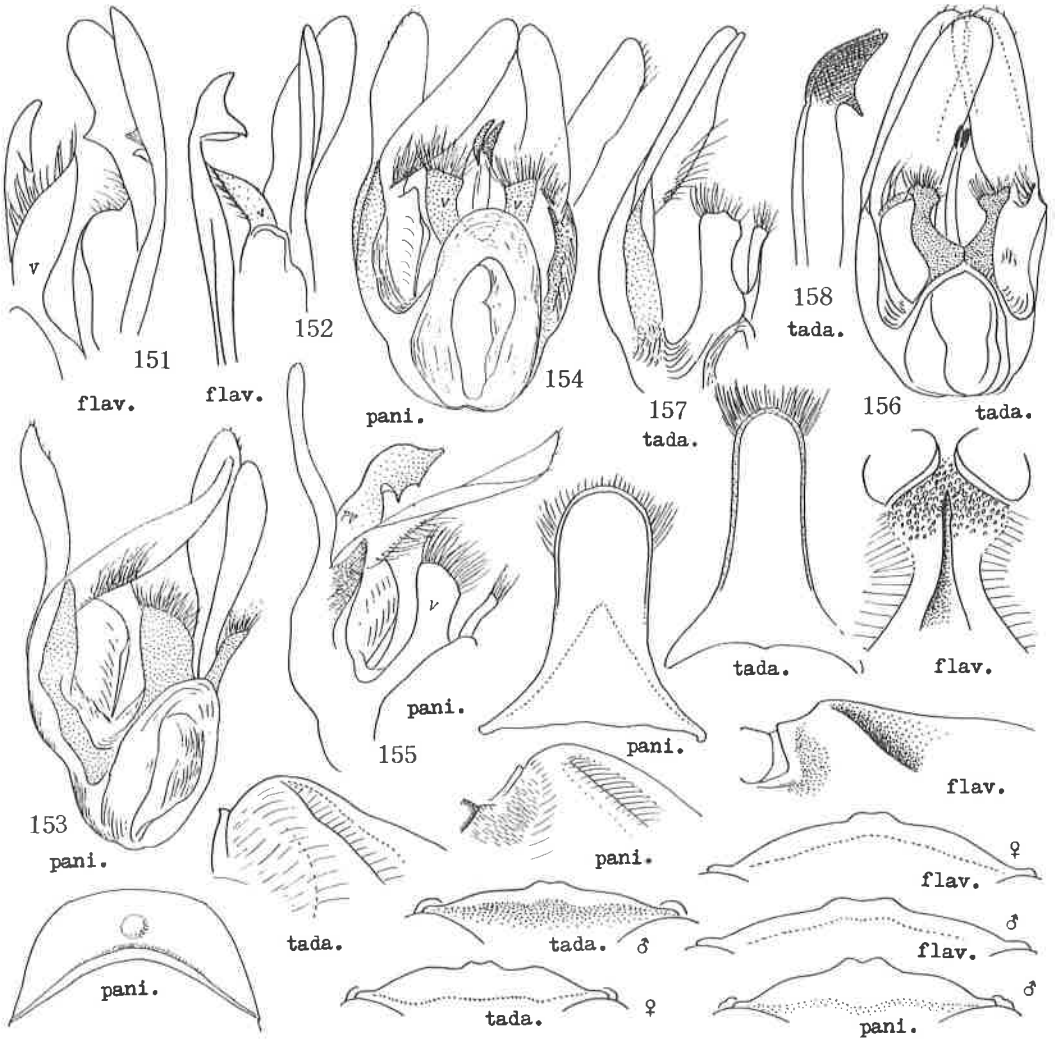


furrow. Mesoscutum without microsculpture, mesopleuron always with pent-roof structure. SAT low broad tuberiform, without transverse carina anteriorly, PAF shallow, downcurved in cross section. Interocular area very narrow, IODs≒3:1 (♀ ♂), supraclypeal area always narrow and very long. Clypeus medianly produced, with apex waved. A3=AW×3.5-4 (♀♂), A13 always very short, ≒A12 or slightly longer. RC=B-C. 7-10 mm.

18. Group of flavipes Tsuneki

Known members 3. Genitalia in flavipes: Figs. 151 (ventral, right half only), 152 (lateral, do.), in panitianum: Figs. 153 (ventro-lateral), 154 (ventral), 155 (ventro-lateral with penis) and in tadaonis: Figs. 156 (ventral), 157 (ventro-lateral) and 158 (penis vlave, lateral).

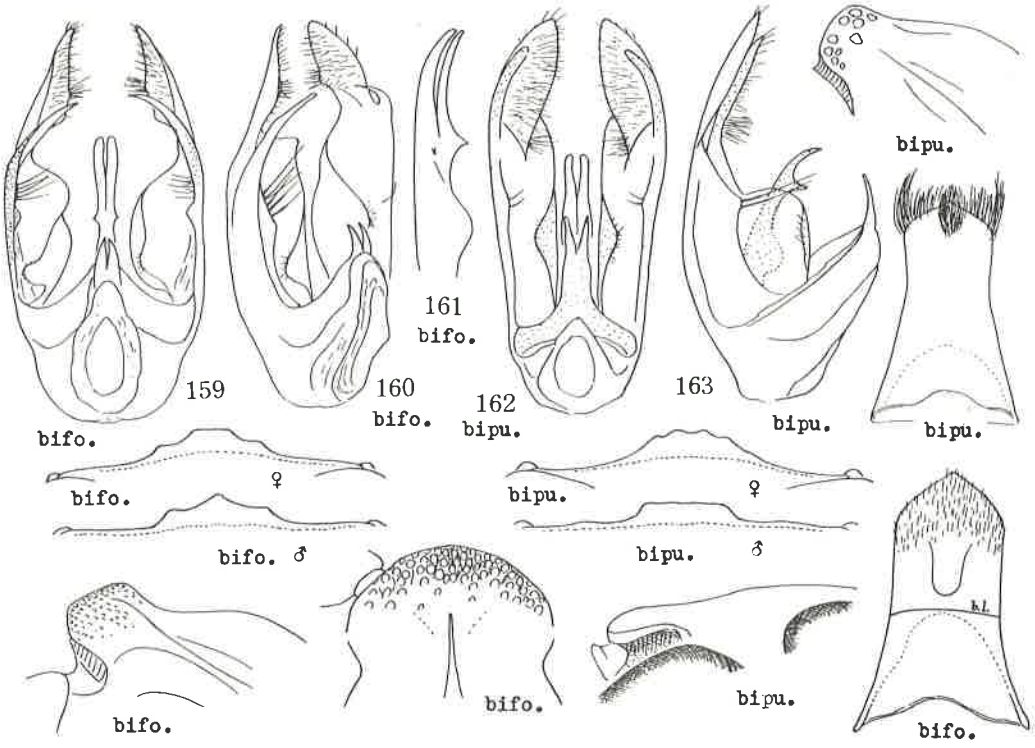
Externally, head thick, subcubic, collar of pronotum thick, Gl (clavate), 2 and 3 slender and long, each carrying a minute fovea at apex, propodeum long extended posteriorly, always provided with propodeal sternite, lateral carina distinct. Area dorsalis not enclosed with furrow. Mesoscutum smooth and shining, sometimes feebly microcoriaceous. IODs=3:1 — 2:1. Supraclypeal area always much longer than wide. SAT low broad round tuberiform, ASR short, PAF down-curved or wide-V-shaped in cross section. Clypeus medianly produced and bluntly bidentate in middle. A3=AW×2 (♂), ×3 (♀), in ♂ A7-8 always excavated beneath, A13 slightly longer than A11+12. RC=C or B, R1 long. 6-7 mm.



19. Group of bifoveatum Tsuneki

Known members 2. Genitalia in bifoveatum: Figs. 159 (ventral), 160 (ventro-lateral), 161 (penis valve, lateral) and in biputeolum: Figs. 162 (ventral) and 163 (lateral). In this group also apical part of penis valve not bent and sickle represented by short tooth; volsella elongate triangular.

Head thick, subcubic. Gl long clavate, without fovea at apex, G2 and 3 also long, each carrying a fovea at apex. Propodeum long extended posteriorly, with lateral carinae distinct, area dorsalis enclosed with shallow groove. Mesoscutum microcoriaceous, SAT low broad round disc, only gently convex, without median carina, covering PAF. Clypeus medianly weakly produced. IODs=3:1—10:1, in ♂ always somewhat greater than in ♀. RC=C, Rl moderately long. 7-9 mm.



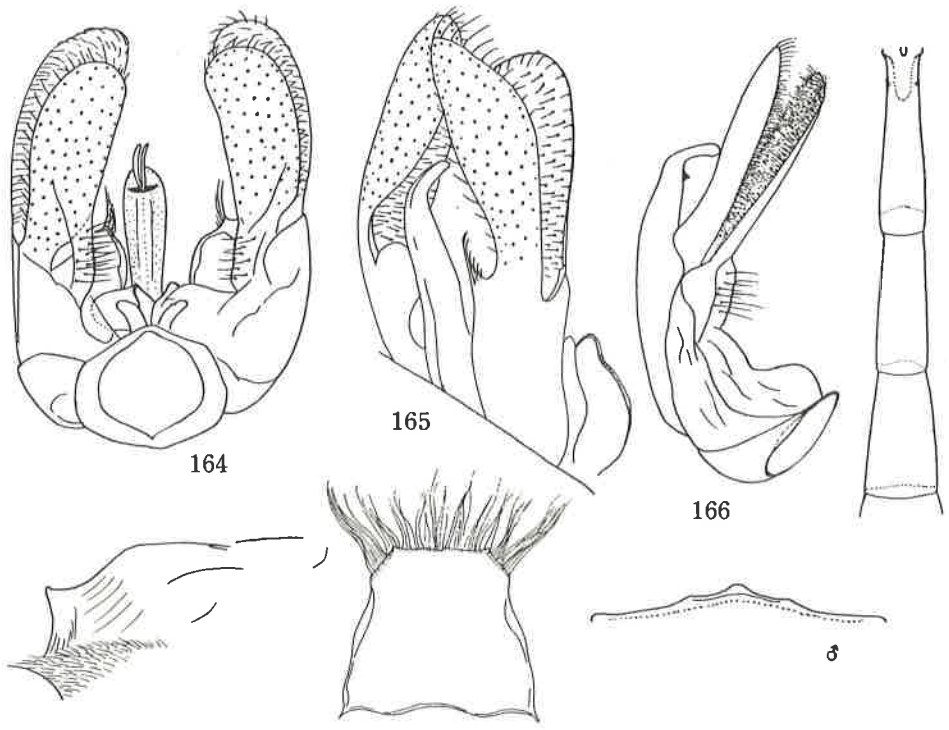
20. Group of planifrons Tsuneki

Known member 1. Genitalia: Figs. 164 (ventral), 165 (dorso-lateral) and 166 (lateral). Paramere characteristic. Sternite 8 figured.

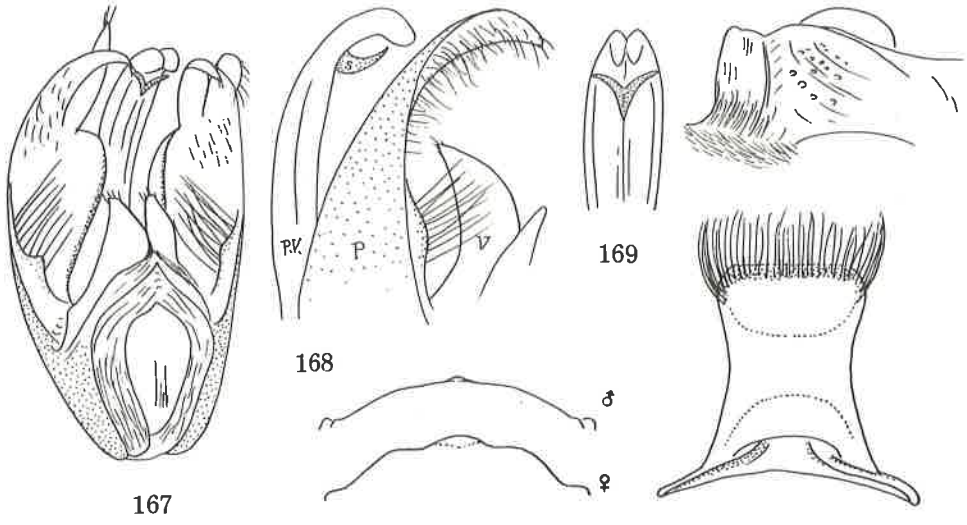
Head thick, subcubic (from above HW:HL=100:62). Gl clavate, Gl, 2, 3 comparatively slender and long, but each without a fovea at apex, collar of pronotum thick. Propodeum with lateral carinae, area dorsalis enclosed with furrow, the furrow anteriorly weak and indistinct. Mesoscutum microcoriaceous. SAT low broad tuberiform, with very feeble median carina, PAF shallow, down-curved in cross section. Clypeus medianly produced, bluntly tridentate in middle. Antenna in ♂ from A3 to A13 provided with rhinaria. IODs=1:1 (♂). RC=B, Rl moderately long. 7 mm. ♀ unknown.

21. Group of ambiguum Tsuneki

Known member 1. Genitalia: Figs. 167 (ventro-lateral), 168 (lateral) and 169 (Penis valve, ventral). Sternite 8 more or less variable in form.



Figs. 164-166 and others. Group of planifrons Tsuneki

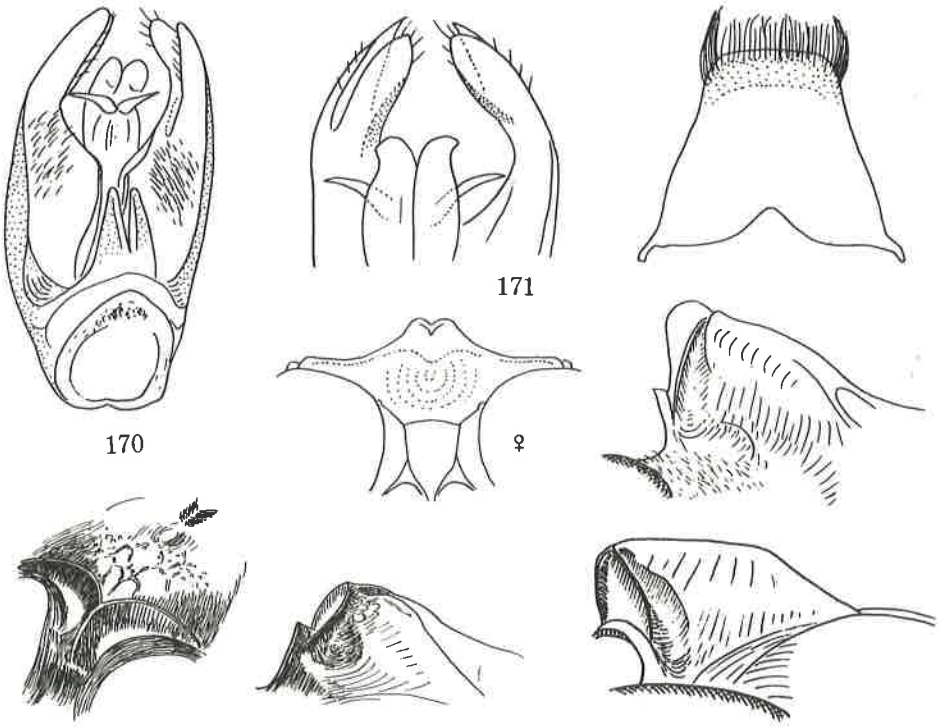


Figs. 167-169 and others. Group of ambiguum Tsuneki

Externally, head transverse, Gl flask-shaped, =Max5. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum microcoriaceous and medianly longitudinally gently furrowed. IODs= 10:9 (♂ ♀). SAT low broad nasiform, PAF shallow and broad, down-curved in cross section. Clypeus roundly produced, apical margin broadly truncate and recurved in middle. A3=AW×2.5 (♂), ×3.7 (♀), Al3 shorter than All+12. RC=C, somewhat close to B. 6-8 mm.

22. Group of clavicerum Lepeletier et Serville

Known member 1. Genitalia: Figs. 170 (ventro-lateral) and 171 (dorsal).
Externally, head transverse, but somewhat thick, HW:HL=100-57-60. Gl clavate, short, =Ma×2. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum microcoriaceous. IODs=4:3 (♂), ÷2:1 (♀). SAT moderately or highly raised, with dorsal width variable, apical margin transversely carinate, carina reaching ASR, interruping PAF. ASR very short, anterior aspect of SAT perpendicularly falling to IAA, sometimes medianly strongly carinate. Clypeus subtriangularly produced anteriorly and bluntly bidentate in middle. A3=AW×1.7-2 (♂), ×2.3-2.5 (♀). Al3=BW×2 and ÷A8- or 9-12. RC=B-C. Rl moderately long. Length 5-7 mm.



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♀

23. Group of abdidum Arnold

Known member 1. Genitalia: Fig. 400 (lateral)
Externally close to stroudi Arnold which belongs to the group of scutatum.

24. Group of tainanense Strand

Known member 1. Genitalia: Fig. 172 (ventral and lateral).
Frontal enclosure and bristle on interantennal area are characteristic.

25. Group of scutatum Chevrier

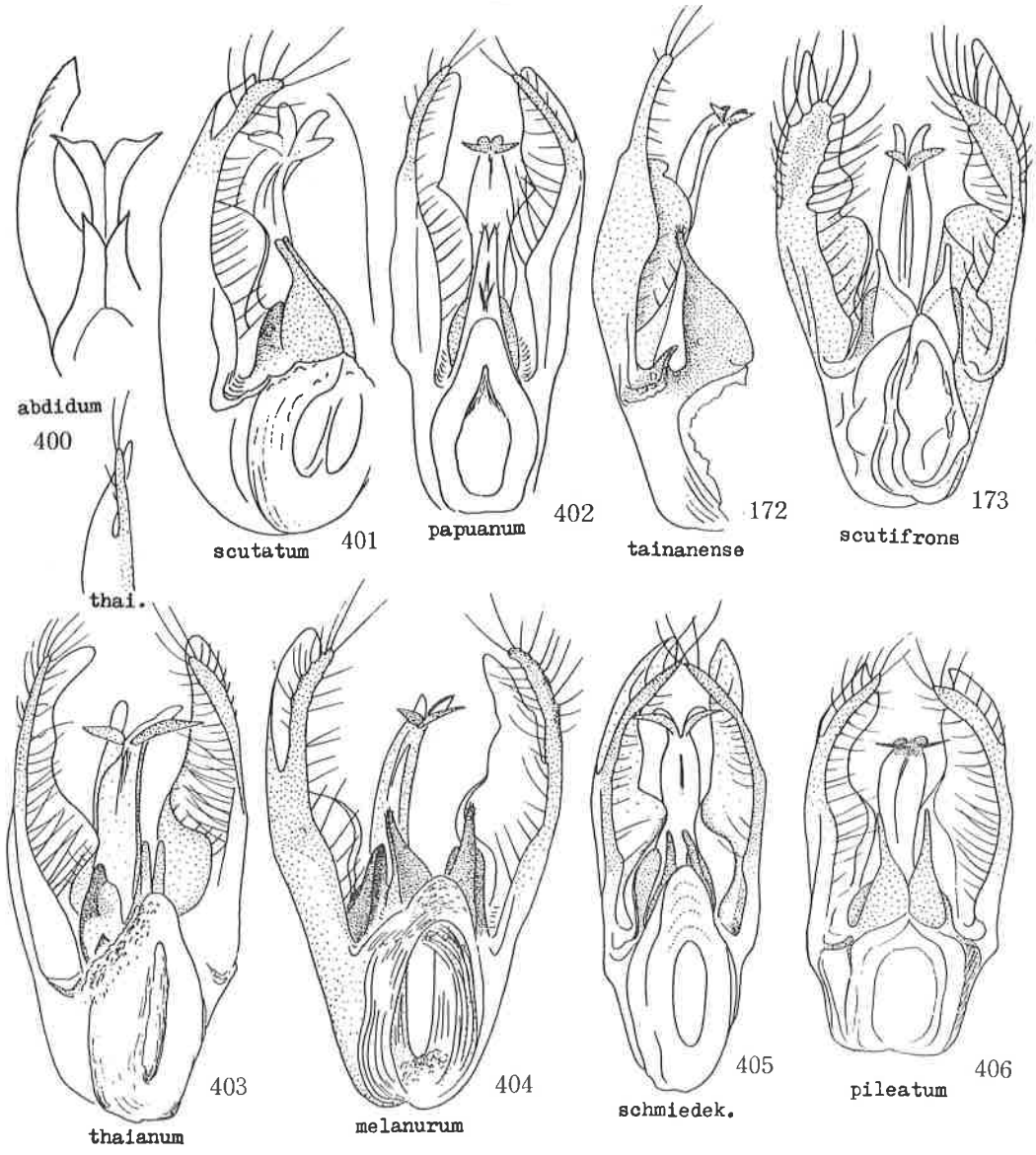
Known members 7. Genitalia: Figs. 401 (ventro-lateral): scutatum, 406 (ventral): pileatum , 402 (ventral): papuanum, 403 (ventro-lateral): thaianum.
Frontal enclosure with upper area longer than lower area. Sternite 8 varied.

26. Group of melanurum Cameron

Known members 2. Genitalia of melanurum: Fig. 404 (ventro-lateral), of schmiedeknechti: Fig. 405 (ventral).
Frontal enclosure with upper area almost as long as lower area in middle.

27. Group of scutifrons Saussure

Known member 1. Genitalia: Fig. 173 (ventral).
Externally very closely resembles pileatum.



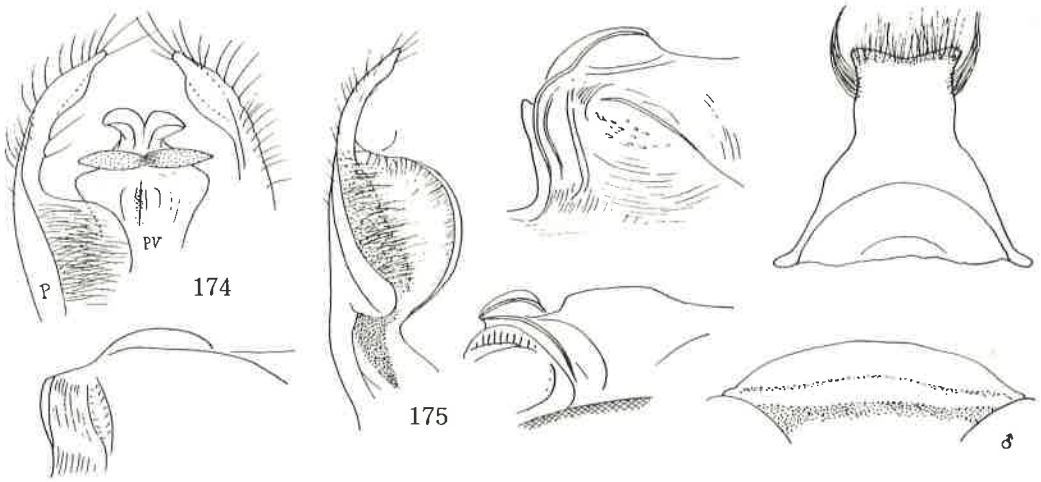
III. GROUPS OF MAJOR GROUP III

A. Submajor Group 1

1. Group of rutilans Tsuneki

Known member 1. Genitalia: Figs. 174 (ventral) and 175 (paramere, ventral).

Head transverse. Gl flask-shaped, =Ma×5. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum shining. SAT low broad nasiform, anterir - ly with transverse carina, carina interrupting PAF. IODs=10:8. Clypeus simply rounded out. Al3≒BW×4 and ≒A8-12. RC=C. 8-12 mm.



2. Group of insulare Tsuneki

Known members 2. Genitalia in insulare: Figs. 176 (ventral), 177 (penis, ventral); in kolambuganum Ts.: Figs. 178 (ventral), 179 (dorsal) and 180 (apical part of paramer, ventral and vertical).

This group is an instance in which genitalia are similar, but external characters are markedly different.

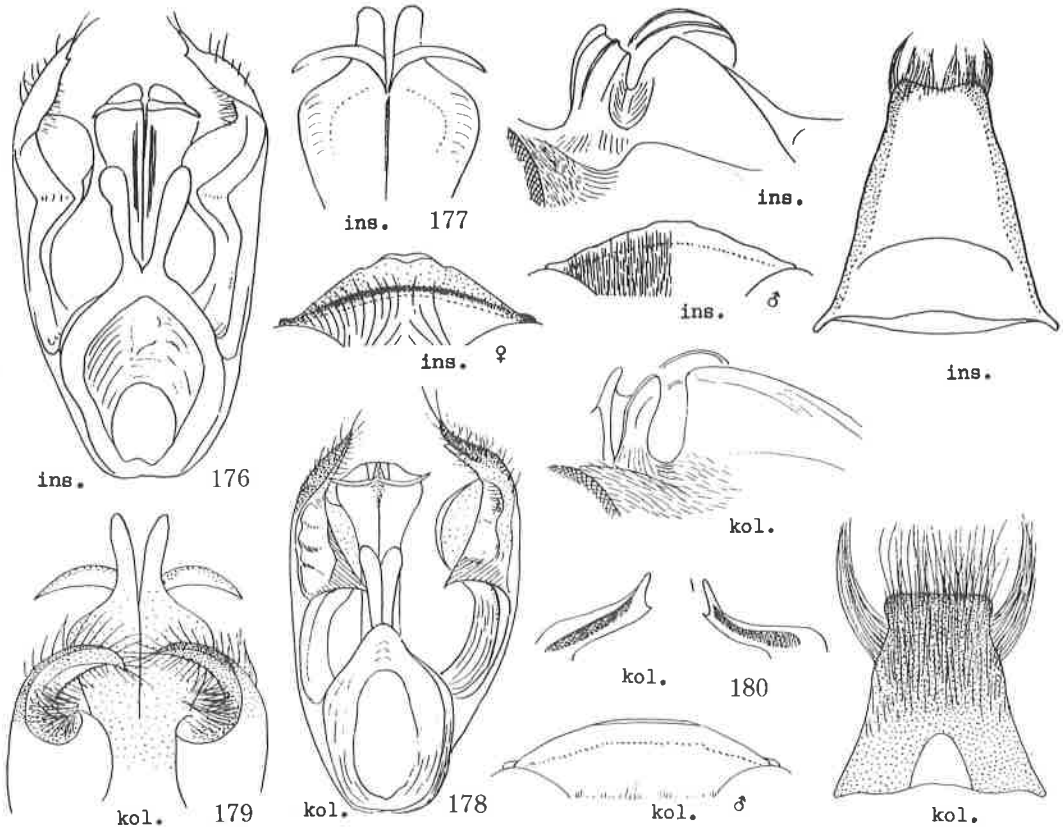
Head transverse. SAT moderately high nasiform, PAF deep, flat-bottomed and U-shaped in cross section. Clypeus rounded out, sometimes medianly weakly produced. Propodeum with lateral carinae, area dorsalis enclosed with furrow. Al3=BW×2.5-2.7 and ≒A10-13.

But Gl in insulare flask-shaped, Ma×4-5; in kolambuganum clavate, ≒Ma×3. Mesoscutum in insulare without microsculpture, shining (but under high magnification weak microstriae can be seen); while in the latter distinctly microcoriaceous. RC= C in insulare, = B in the latter. In kolambuganum ♀ unknown.

3. Group of apicatum Tsuneki

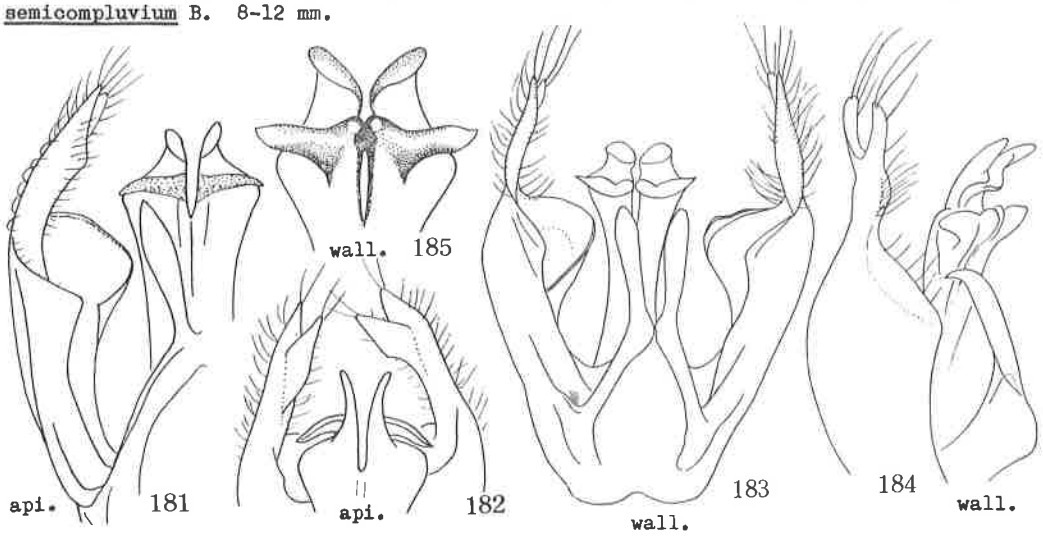
Known members 7. Genitalia in apicatum: Figs. 181 (ventral), 182 (dorsal); in wallacei Ts.: Figs. 183 (ventral), 184 (lateral), 185 (penis, ventral); in longicorne Ts.: Figs. 186 (ventral), 187 (lateral); in silvicola Ts.: Figs. 188 (ventral), 189 (penis, ventral); in compluvium Ts.: Figs. 191 (ventral), 192 (dorso-lateral), 193 (penis vlave, dorsal); in semicompluvium Ts.: Figs. 194,A (ventral), 194,B (dorsal) and in curvum Ts.: Fig. 194,C (paramere, ventro-lateral).

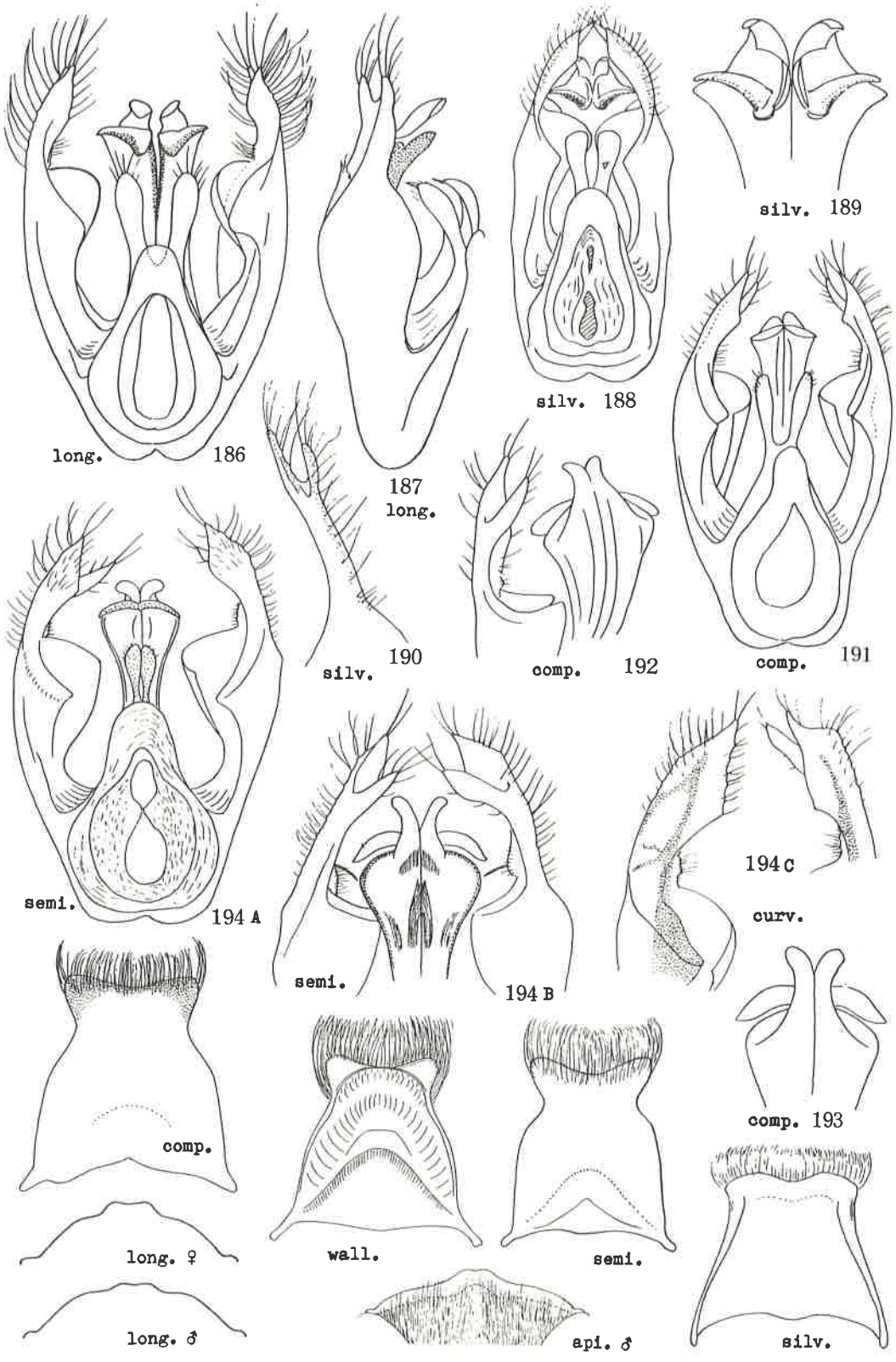
Head transverse, HW:HL=100:50 or less. Gl flask-shaped, =Ma×5-7. Propodeum with lateral carinae (in longicorne feeble), area dorsalis with lateral furrows (in silvicola without), mesoscutum shining, sometimes microcoriaceous and sometimes under high

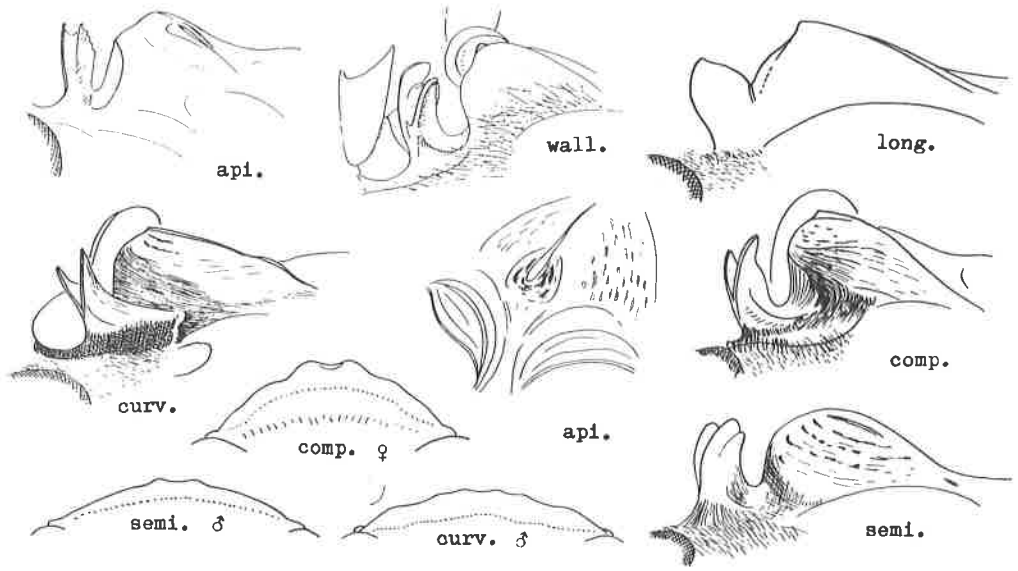


Figs. 176-180. Group of insulare Tsuneki

magnification feeble microstriae on PIS can be seen. Mesopleuron always with pent-roof structure at subalar area (in semicompluvium somewhat less developed), IODs=10:8-10. SAT moderately high rounded nasiform, sometimes nearly tuberiform, PAF deep, flat-bottomed, U-shaped in cross section, only in longicorne moderately deep, V-shaped in cross section, with bottom line up-curved. Clypeus mostly with medio-apical area waved. A3 varied in relative length, A13=A8- or 9-12. RC mostly C, sometimes close to M, but in semicompluvium B. 8-12 mm.




long. 186
187 long.
silv. 188
silv. 189
silv. 190
comp. 192
comp. 191
semi. 194 A
semi. 194 B
194 C
curv.
comp.
long. ♀
long. ♂
wall.
semi.
api. ♂
comp. 193
silv.

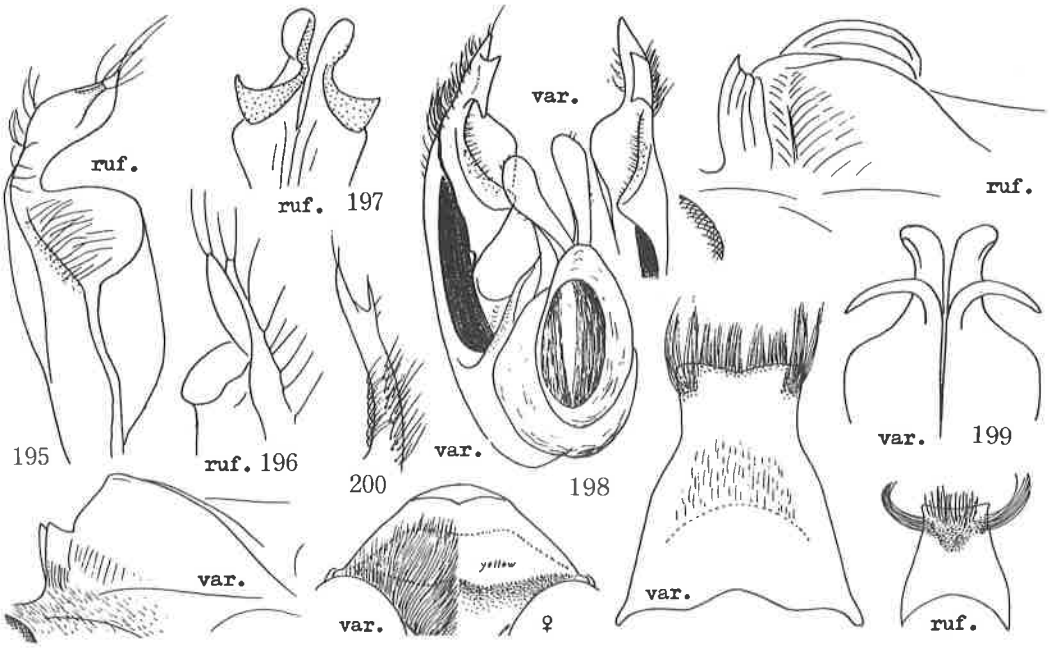


Figures of Group of apicatum Tsuneki

4. Group of rufiventre Tsuneki

Known member 1. Genitalia: Figs. 195 (paramere, ventral), 196 (apical portion of paramere, dorsal) and 197 (penis valve, ventral).

Head transverse, Gl flask-shaped, =Max5, Propodeum with lateral carinae, area dorsalis without lateral furrows, mesoscutum without microsculpture, hair brassy to golden. SAT low broad nasiform, with round flat area medio-anteriorly, apical margin with transverse carina, carina interrupting PAF. Clypeus weakly waved at apical margin or entire. IODs=5:4 (♀), ÷3:2 (♂), A3=AWx5 (♀), ×2.3 (♂), Al3÷A9-12. RC=C. 9-10 mm.



Figs. 195-197, 198-200 and others. Groups of rufiventre and varicolor.

5. Group of variocolor Tsuneki

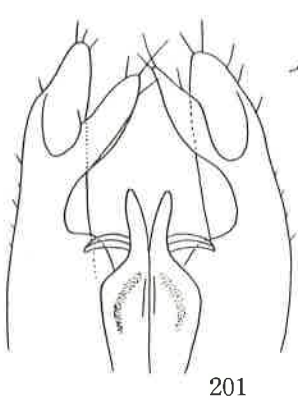
Known member 1. Genitalia: Figs. 198 (ventro-lateral), 199 (penis, ventral), 200 (apical part of paramere, lateral).

Head transverse, Gl flask-shaped, = Max5. Propodeum with lateral carinae, area dorsalis with lateral furrows, mesoscutum microcoriaceous. Hair golden. IODs=10:8 (♀), =10:7 (♂). SAT high nasiform, PAF moderately deep, V-shaped in cross section, bottom line up-curved. Clypeus simply rounded out (♀ ♂), A3=AWx5 (♀), x2.2 (♂), Al3≒A10-12. RC=C, Rl short. 13-20 mm.

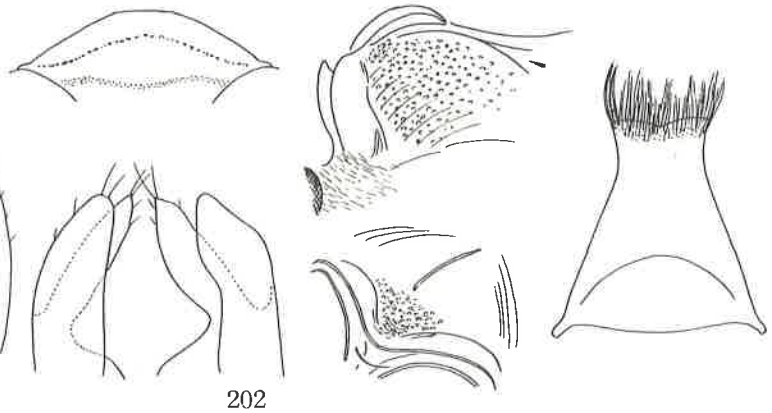
6. Group of luteocollare Tsuneki

Known member 1. Genitalia: Figs. 201 (dorsal), 202 (apical portion of paramere, ventral).

Head transverse. Gl flask-shaped, comparatively short, =Max3. Propodeum with lateral carinae, area dorsalis without lateral furrows, mesoscutum without microsculpture. Hair golden. IODs=10:9 (♀ ♂). SAT low broad nasiform, anteriorly margined with transverse carina, carina reaching ASR, interrupting PAF. Clypeus simply rounded out (♀ ♂). A3=AWx2 (♂), x3.5 (♀), Al3= A7·8-12. RC=B-C. Rl short. 9-11mm.



201



202

7. Group of giganteum Tsuneki

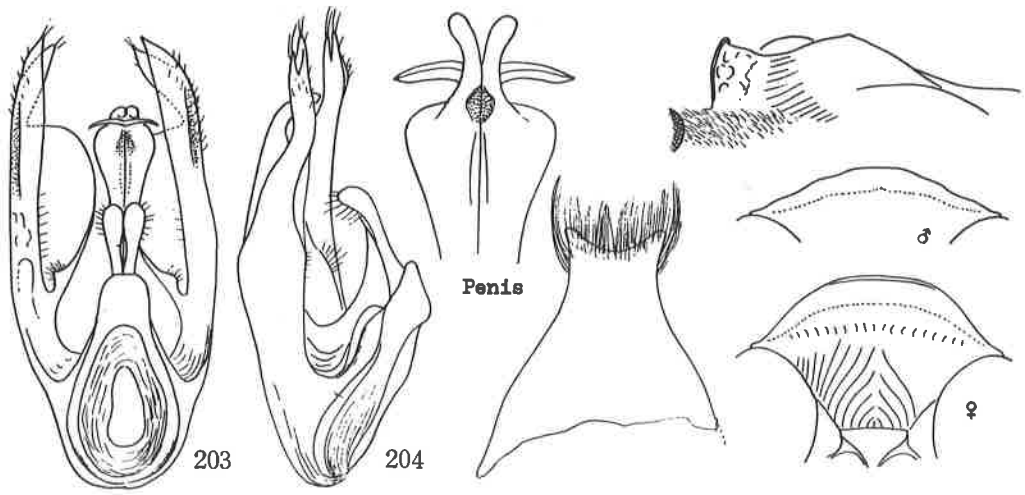
Known member 1. Genitalia: Figs. 203 (ventral), 204 (lateral).

Head transverse. Gl flask-shaped, =Max4. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum shining. IODs=10:9 (♀ ♂). SAT low broad nasiform, ASR comparatively long, PAF shallow, down-curved in cross section. Clypeus rounded out, in ♂ weakly undulate at apical margin. A3=AWx2.5 (♂), x4.5 (♀), Al3=A8·9-12. RC=C, Rl short. 14-20 mm.

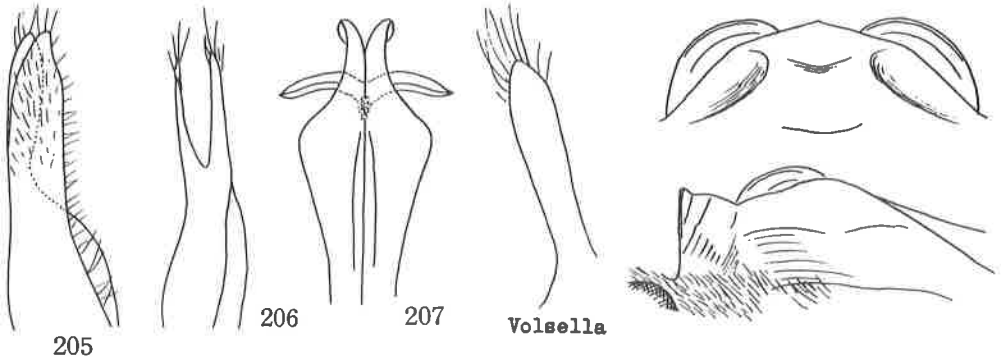
8. Group of albitarsatum Tsuneki

Known member 1. Genitalia: Figs. 205 (paramere, ventral), 206 (do., lateral), 207 (penis valve, dorsal and vertical). Volsella and SAT also figured.

Head transverse. Gl flask-shaped, ≒Ma x5. Propodeum with lateral carinae, area dorsalis without lateral furrows, mesoscutum shining. IODs=10:8-9 (♀ ♂). SAT low broad nasiform, nearly tuberifrom, PAF shallow, down-curved in cross section, sometimes wide V-shaped so. Clypeus rounded out anteriorly, apical margin simple. A3=AWx2.3-2.5 (♂), x4-4.2 (♀), Al3=A7-12. RC=C. Rl short. 12-18 mm.



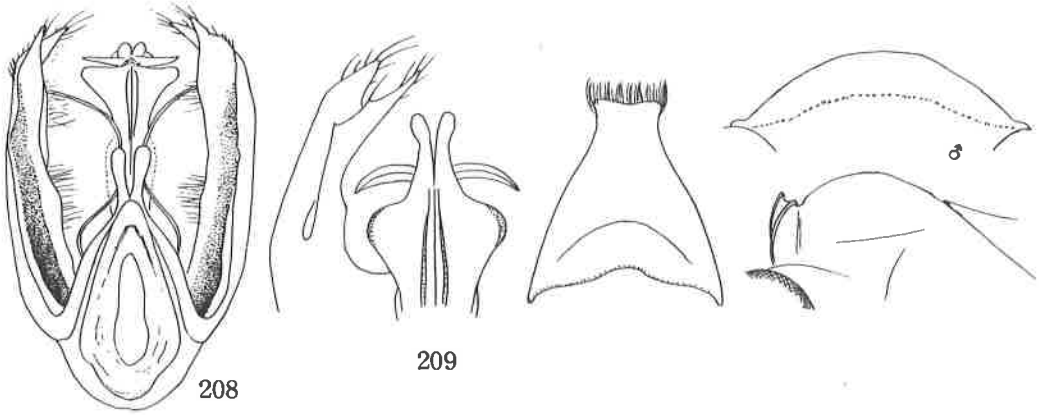
Figs. 203-204 and others. Group of giganteum Tsuneki



Figs. 205-207 and others. Group of albitarsatum Tsuneki

9. Group of antennatum Tsuneki

Known member 1. Genitalia: Figs. 208 (ventral) and 209 (dorsal).
Head transverse. Gl clavate, =Ma×3. Propodeum with lateral carinae, area dorsalis

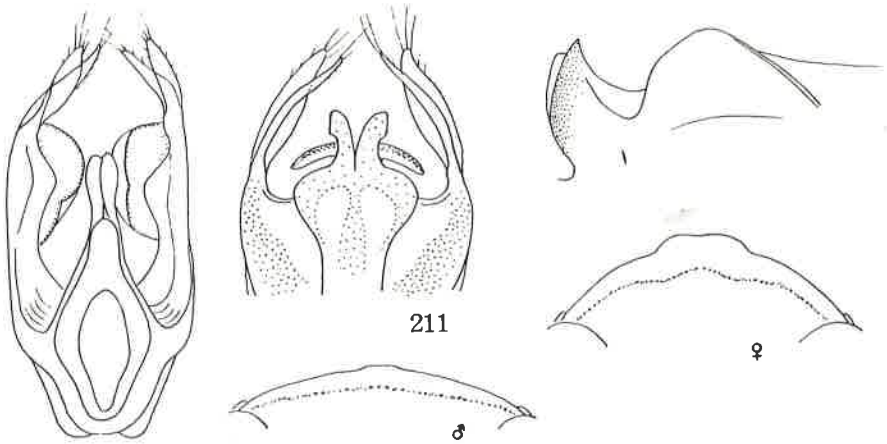


enclosed with furrow. Mesoscutum without microsculpture, shining. IODs=10:9-10 (♀ ♂). Hair brassy. SAT low tuberiform, PAF shallow, wide-V-shaped in cross section, with bottom line up-curved. Clypeus simply rounded out (♀ ♂). A3=AW×2 (♂), ×4 (♀), A13 very long, ≒BW×5 and ≒A5-12. RC=C. R1 short. 11-12 mm.

10. Group of maculiventre Tsuneki

Known member 1. Genitalia: Figs. 210 (ventral) and 211 (dorsal).

Head transverse. Gl flask-shaped, Ma×7. Propodeum with lateral carinae, area dorsalis without lateral furrows. Mesoscutum microcoriaceous. Hair golden. IODs=10:9 (♀ ♂). SAT moderately high nasiform, ASR long, roundly reflected, PAF moderately deep, broad U-shaped in cross section, with bottom line up-curved. Clypeus with apical margin rounded and medianly weakly produced. A3=AW×3,7 (♂), ×5 (♀), A13=A9-12. RC=C. R1 moderately long. 9-14 mm.



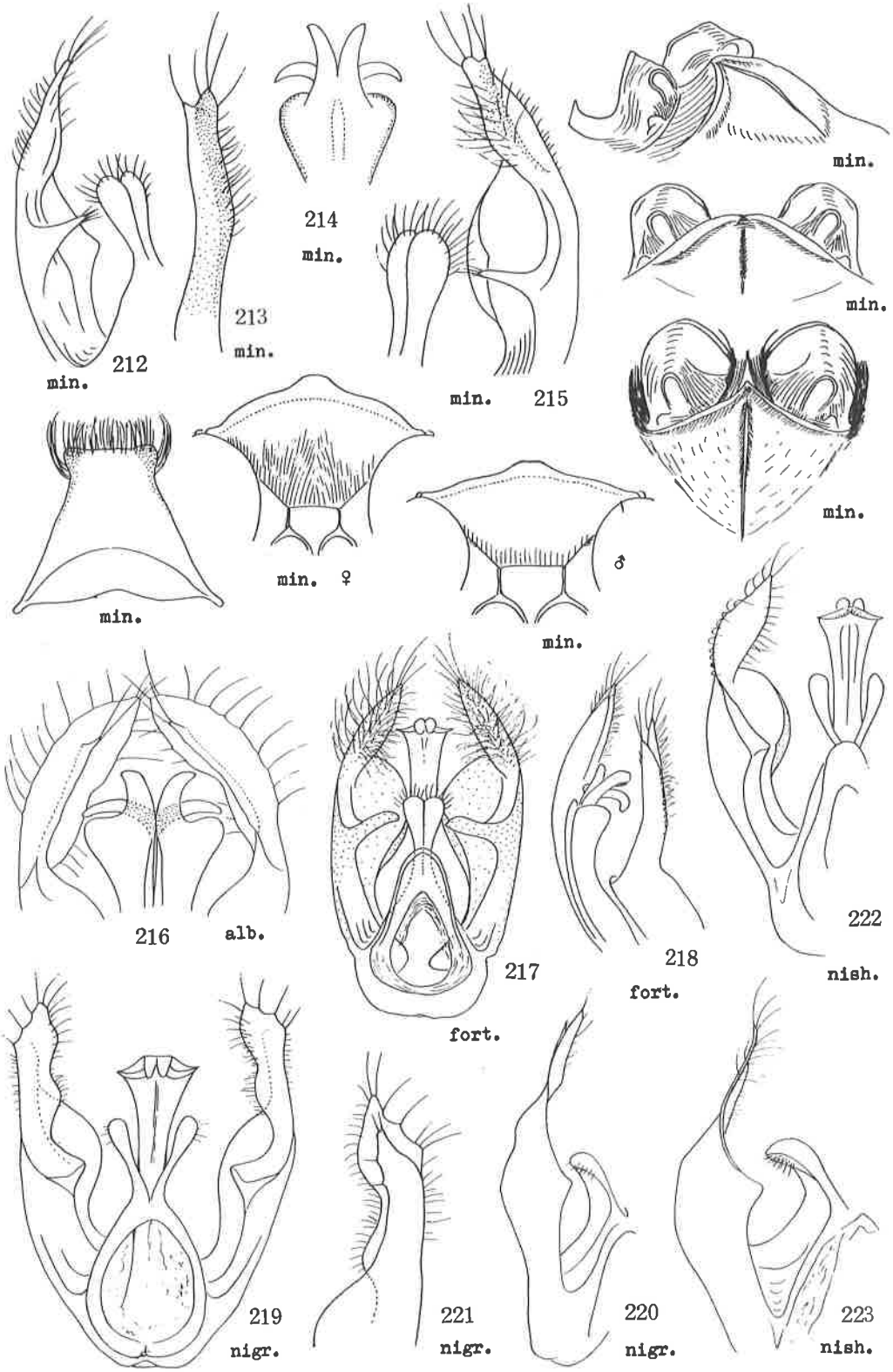
B. Submajor Group 2

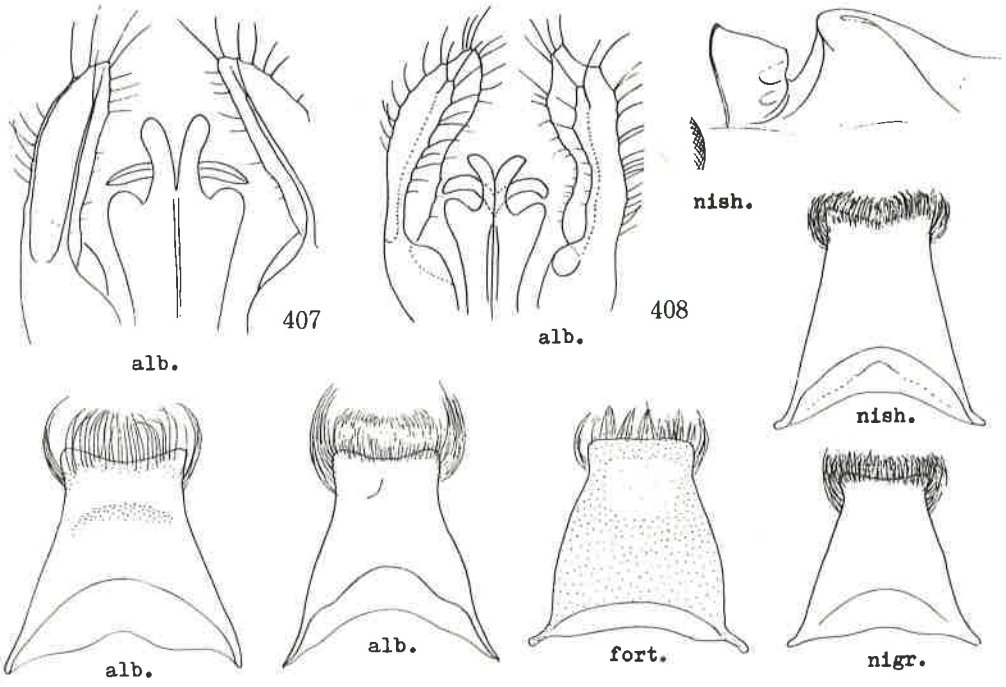
11. Group of mindanaonis Tsuneki

Known members 5. Genitalia in mindanaonis: Figs. 212 (ventral, partly omitted), 213 (apical part of paramere, seen vertically to apical incision), 214 (penis valve, dorsal), 215 (ventro-lateral); in albispinosum Ts.: Figs. 216 (dorsal); in fortius Ts.: Figs. 217 (ventral), 218 (dorsal); in nigripes Ts.: Figs. 219 (ventral), 220 (lateral), 221 (apical part of paramere, dorsal) and in nishidai Ts.: Figs. 222 (ventral, right paramere omitted) and 223 (lateral).

Externally, head always transverse. Gl flask-shaped, =Ma×6-7. Propodeum with lateral carinae, area dorsalis enclosed with furrow, the furrow always shallow and weak. Mesoscutum shining, usually with strong plumbeous shine, sometimes (e.g. albispinosum) under high magnification feeble microstriae can be seen on puncture interspaces. IODs=10:8-8.5 (♀ ♂). Clyepeus with apical margin rounded and medianly shortly produced. SAT gently convex, with apical margin acutely edged or carinate, PAF deep and flat-bottomed, U-shaped in cross section. ASR raised, considerably high, always provided with one or two distinct hollow on posterior wall. A3=AW×2-2.3 (♂), ×3-3.7 (♀), A13≒A9- or A8-12. RC=C, but sometimes (e.g. albispinosum) B. 7-11 mm.

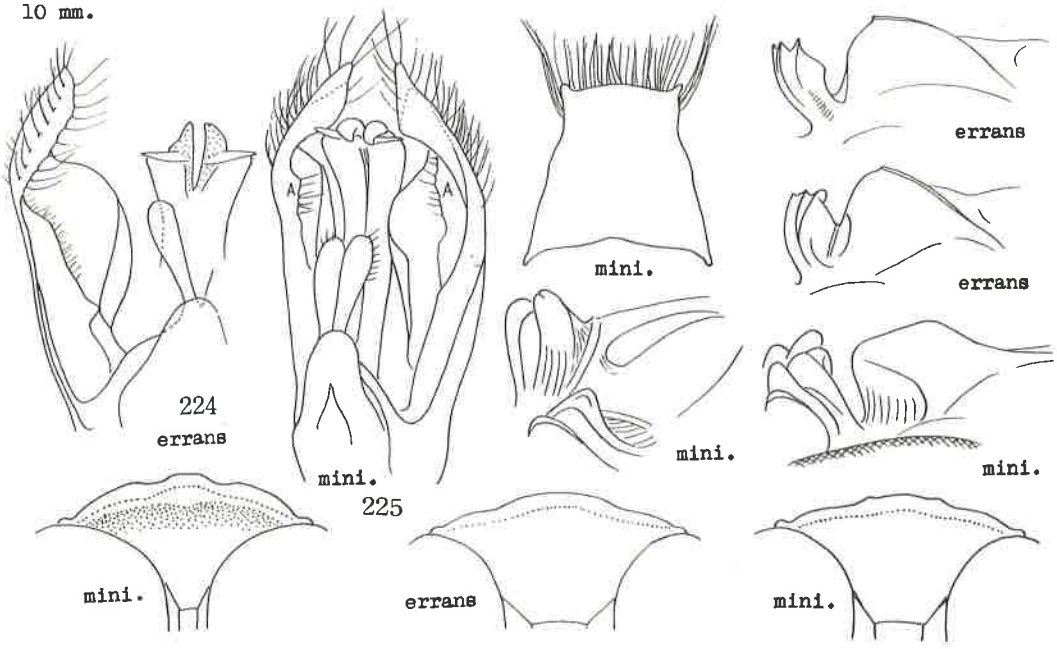
Remarks. It seems worthy of special mention that in albispinosum, ♂, collected in Laos and in South India the shoulder of the penis valve is distinctly roundly raised as shown in Figs. 407 and 408, as in members of Submajor Group III, while in that from Hongkong it is horizontal (Fig. 216) as in other members of the mindanao-group. The form of the shoulder of the penis valve is constant within a species, but the presence of such an exceptional species as this throws doubt about the submajor division.


212
min.
213
min.
214
min.
215
min.
min.
min.
min.
min.
♀
min.
♂
min.
216
alb.
217
fort.
218
fort.
222
nish.
219
nigr.
221
nigr.
220
nigr.
223
nish.



12. Group of errans Saussure

Known members 2. Genitalia in errans: Fig. 224, in miniovatum: Fig. 225.
Head transverse, Gl flask-shaped, =Max5-6. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum without microsculpture, shining. IODs≒3:2 (♂), =2:1 (♀). SAT moderately high nasiform, PAF deep, flat-bottomed, U-shaped or oval in cross section. Clypeus rounded out and medianly recurved. A3=AWx2-2.5 (♂), = AWx5-6 (♀), Al3 varied, at least >All-12, at most=A9-12. RC=B, often close to C. 6-10 mm.



13. Group of semperi Tsuneki

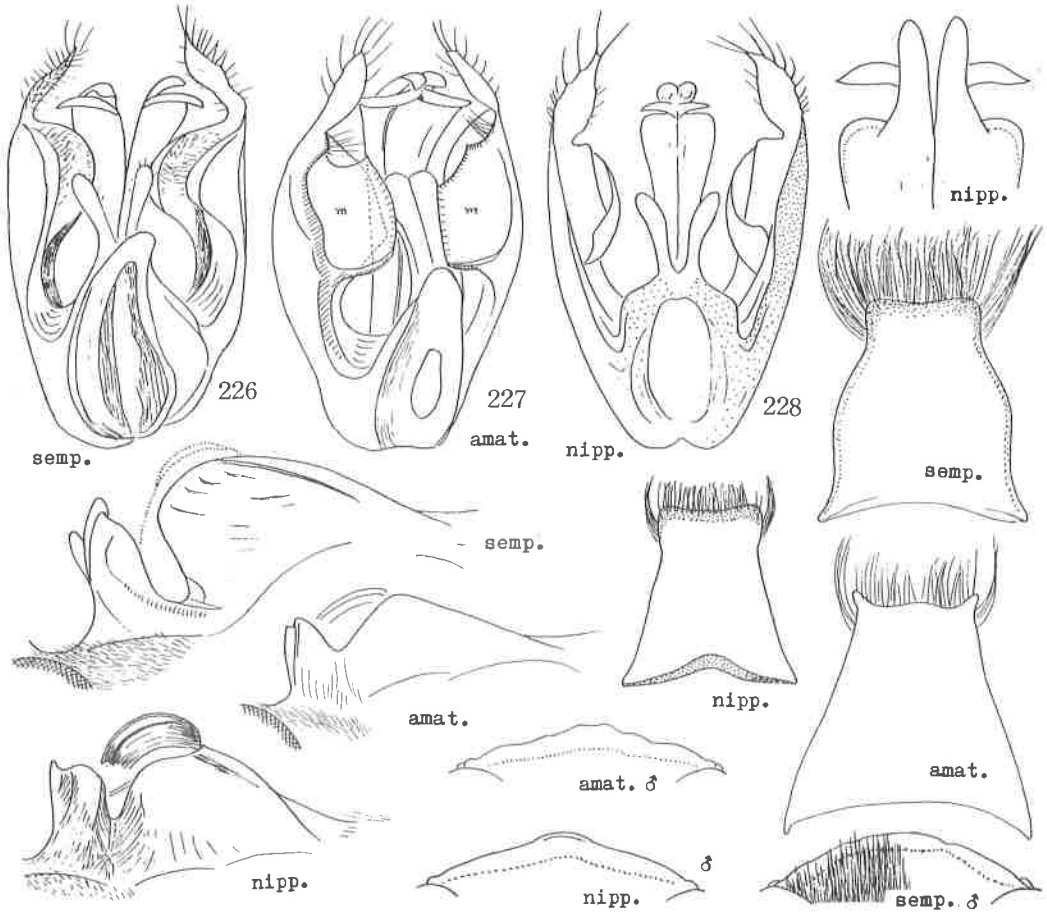
Known member 1. Genitalia: Fig. 226 (ventral). Sternite 8 figured.
Head transverse. Gl long clavate, =Ma×7, propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum microcoriaceous. Mesopleuron with pent-roof structure at subalar area. IODs=5:4 (♂). SAT fairly high rounded nasiform, PAF deep, flat-bottomed, U-shaped in cross section, but at outer end weakly closed with extended elevation from ASR. Clypeus as figured. A3=AW×2.7, A13=A9-12. RC=C but close to M. R1 short but reaching close to wing apex. 10 mm. ♀ unknown.

14. Group of amatorium Tsuneki

Known member 1. Genitalia: Fig. 227 (ventral). Sterniter 8 figured.
Head transverse. Gl flask-shaped, =Ma×7. Propodeum with weak lateral carinae, area dorsalis with distinct lateral furrows, mesoscutum smooth and shining. IODs=10:7 (♂). SAT low nasiform, PAF moderately deep, wide-V-shaped in cross section. Clypeus gently gently rounded out, with apical margin waved. A3=AW×3.5, A13=A10-12. RC=C, but somewhat close to B. R1 short. 8 mm. ♀ unknown.

15. Group of nipponicum Tsuneki

Known member 1. Genitalia: Fig. 228 (ventral). Penis and sternite 8 figured.
Head transverse. Gl flask-shaped, =Ma×5-6. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum shining. IODs=5:4 (♂), 10:7 (♀). SAT moderately high tuberiform, medianly strongly carinate, PAF deep, flat-bottomed, U-shaped

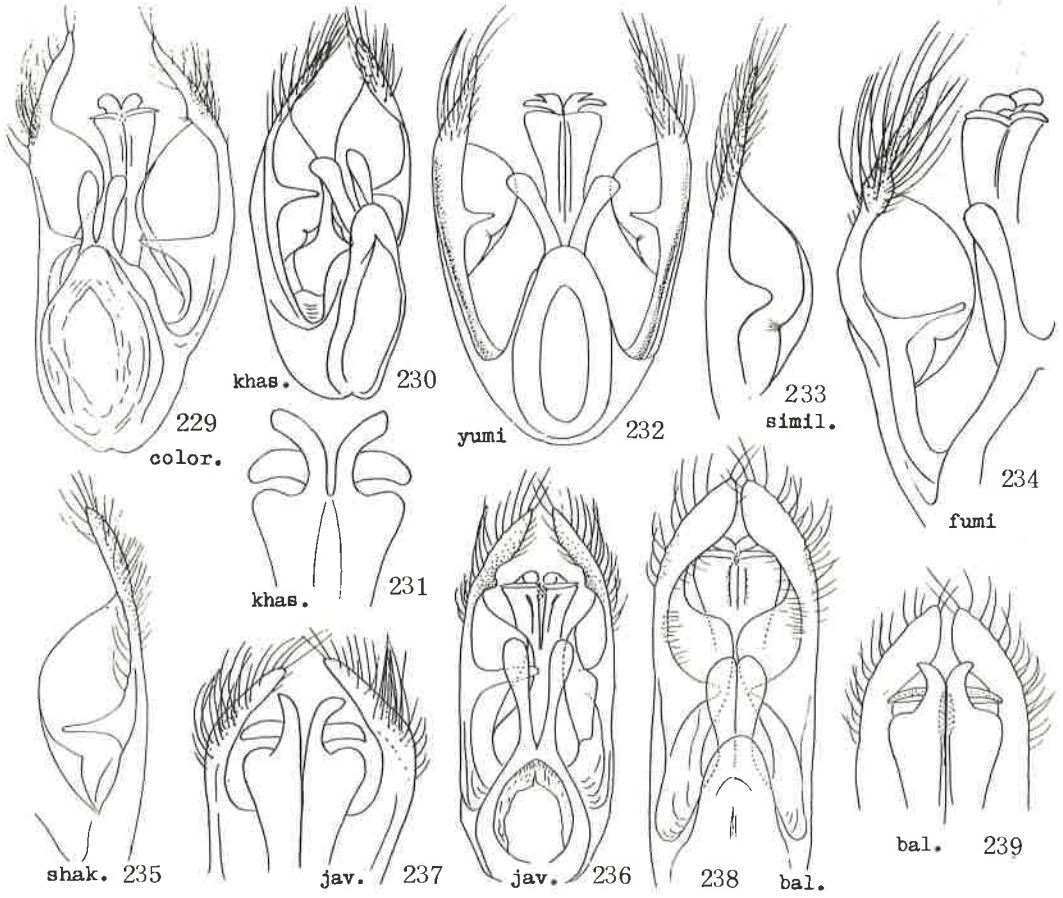


in cross section. Clypeus rounded, medianly weakly produced. A3=AW×2 (♂), ×4 (♀), A13=A9-12. RC=B. 10-13 mm.

16. Group of coloratum Smith

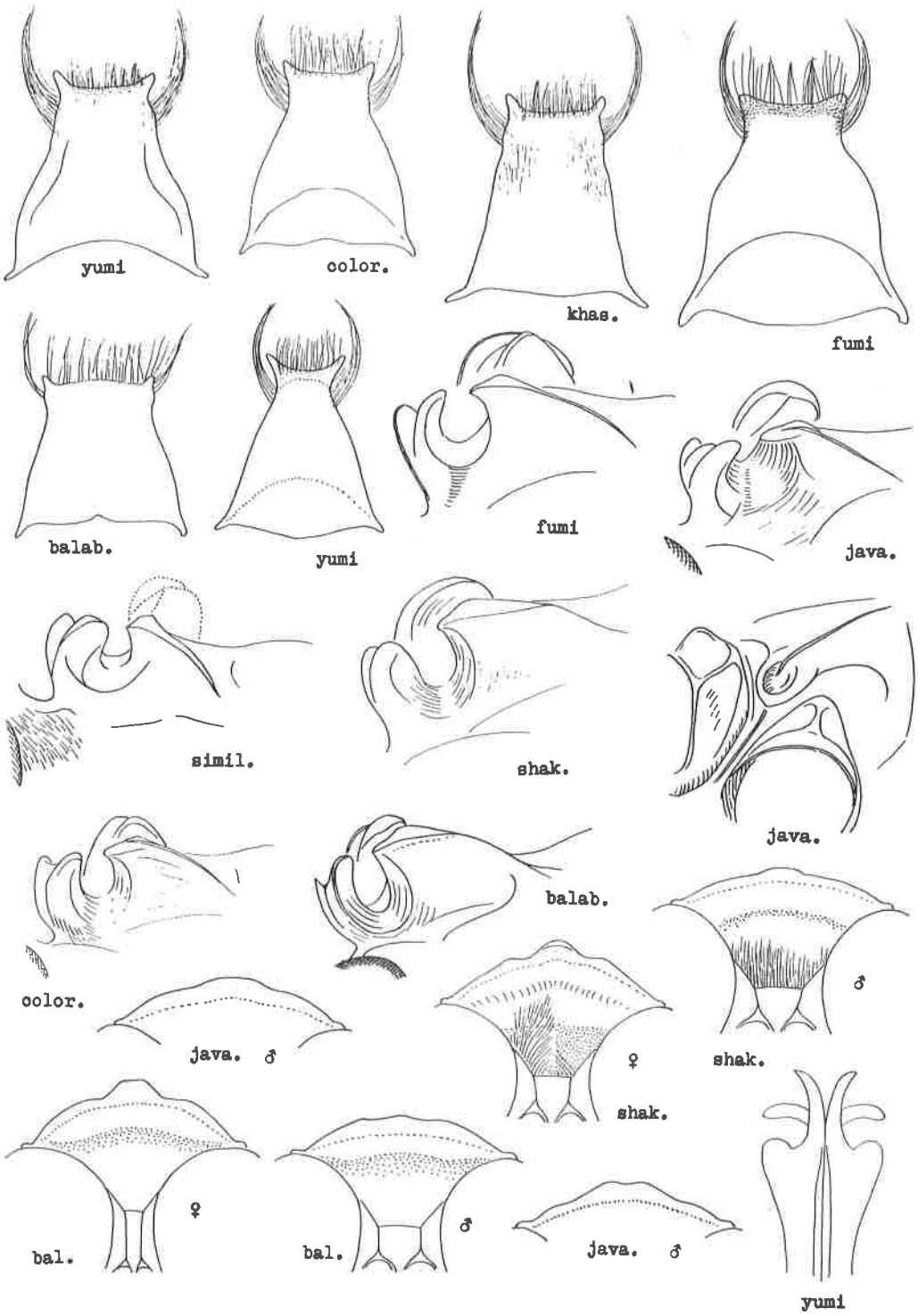
Known members 8. Genitalia in coloratum Sm.: Fig. 229 (ventro-lateral), in khasiae Cam.: Figs. 230 (ventro-lateral) and 231 (penis, dorsal), in yumi Ts.: Fig. 232 (ventral), in simile Ts.: Fig. 233 (left paramere, ventral), in fumi Ts.: Fig. 234 (ventro-lateral), in shakha Ts.: 235 (right paramere, ventral), in javanicum Ts.: Figs. 236 (ventral) and 237 (dorsal) and in balabacense Ts.: Figs. 238 (ventral) and 239 (dorsal). Sternite 8 of coloratum, khasiae, yumi (with variation), fumi and balabacense are figured.

Head transverse. Gl flask-shaped, =Max5-7. Lateral carinae of propodeum some times absent (coloratum, shakha, fumi), sometimes feeble (khasiae, yumi, simile) and sometimes distinct (javanicum, balabacense). Lateral furrows of area dorsalis also varied: absent: coloratum, khasiae and fumi; feeble: yumi, simile, shakha; distinct: javanicum and balabacense. Mesoscutum usually smooth and shining (often with plumbeous shine), but in coloratum feebly microcoriaceous and in fumi, javanicum and balabacense under high magnification microstriae observed on PIS. SAT moderately high nasiform, sometimes more or less varied in height, always with a round flat and hollowed area medio-anteriorly, PAF deep, flat-bottomed (rarely bottome line gently upcurved - coloratum, ♀), oval in cross section. Clypeus rounded out and medianly again produced anteriorly, produced area sometimes gently emarginate at apex. IODs=10:8-9 (♂), 10:6-8 (♀), usually in ♂ greater than in ♀, but in khasiae same; IODs in balabacense exceptional, in ♂ 10:5.5 and in ♀ 10:4.5. A3=AW×3 (♂), constantly so and in ♀ =AW×5-7. A13=A9-12, sometimes slightly shorter, but >A10-12, in balabacense alone = A10-12. RC=C, rarely B (khasiae). Hair silvery, but in khasiae often brassy.



Remarks. In balabacense apical part of paramere is broader than in others and this may have bearing upon its aberrant characters as noted above. If so it may represent a distinct group.

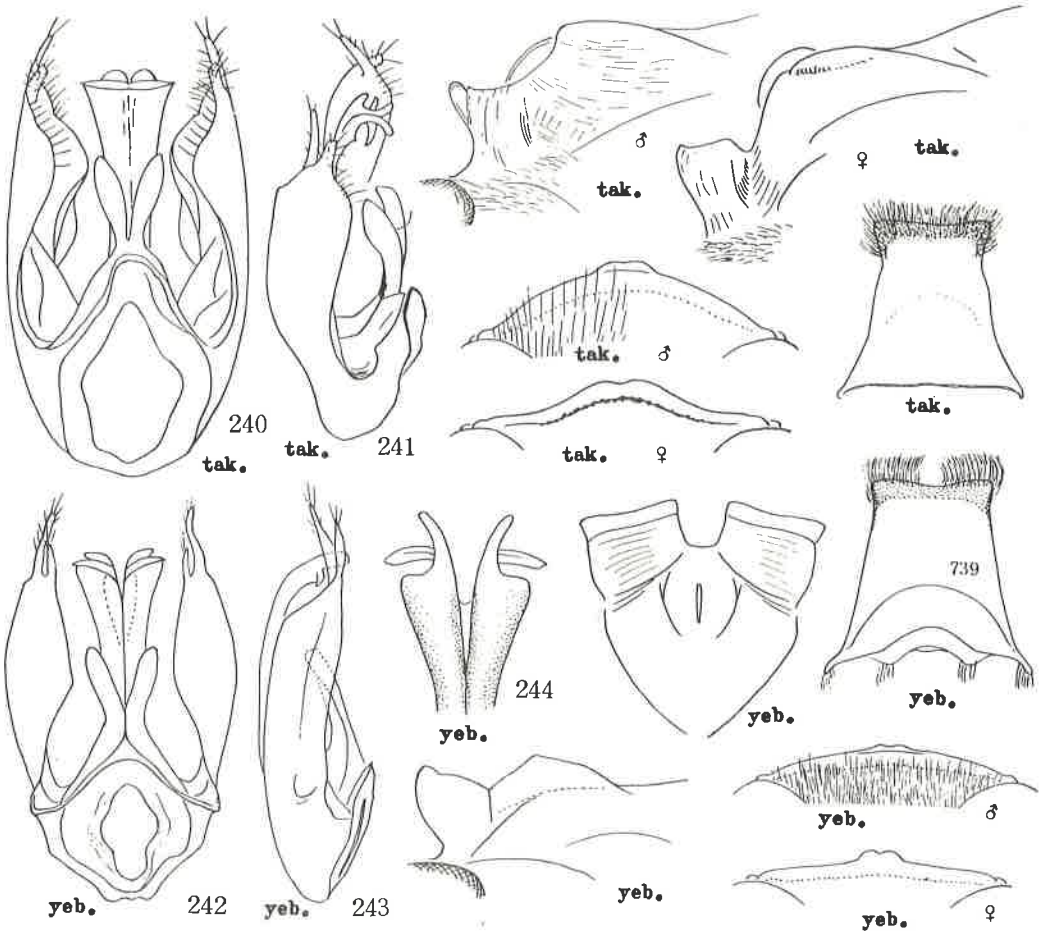
Another instance of aberration in the form of shoulder in yumi is illustrated.



17. Group of takasago Tsuneki

Known members 2. Genitalia in takasago: Figs. 240 (ventral) and 241 (lateral) and in yebissum Ts.: Figs. 242 (ventral) and 243 (lateral) and 244 (penis, dorsal).

Head transverse. Gl flask-shaped, =Max4-7 (in ♂ shorter). Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutm smooth and shining. IODs=5:4 - 4:3 (♀ ♂). SAT low broad tuberiform, ASR broad, PAF shallow, down-curved or wide-V shaped in cross section. Clypeus medianly gently produced, with apex frequently emarginate. A3=AWx3.5 (♀), x2 (♂). Al3 varied, =A10-12 or A7-12. RC=C, sometimes close to M. 10-14 mm.

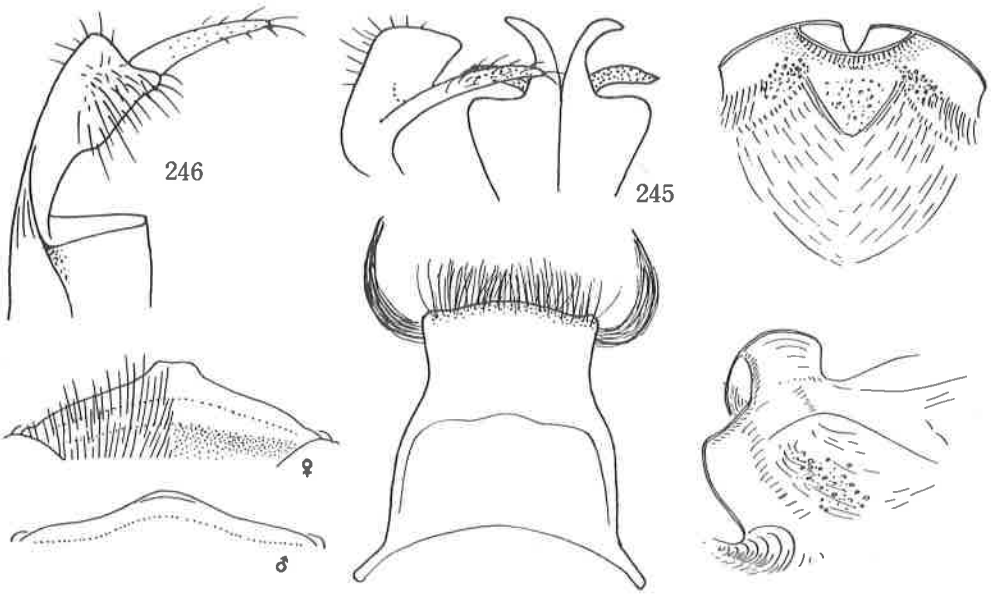


18. Group of formosicola Strand

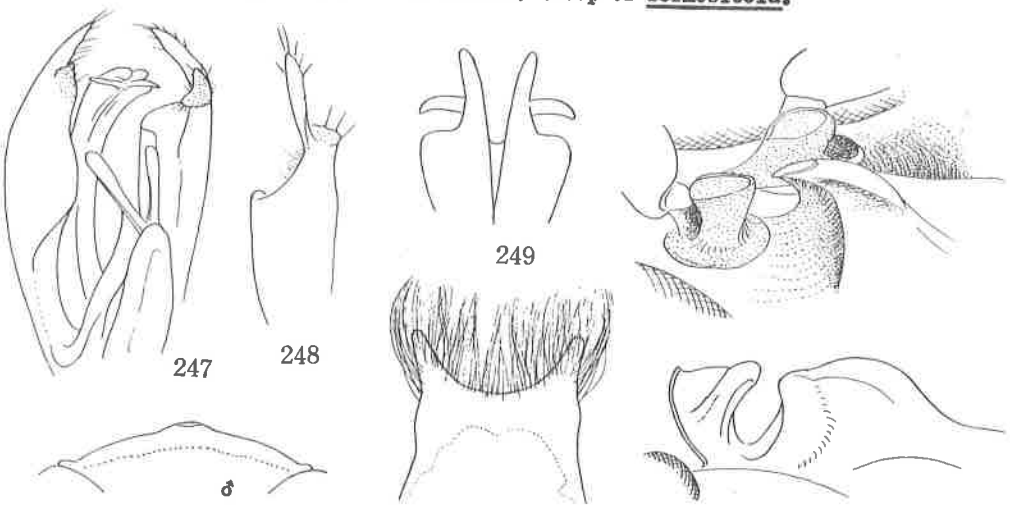
Known member 1. Genitalia: Figs. 245 (apical portion, dorsal), 246 (paramere, ventral). Sternite 8 figured.

Head transverse. Gl flask-shaped, =Ma×6-7. Propodeum with lateral carinae, area dorsalis with lateral furrows. IODs=5:4 (♀ ♂). SAT moderately high tuberiform, apical area margined with round V-shaped carina, carina reaching ASR, carina in some forms less developed or completely absent, when PAF down-curved in cross section. Clypeus medianly produced. A3=AWx2 (♂), x4 (♀), Al3≒A10-12. RC=C, close to M. 10-12 mm.

19. Group of kepongianum Tsuneki



Figs. 245-246 and others. Group of formosicola.

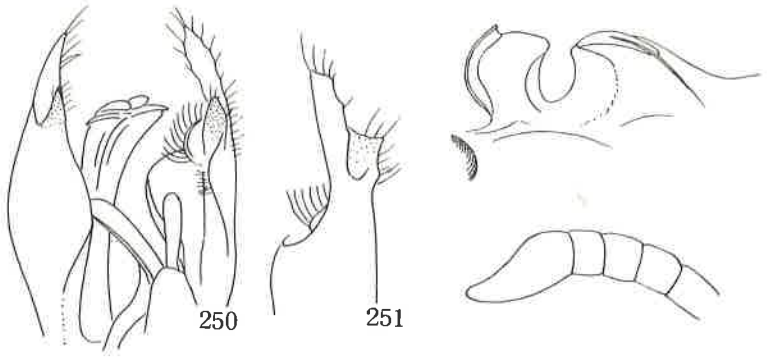


Figs. 247-249 and others. Group of kepongianum.

Known members 2. Genitalia in kepongiatum Ts.: Figs. 247 (ventro-lateral), 248 (paramere, dorsal) and 249 (penis valve, dorsal); in vientianense: Figs. 250 (ventro-lateral), 251 (paramere, dorsal).

Head transverse, Gl flask-shaped, =Max5. Propodeum with lateral carinae, area dorsalis without lateral furrows, mesoscutum without microsculpture, with plumbeous shine. IODs=10:7. SAT moderately high tuberiform, with medio-apical area slightly produced over interantennal area, forming a round flat area above, ASR raised above, forming a low round stand, with top area flattened. PAF deep, flat-bottomed and oval in cross section. Clypeus medianly produced. A3=AWx2.5-3, Al3=BWx2-2.5 and =Al0-12 or All-12. RC=C, sometimes somewhat close to B. 8 mm or so. ♀ unknown.

Remarks. Externally this group is characteristic in the structure of SAT and ASR.

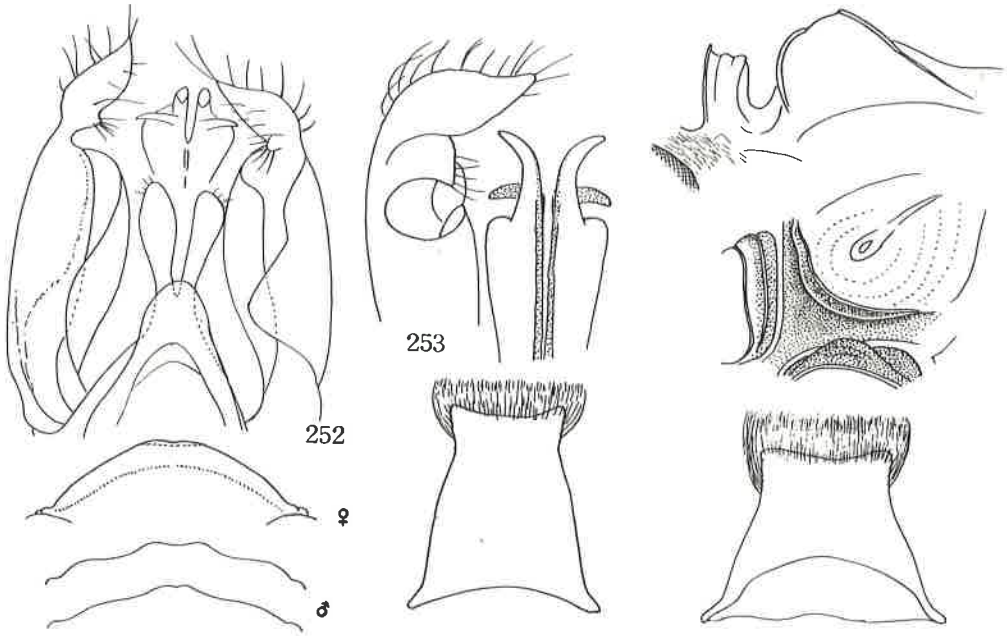


Figs. 245–246 and others. Group of kepongianum Tsuneki (sp. vientianense Ts.)

20. Group of atricorne Tsuneki

Known member 1. Genitalia: Figs. 252 (ventral), 253 (dorsal, left paramere omitted).

Head transverse. Gl flask-shaped, =Ma×8. Propodeum with lateral carinae, area dorsalis with lateral furrows, mesoscutum shining. IODs=5:4 (♀ ♂). SAT low broad tuberiform, margined anteriorly with carina, carina not reaching ASR, PAF deep, flat-bottomed and U-shaped in cross section. Clypeus with apical margin waved. A3=AW×3 (♂), ×4.3 (♀), Al3≒Al0–12. RC=C. Rl short. 9–13 mm.

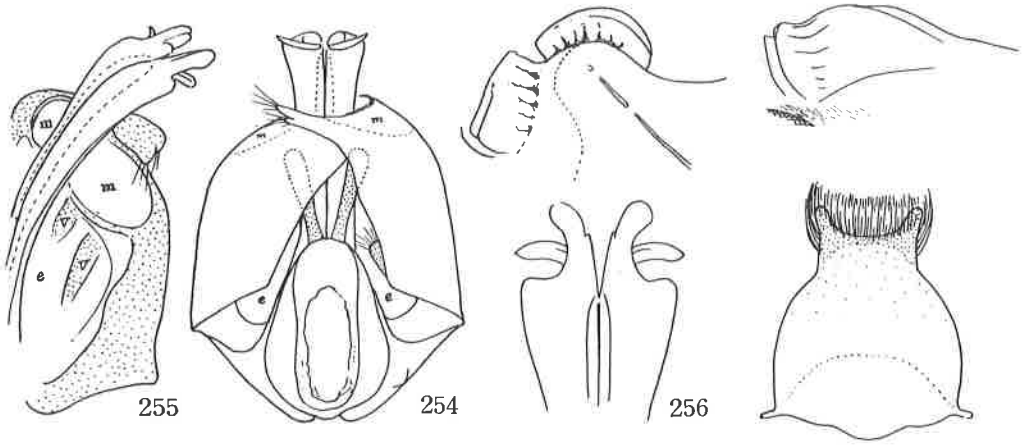


21. Group of spangleri Tsuneki

Known member 1. Genitalia: Figs. 254 (ventral), 255 (dorso-lateral) and 256 (penis valve, dorsal). Characteristic in the structure of paramere, m in the figure translucent membrane, e empty area.

Head seen in front subquadrate, from above transverse. Gl flask-shaped, =Ma×5–6. Propodeum with lateral carinae, area dorsalis without lateral furrows. Mesoscutum shin-

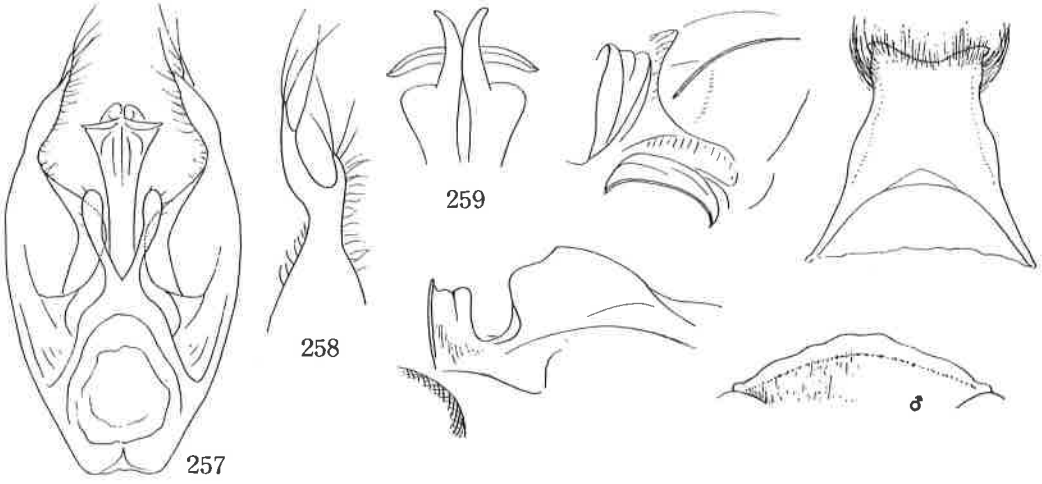
ing, but under high magnification bearing microstriae on PIS. IODs=10:8. SAT low broad tuberiform, without median carina, instead with a fine groove, PAF shallow, bread and down-curved in cross section. Clypeus rounded out and medianly weakly emarginate. A3=AW×1.5, Al3=A9-12. RC=B, Rl short. 6-7 mm.



22. Group of menkei Tsuneki

Known member 1. Genitalia: Figs. 257 (ventral), 258 (apical part of paramere, lateral) and 259 (penis valve, dorsal).

Gl flask-shaped, very long, ≒Ma×8. Propodeum with lateral carinae, area dorsalis with lateral furrows. Mesoscutum shining. IODs=10:9. SAT moderately high broad nasiform, PAF deep, flat-bottomed, U-shaped in cross section. Clypeus with apical margin weakly waved. A3=AW×3, Al3=A9-12. RC=C, but somewhat close to M. Rl short. 12-15 mm. ♀ unknown.

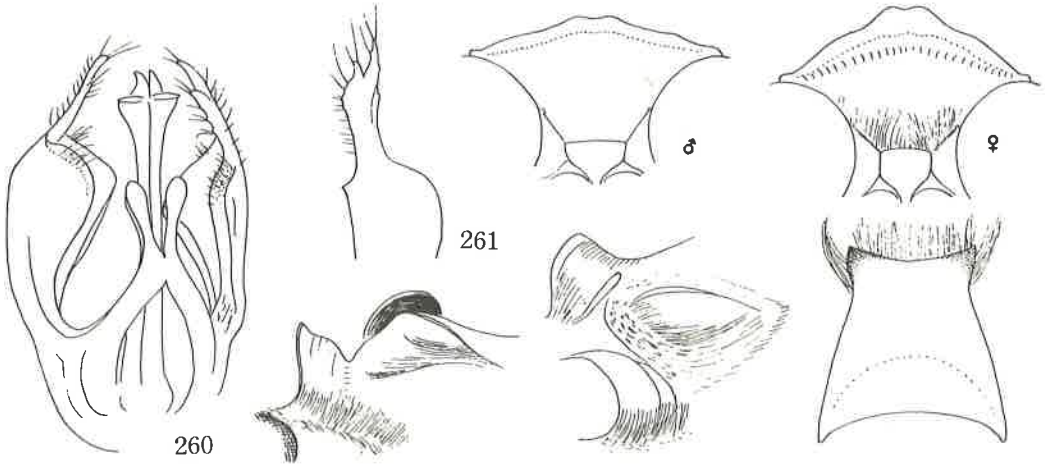


23. Group of auropilosum Tsuneki

Known member 1. Genitalia: Figs. 260 (almost ventral), 261 (apical part of paramere, lateral to see through apical incision).

Head transverse. Hair golden. Gl flask-shaped, =Ma×9. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum smooth and shining. IODs=10:9 (♀ ♂). SAT low nasiform, with a low lenticular mound in middle, carrying median carina.

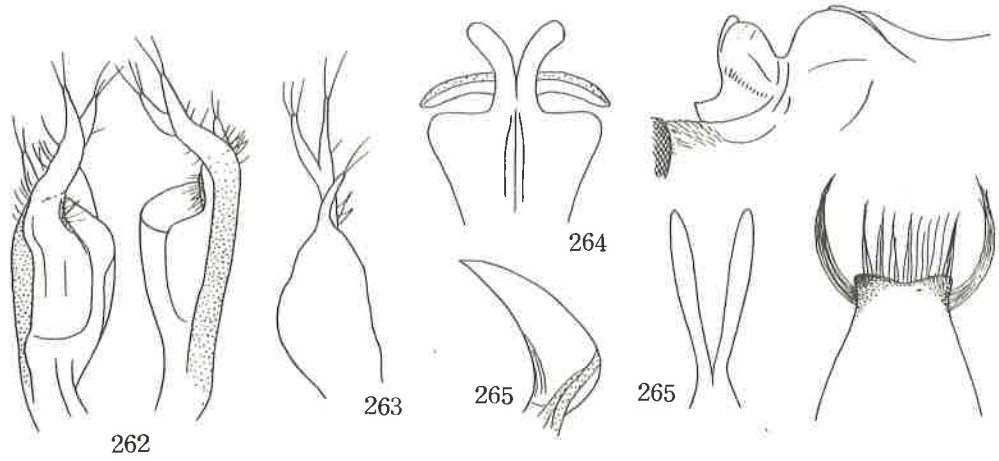
PAF shallow, broad-V-shaped in cross section, bottom line up-curved. Clypeus rounded out and medianly produced, with apex emarginate. A3=AW×4 (♂), ×5 (♀), Al3≒A9-12. RC=C, somewhat close to M. Rl moderately long, reaching close to wing apex. 11-13 mm.



24. Group of sayabouryense Tsuneki

Known member 1. Genitalia: Figs. 262 (parameres, ventral), 263 (left paramere, from outer side), 264 (penis valve, dorsal), 265 (volsella, lateral and ventral).

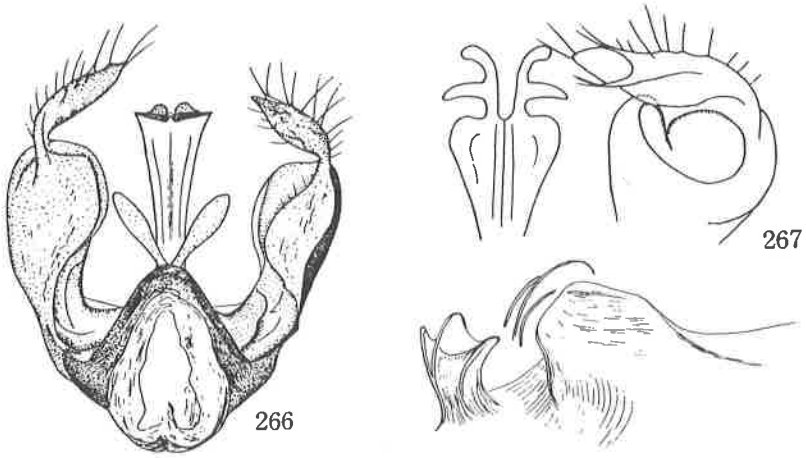
Head transverse. Gl flask-shaped, = Ma×8. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum smooth and punctured. IODs=5:4 (♂). SAT moderately high broad nasiform, PAF moderately deep, wide-V-shaped in cross section, bottom line up-curved. Clypeus medianly gently produced. A3=AW×2.8 (♂), Al3=BW×2.5 and ≒Al0-12. RC=C. ♀ unknown. ♂ 8 mm.



25. Group of melanocorne Strand

Known member 1. Genitalia: Figs. 266 (ventral) and 267 (apical portion seen vertically from dorsal apex, right paramere omitted).

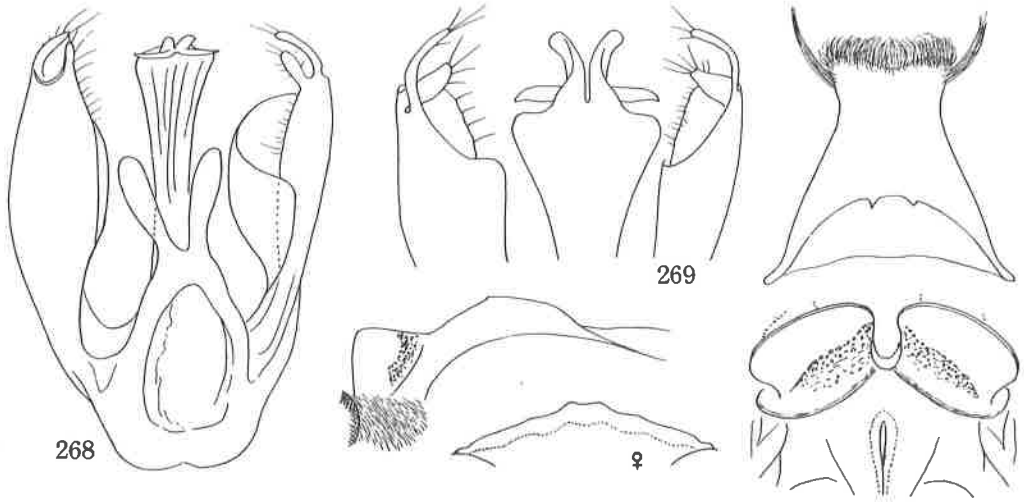
Head transverse. Gl flask-shaped, =Ma×8. Propodeum with lateral carinae, area dorsalis with lateral furrows, mesoscutum without microsculpture. IODs=5:4 (♀ ♂). SAT moderately high tuberiform, PAF deep, flat-bottomed, U-shaped in cross section. Clypeus gently roundly produced, apical margin waved. A3=AW×3 (♂), ×4 (♀), Al3=Al0·11-12. RC=M-C. Rl slightly long, reaching close to wing apex. 10-14 mm.



Figs. 266–267. Group of melanocorne Strand

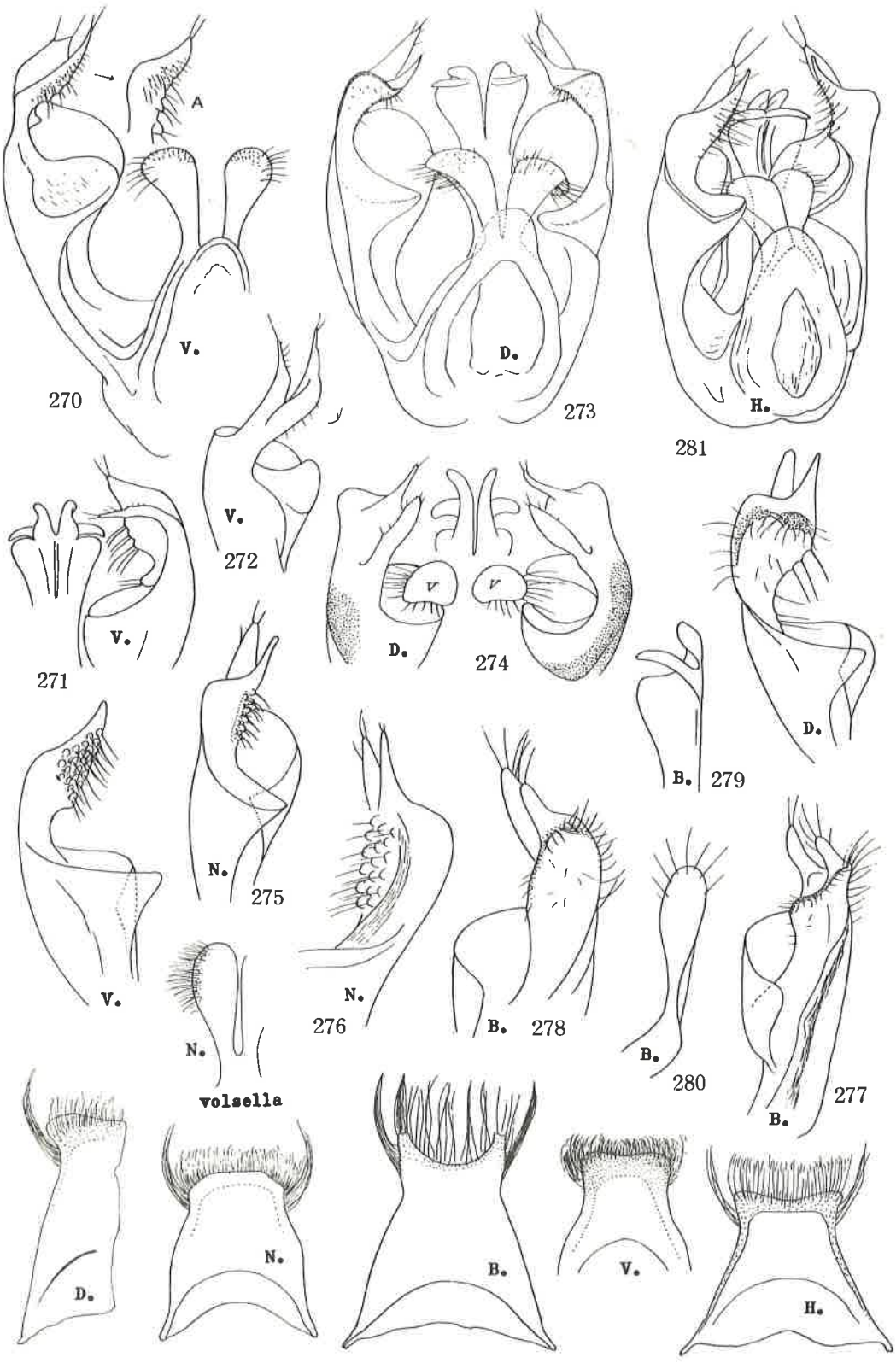
26. Group of membranaceum Tsuneki

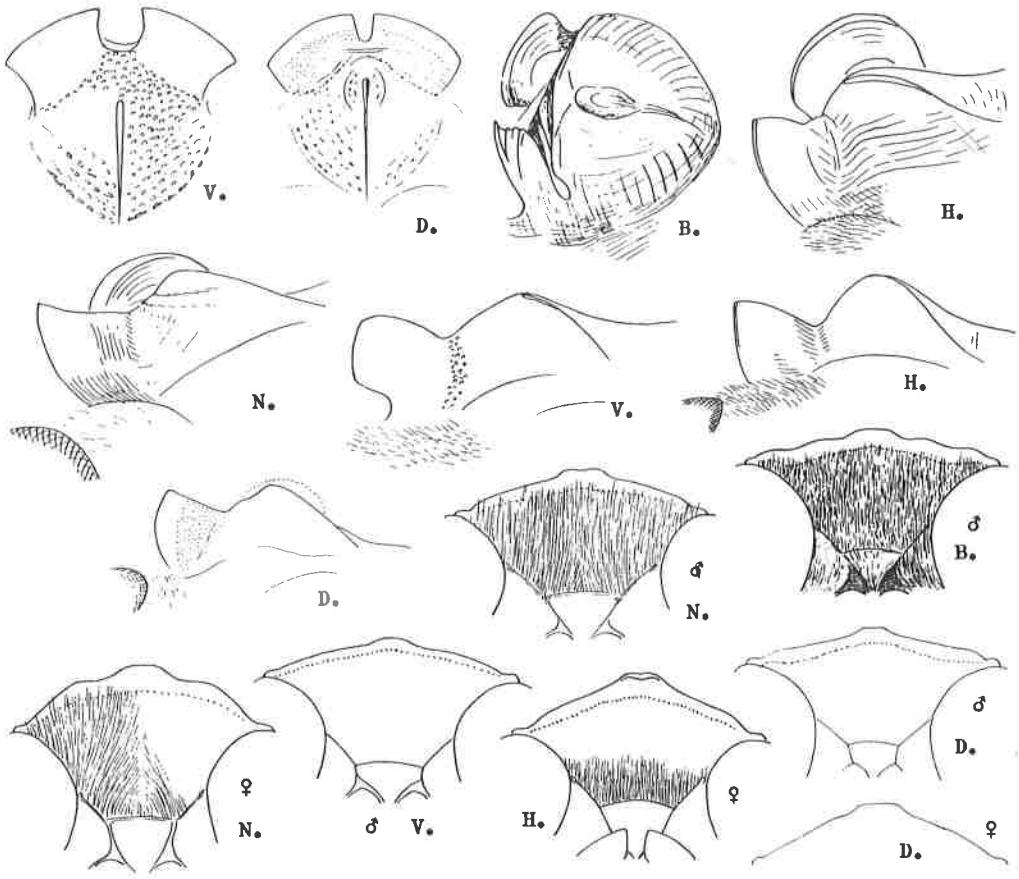
Known member 1. Genitalia: Figs. 268 (ventral) and 269 (dorsal, somewhat apical). Head transverse. Gl flask-shaped, in ♂ shorter, =Ma×4, in ♀ =Ma×7. Propodeum with lateral carinae, area dorsalis with lateral furrows, mesoscutum smooth and punctured. IODs=10:9–10. SAT low broad nasiform, ASR broadly expanded anteriorly, largely membranaceus, PAF shallow, broad-V-shaped in cross section, bottom line up-curved. Clypeus medianly produced. A3=AW×2.2 (♂), ×3.3 (♀), Al3=Al0–12. RC=C, Rl short. 6.5–10.5 mm.



27. Group of vardyi Tsuneki

Known members 5. Genitalia in vardyi: Figs. 270 (ventral), 271 (dorsal), 272 (paramere, lateral to see through apical split); in daicoccum: Figs. 273 (ventral), 274 (dorso-apical); in nesianum: Figs. 275 (left paramere, ventral), 276 (right paramere, ventral, somewhat from inside); in betremi: Figs. 277 (right paramere, ventral), 278 (do., somewhat more basal view), 279 (penis valve, left half, ventral), 280 (volsella, ventral); in hollisi: Fig. 281 (ventro-lateral).


A
V.
270
D.
273
H.
281
V.
272
V.
271
D.
274
D.
B.
279
N.
275
N.
276
B.
278
B.
280
B.
277
V.
N.
volsella
D.
N.
B.
V.
H.



Externally, head transverse, Gl flask-shaped, =Ma×5-7. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum smooth, shining and finely punctured. IODs=10:8-10 (♀ ♂). SAT moderately high round nasiform, sometimes nearly tuberiform, ASR widely expanded anteriorly, smooth and largely amber-yellow in colour, PAF shallow, wide-V-shaped in cross section or simply down-curved, bottom line up-curved. Clypeus with apical margin medianly produced, sometimes with apex emarginate, sometimes apical margin widely waved. A3=AW×2-2.3 (♂), ×4 (♀), Al3 always ≒Al0-12. RC=C, sometimes close to M, rarely close to B. 10-12 mm.

28. Group of anamalaiense Tsuneki

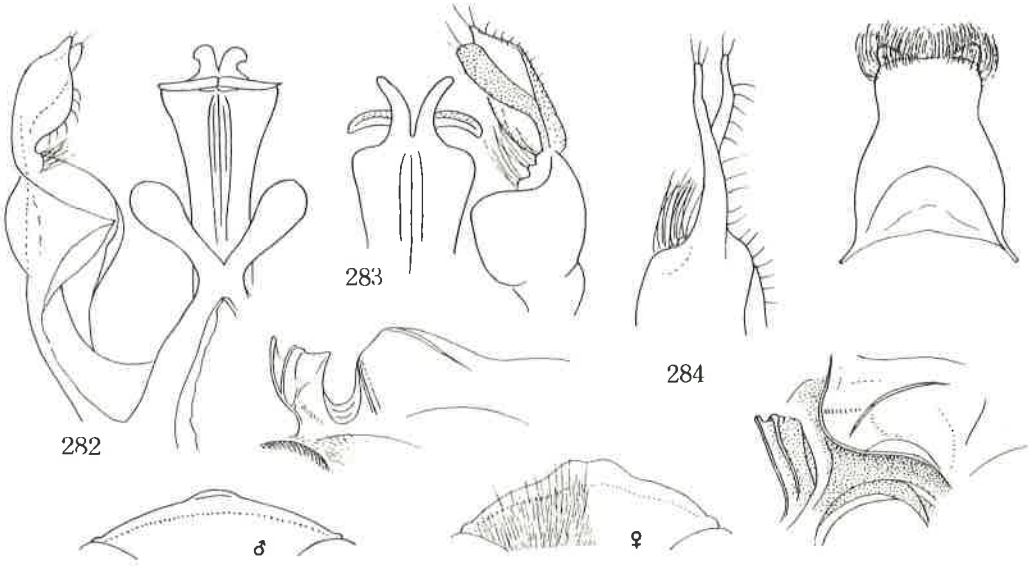
Known member 1. Genitalia: Figs. 282 (ventral), 283 (dorsal) and 284 (paramere, (lateral).

Head transverse. Gl flask-shaped, =Ma×5. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum without microsculpture, with strong plumbeous shine. IODs≒10:9 (♀ ♂). SAT low broad nasiform, anteriorly margined with transverse carina and medio-anteriorly with a round flat, but not hollowed area. PAF deep, flat-bottomed, U-shaped in cross section. A3=AW×2.3 (♂), ×5 (♀), Al3=BW×3.3 and ≒A9-12. RC=C or M, Rl short. ♂ 10 mm, ♀ 14-16 mm.

29. Group of srilankum Tsuneki

Known member 1. Genitalia: Fig. 285 (ventro-lateral).

Head transverse, Gl flask-shaped, =Ma×5. Propodeum with lateral carinae, area dor-



Figs. 282-284 and others. Group of anamalaiense

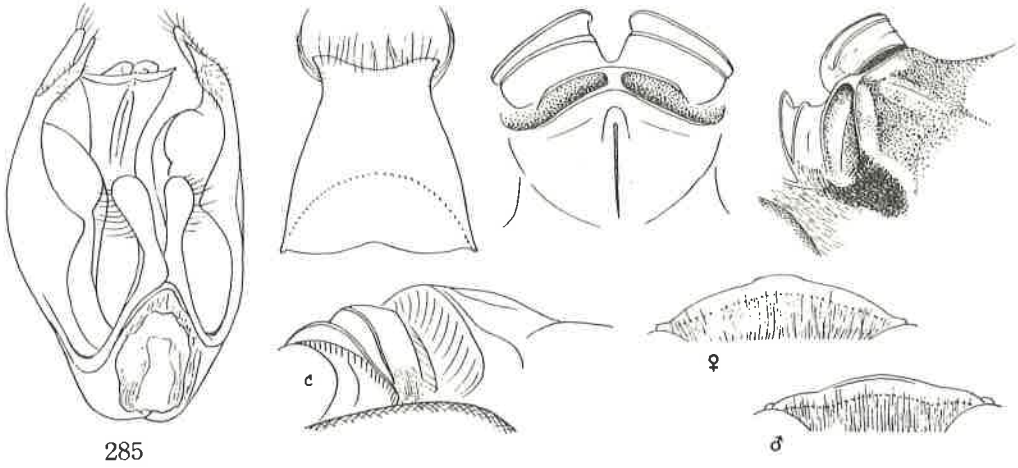


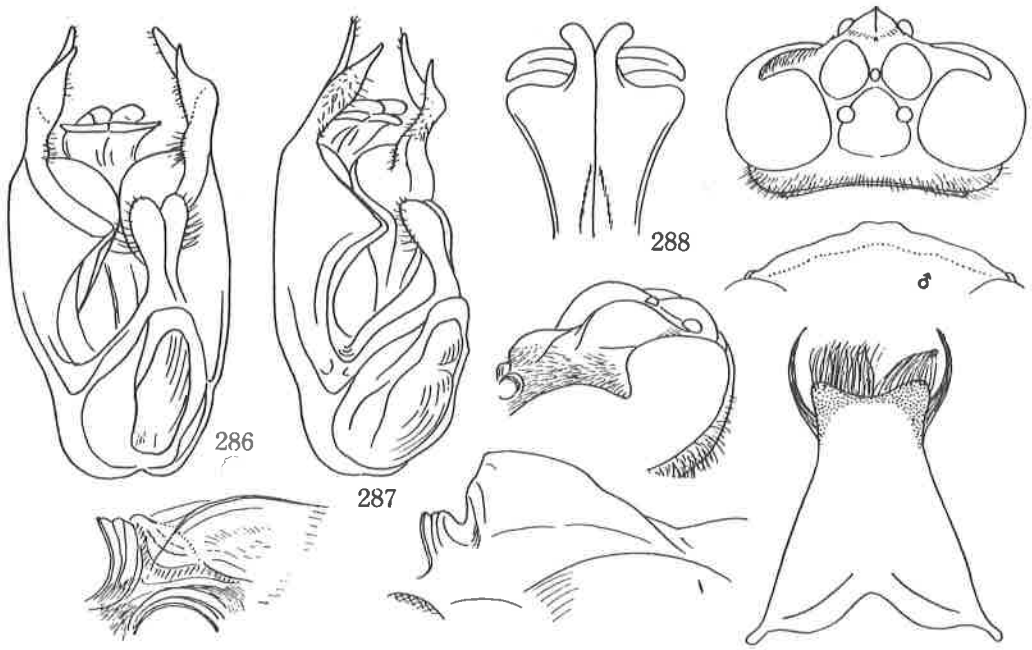
Fig. 285 and others. Group of srilankum

salis with lateral furrows. Mesoscutum smooth and shining, finely punctured, without microsculpture. IODs=5:4 (♀ ♂). SAT low broad nasiform, anteriorly margined with x-shaped carinae, apical one of the carinae reaching raised posterior margin of ASR and between the carinae deeply excavated into a furrow (corresponding to PAF). Clypeus medianly weakly produced. A3=AW×2.2 (♂), ×3 (♀), Al3≒BW×3 and =A9·10-12. RC=C. 9-13 mm.

30. Group of trituberculatum Tsuneki

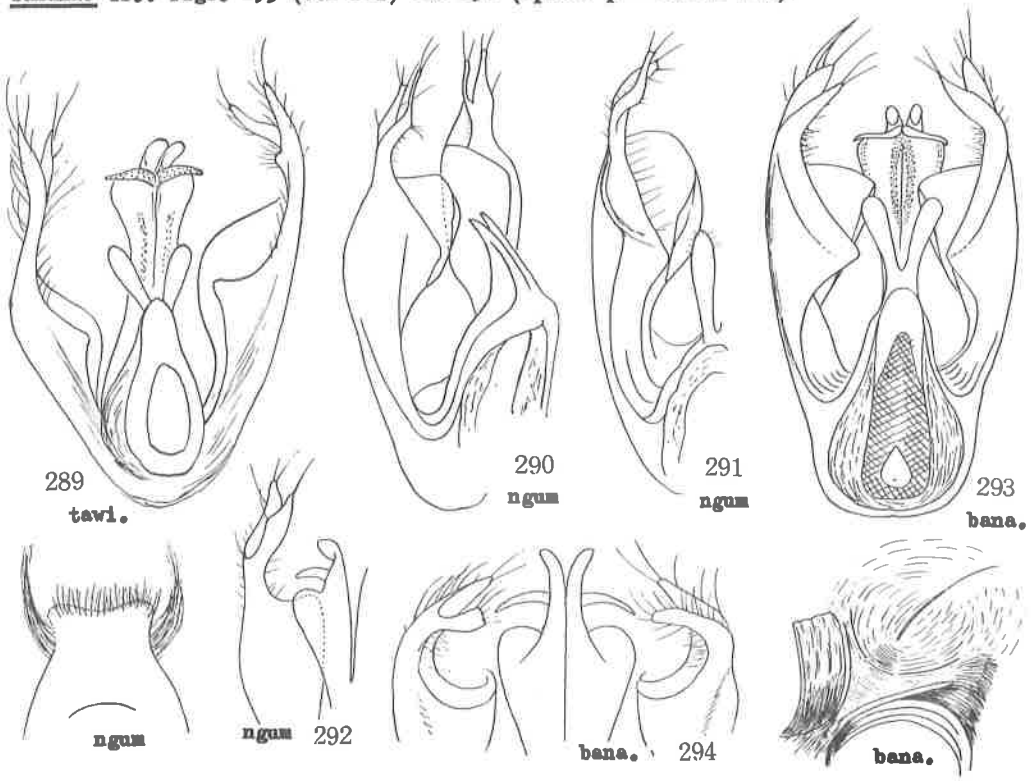
Known member 1. Genitalia: Figs. 286 (ventro-lateral), 287 (more lateral), 287 (penis valve, dorsal).

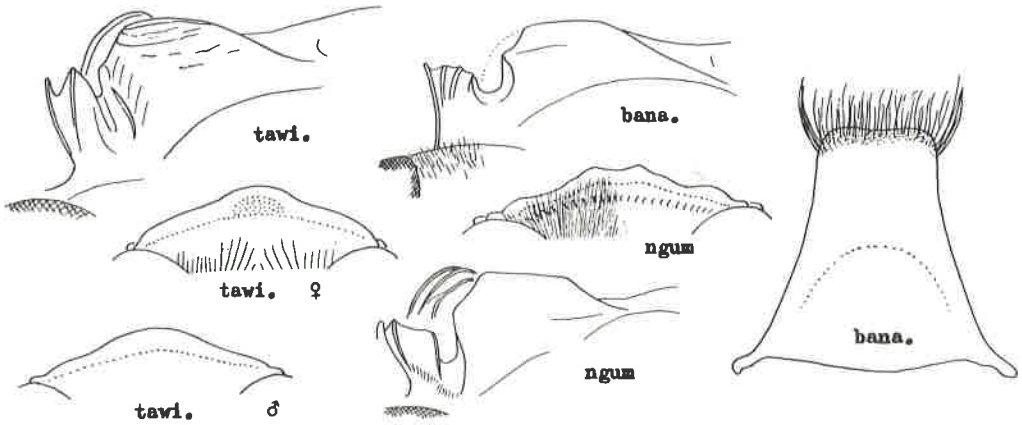
Head transverse, bearing three highly raised tubercles on vertex and frons. Gl flask-shaped, =Max6-7. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum without microsculpture. IODs=5:4 (♀ ♂). SAT moderately high nasiform, PAF moderately deep, flat-bottomed, somewhat shallow U-shaped in cross section. Clypeus medianly produced. A3=AW×3 (♂), ×4 (♀), Al3≒A10-12. RC=B. Rl short. ♂ 7-11 mm and ♀ 11-13 mm.



31. Group of tawitawiense Tsuneki

Known members 3. Genitalia in tawitawiense: Fig. 289 (ventral), in ngum Ts.: Figs. 290 (ventro-lateral), 291 (left half, ventral), 292 (right half, dorsal); in banahao Ts.: Figs. 293 (ventral) and 294 (apical portion dorsal).



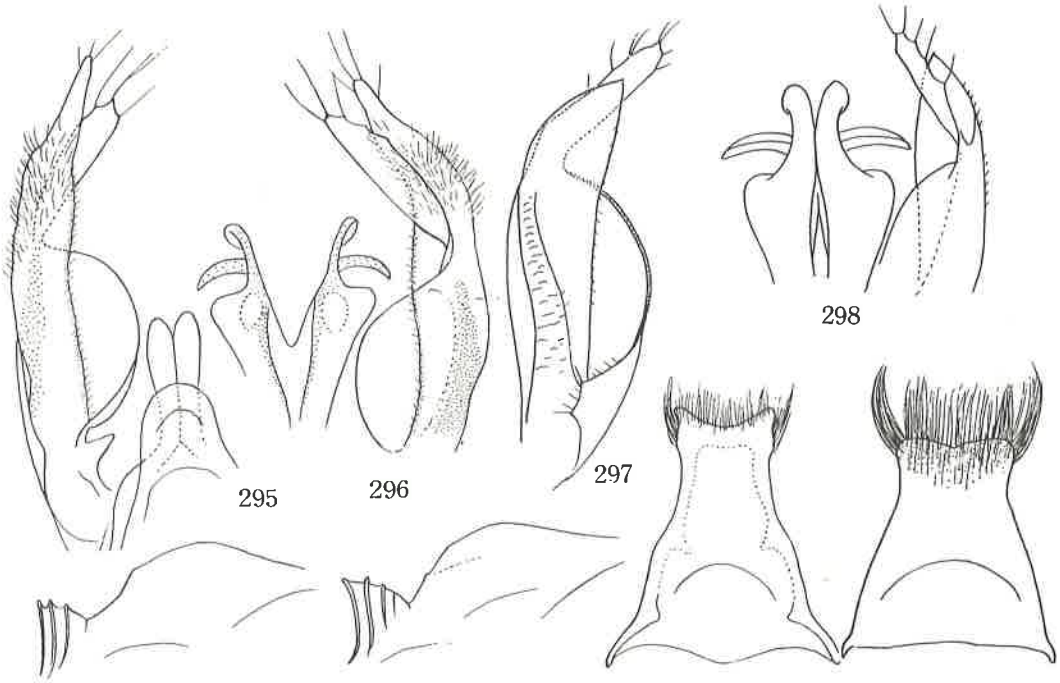


Head transverse. Gl flask-shaped, =Max 6–8. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum without microsculpture, shining, but sometimes feebly microcoriaceous (banahao). IODs=10:8–9 (♀ ♂). SAT rather low round nasiform, nearly tuberiform, PAF fairly deep, flat-bottomed, U-shaped in cross section. A3=AW×3 (♂), ×4–4.5 (♀), Al3 slightly longer than Al0–12, in banahao slightly shorter. RC=M, sometimes somewhat close to C. Rl short. 9–15 mm.

32. Group of fulvocollare Cameron

Known member 1. Genitalia in Laos specimen: Figs. 295 (left paramere and volsella, ventral), 296 (penis valve and left paramere, dorsal); in Borneo specimen: Figs. 297 (left paramere, ventral) and 298 (penis valve and left paramere, dorsal). Considerable difference is observed between them in the relative width of ventral one of apical lobes of paramere. It seems not simply due to difference in the direction observed.

Externally well agree. Head transverse, Gl flask-shaped, =Ma×5. Propodeum with (very feeble) or without lateral carinae, area dorsalis always without lateral furrows.

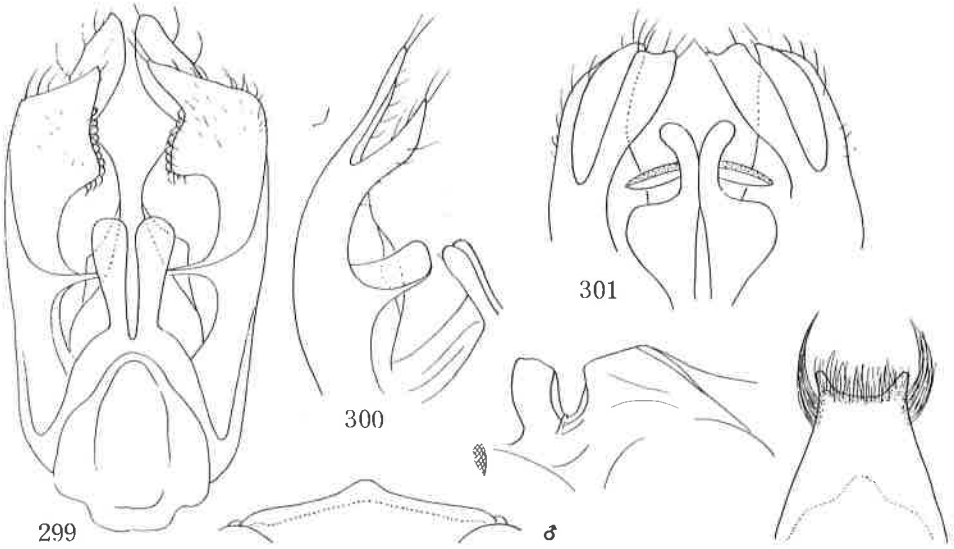


Mesoscutum shining, without microsculpture. Hair golden to brassy. IODs=5:4-5 (♀ ♂). SAT low nasiform, PAF moderately deep, wide-V-shaped in cross section, bottom line up-curved. Clypeus on apical margin simply rounded. A3=AW×2 (♂), ×4 (♀), Al3=A8·9-12. RC C-type, Rl short. 9-15 mm.

33. Group of orientale Cameron

Known member 1. Genitalia: Figs. 299 (ventral), 300 (lateral) and 301 (dorsal).

Head transverse. Gl flask-shaped, =Ma×7. Propodeum with lateral carinae, area dorsalis enclosed with furrow. Mesoscutum without microsculpture. IODs=10:9-10 (♀ ♂). SAT low broad nasiform, PAF deep, flat-bottomed, U-shaped in cross section. Clypeus medianly produced. A3=AW×2.7 (♂), ×5 (♀), Al3=A10-12. RC=C. Rl short. 12-15 mm.



34. Group of ornatigaster Tsuneki

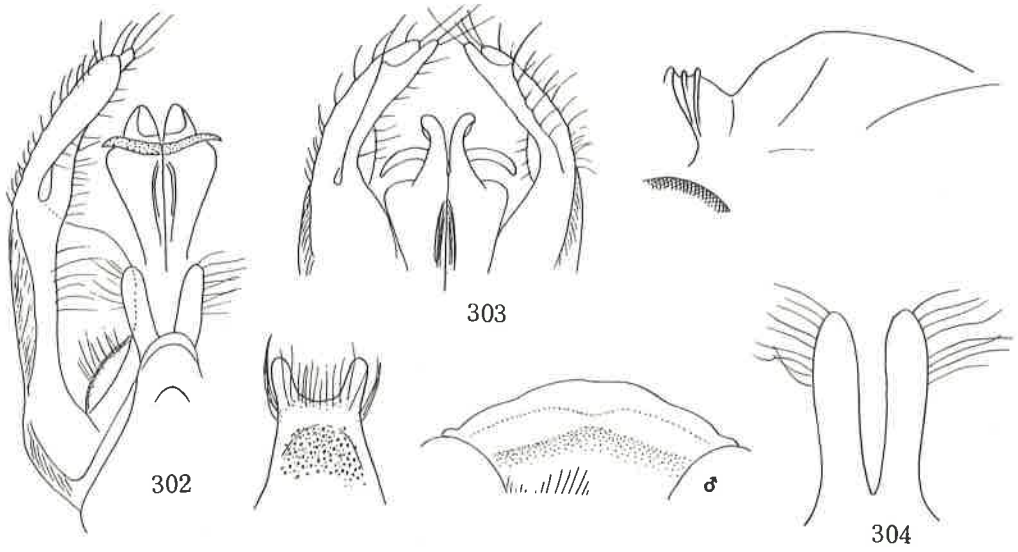
Known member 1. Genitalia: Figs. 302 (ventral, right paramere omitted), 303 (dorsal), 304 (volsella, ventral).

Head transverse. Gl flask-shaped, =Ma×4-5. Propodeum with lateral carinae, area dorsalis enclosed with feeble furrow. Mesoscutum shining, with plumbeous shine, without microsculpture. IODs=10:8-10. SAT low broad nasiform, with a round flat area on medio-apical portion, PAF shallow, wide-V-shaped in cross section, bottom line up-curved. A3=AW×2.5 (♂), ×4.5 (♀), Al3=A8-9-12. RC=C, Rl short. 11-14 mm. Hair golden.

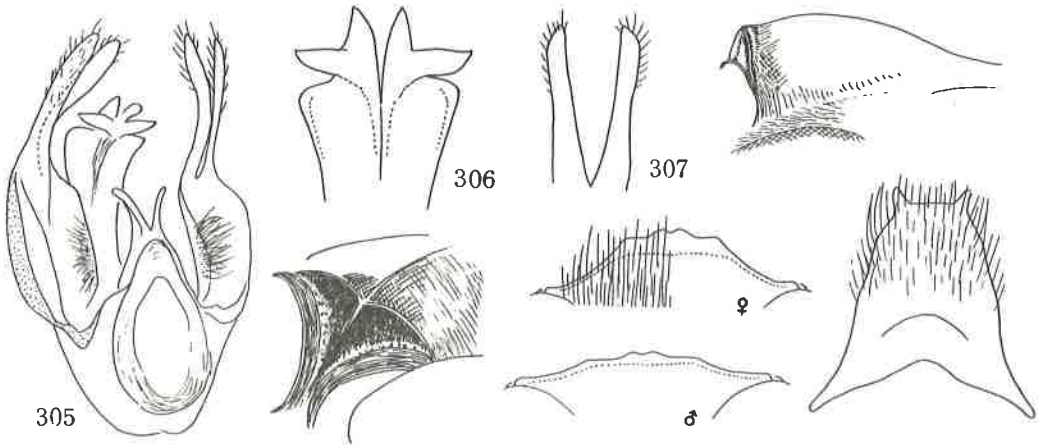
35. Group of attenuatum Smith

Known member 1. Genitalia: Figs. 305 (ventro-lateral), 306 (penis valve, ventral) 307 (volsella, ventral).

Head transverse. Gl flask-shaped, but short, =Ma×3-4. Propodeum with feeble lateral carinae, area dorsalis not enclosed with furrow. IODs=10:8 (♂), 10:7 (♀). SAT moderately high round nasiform, apical margin transversely carinated, carina reaching ASR, interrupting PAF, median carina of SAT extended anteriorly across the transverse carina to IAA. Clypeus with apical margin waved. A3=AW×1.3 (♂), ×2.5 (♀), Al3= A9-12. RC=C-B. 6.5-10 mm.



Figs. 302-304 and others. Group of ornatigaster.



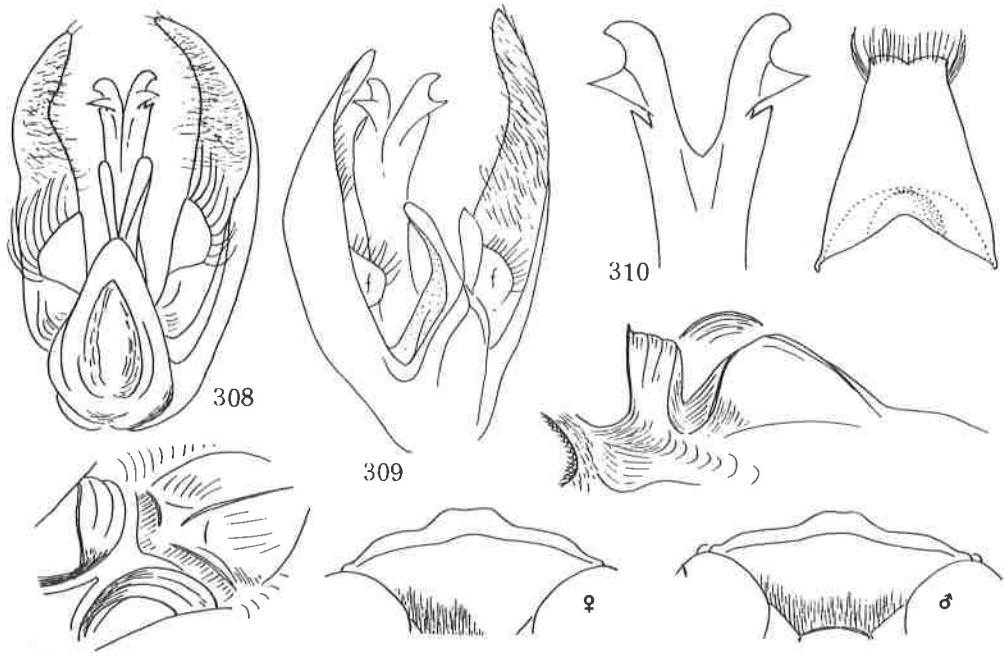
Figs. 305-307 and others. Group of attenuatum.

C. Submajor Group 3

36. Group of sapporoense Tsuneki

Known member 1. Genitalia: Figs. 308 (ventral), 309 (ventro-lateral), 310 (penis valve, ventral).

Head transverse. Gl long clavate, =Ma×3-4. Propodeum with lateral carinae, area dorsalis enclosed with feeble furrow. Mesoscutum dull and opaque, weakly microcoriaceous. IODs=3:2 (♀ ♂). SAT moderately high broad nasiform, PAF deep, flat-bottomed, U-shaped in cross section. Clypeus medianly produced. A3=AW×1.5 (♂), ×3.5 (♀), Al3=BW×2.3 and =A8·9-12. RC=C, somewhat close to M. Rl moderately long. 7.5-9 mm.

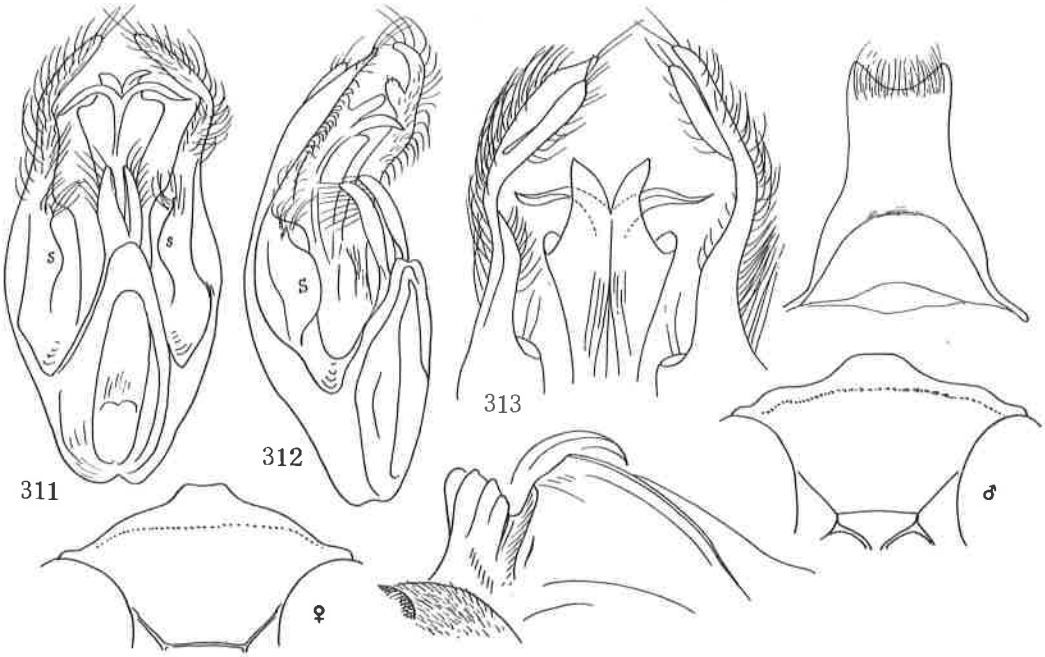


Figs. 308–310 and others. Group of <u>sapporoense</u> Tsuneki

37. Group of <u>salween</u> Tsuneki

Known member 1. Genitalia: Figs. 311 (nearly ventral), 312 (ventro-lateral), 313 (dorsal).

Head transverse. Gl flask-shaped, =Ma×5. Propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum without microsculpture, shining. IODs=10:8

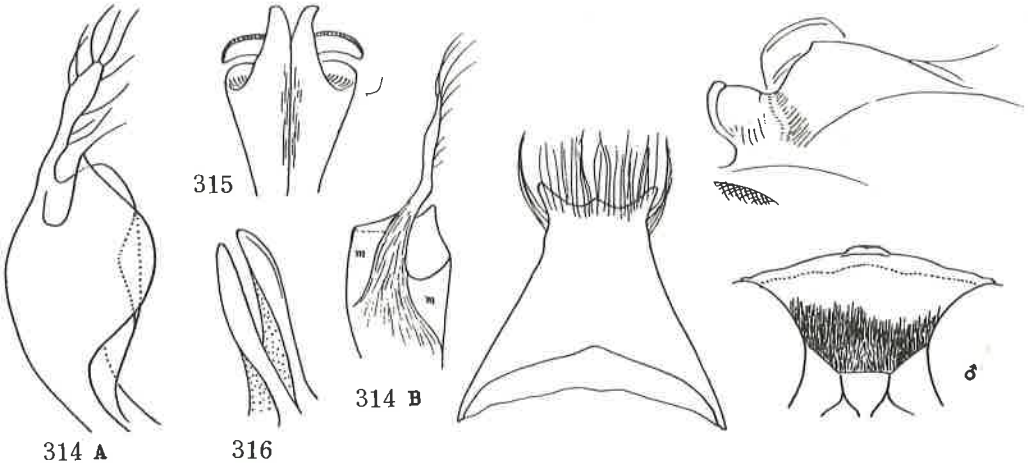


(♂), 10:7 (♀). SAT low broad nasiform, nearly tuberiform, medianly distinctly carinate, PAF fairly deep, flat-bottomed, U-shaped in cross section. Clypeus medianly produced. A3=AW×1.8 (♂), ×4 (♀), A13=A9·10-12. RC=C, somewhat close to M. 13-14 mm.

38. Group of viridaricola Tsuneki

Known member 1. Genitalia: Figs. 314,A (paramere, ventro-lateral), 314,B (do., lateral, m... yellowish translucent membrane), 315 (penis, dorsal), 316 (volsella, ventro-lateral).

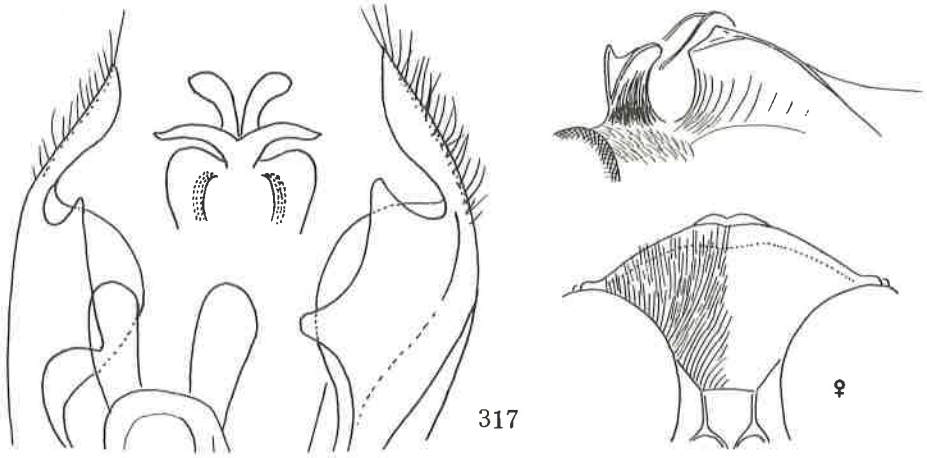
Head transverse. Gl flask-shaped, =Ma×7. Propodeum with lateral carinae, area dorsalis enclosed with furrow. IODs=10:9 (♂). SAT moderately high nasiform, ASR fairly long expanded anteriorly, PAF moderately deep, wide-V-shaped in cross section, Clypeus medianly weakly produced. A3=AW×2.3, A13≒A10-12. RC=C. 9 mm. ♀ unknown.



39. Group of hyperorientale Strand

Known member 1. Genitalia: Fig. 317 (ventro-lateral, with penis valve, ventral).

Head transverse. Gl flask-shaped, =Ma×6-7. Propodeum with lateral carinae, area dorsalis enclosed with furrow. Mesoscutum without microsculpture, shining. IOSa=4:3 (♂), 5:3 (♀). SAT moderately high nasiform, bearing a flattened and gently hollowed

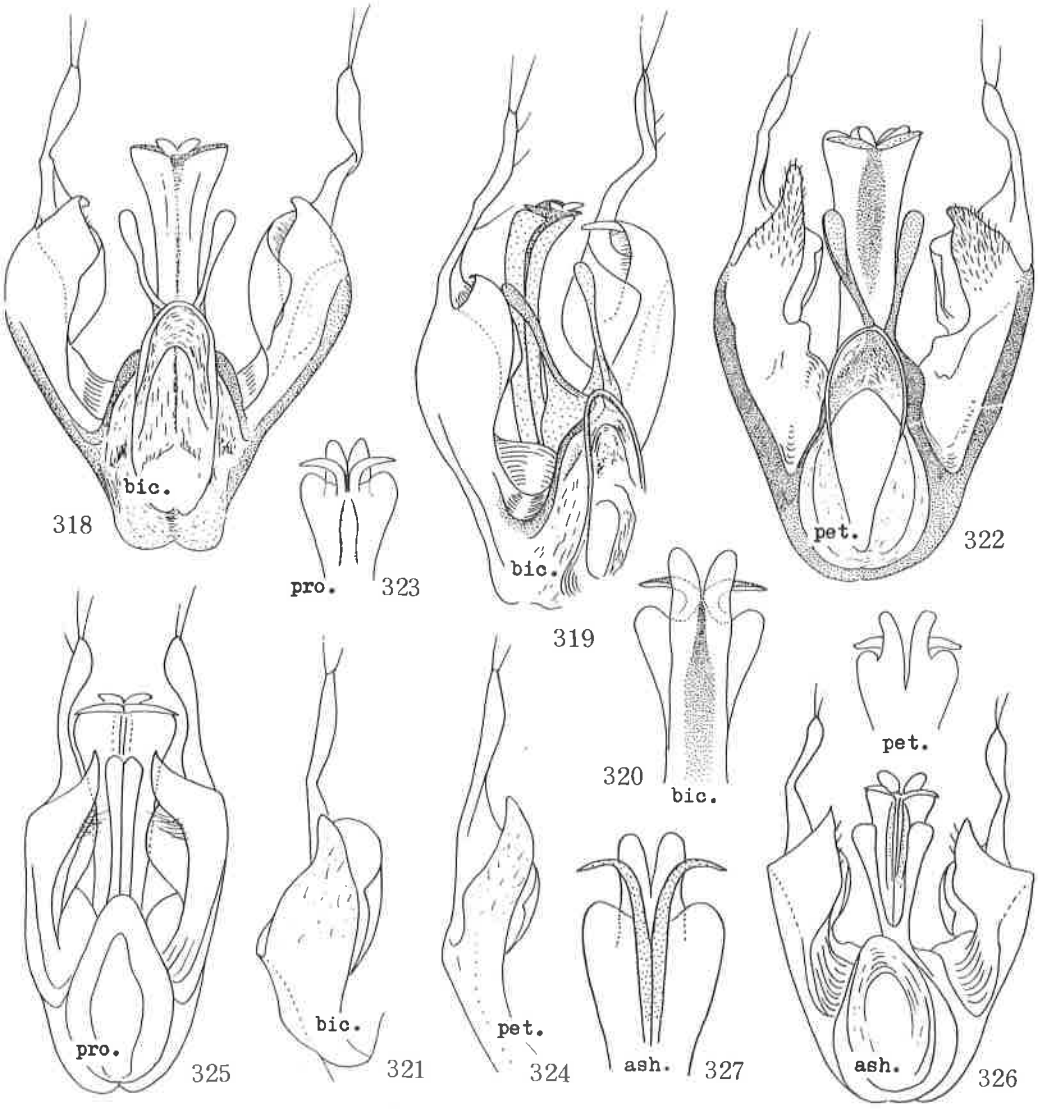


triangular area medio-anteriorly, PAF deep, flat-bottomed, oval in cross section. A3= AW×2.7 (♂), ×5 (♀), A13=BW×2 and slightly shorter than A10-12. RC=C. Antenna in ♀ not ferruginous beneath. 12-14 mm.

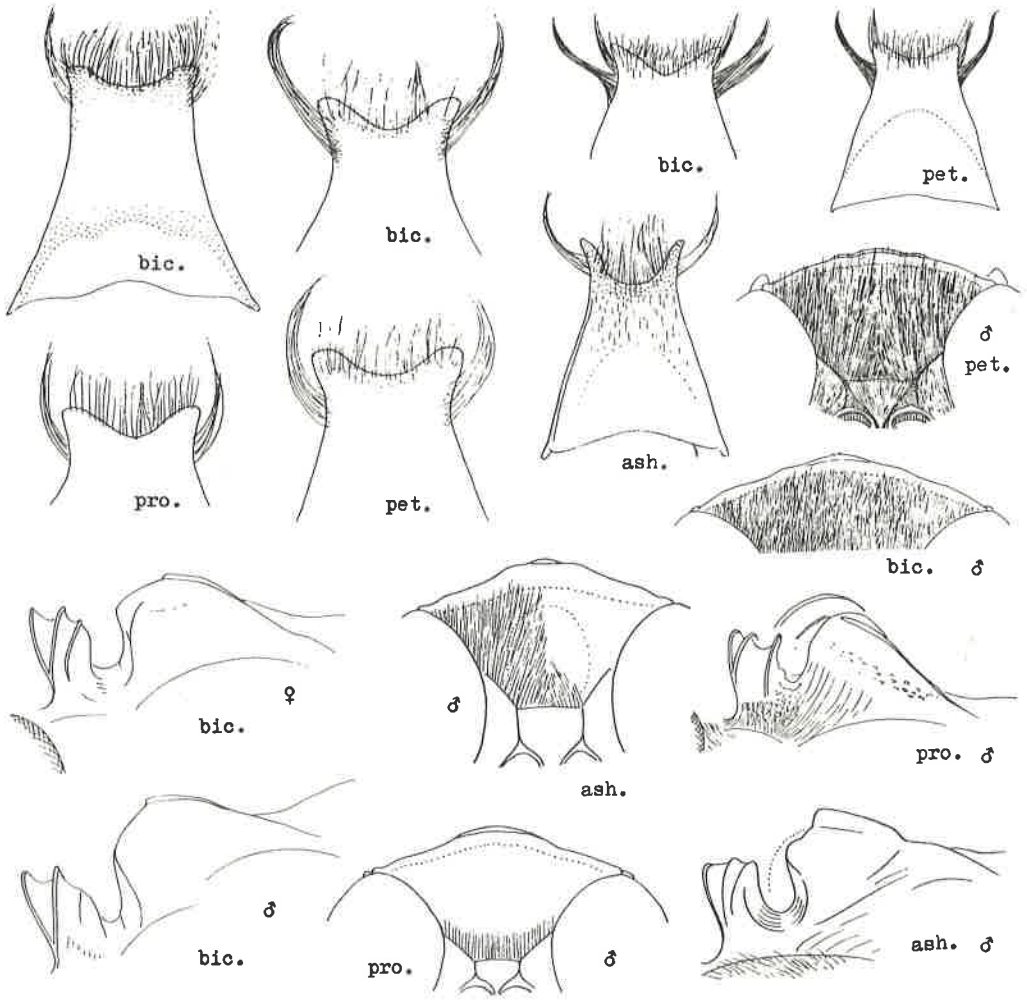
40. Group of bicolor Smith

Known members 4. Genitalia in bicolor: Figs. 318 (ventral), 319 (ventro-lateral), 320 (penis valve, dorsal), 321 (left paramere, ventro-lateral); in petiolatum Sm.: Figs. 322 (ventral), 323 (penis valve, ventral), 324 (left paramere, ventro-lateral); in providum: Fig. 325 (ventral) and in ashmead Balt.: Figs. 326 (ventral) and 327 (penis valve, ventral).

Head transverse. Gl flask-shaped, =Ma×5-7. Propodeum without lateral carinae, often with very feeble indistinct carinae, area dorsalis without lateral furrows, but sometimes with feeble furrows. IODs=10:8-9 (♂), ÷4:3 (♀), sometimes in both 4:3 or 10: 7-8. SAT low broad nasiform, sometimes somewhat high nasiform, PAF fairly deep (always deeper in ♂ than in ♀), flat-bottomed, U-shaped in cross section, but in providum in ♀



as in others, but in ♂ broad, shallow, down-curved in cross section and coarsely crossed with strong striae. A3=AW×3 (♂) and ×5 (♀), A13=A9- 0r 10-12. RC=B, in providum somewhat close to C. Length varied, 10-20 mm.



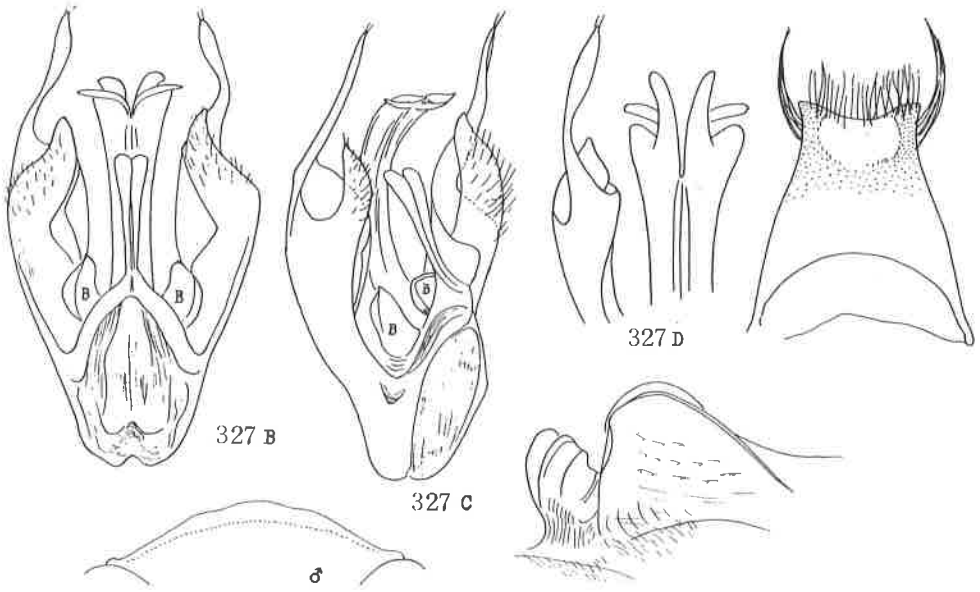
41. Group of myitkyinae Tsuneki

Known member 1. Genitalia: Figs. 328 (ventral), 329 (ventro-lateral) and 330 (dorsal, right paramere omitted). Except for the presence of basal appendage of paramere, the present group almost completely agrees with that of bicolor.

Head transverse. Gl flask-shaped, ≒Ma×5. Mesoscutum without microsculpture, shining. IODs=5:4 (♂). SAT moderately high nasiform, acutely edged at verge to PAF. PAF deep, flat-bottomed, U-shaped in cross section. Clypeus with apical margin gently recurved in middle. A3=AW×2, A13=A9-12. RC=C, Rl short. 8 mm. ♀ unknown.

42. Group of sacinasium Tsuneki

Known members 4. Genitalia in sacinasium: Figs. 328 (ventral), 329 (penis valve, ventral and dorsal); in bibou: Figs. 330 (ventral, right paramere omitted), 331 (dorsal, do.); in kokodaense: Figs. 332 (ventral, do.), 333 (penis valve, dorsal, do.)



Figs. 327,B-327,D and others. Group of myitkyinae Tsuneki

and in kalilicum: Fig. 334 (ventro-lateral).

Head transverse. Gl flask-shaped, =Max5-7. Propodeum without lateral carinae, lateral furrows of area dorsalis shallow and weak. Mesoscutum without microsculpture, shining. IODs=10:8-10 (♂), ≒3:2 (♀). SAT moderately high nasiform, long carinated in middle, PAF shallow, wide-V-shaped in cross section, bottom line up-curved, in kalilicum in which alone the female is known PAF in ♀ as in ♂ of others and in ♂ somewhat deeper: shallow U-shaped in cross section (see figures given). Clypeus roundly produced anteriorly and at medio-apical margin weakly waved, in kalilicum ♀ apex broadly truncate, sometimes gently emarginate. A3=AWx2.5-3 (♂), x5 (♀), Al3≒Al0-12 or slightly longer. RC=B. 13-15 mm, in kalilicum 17-19 mm.

43. Group of eximium Smith

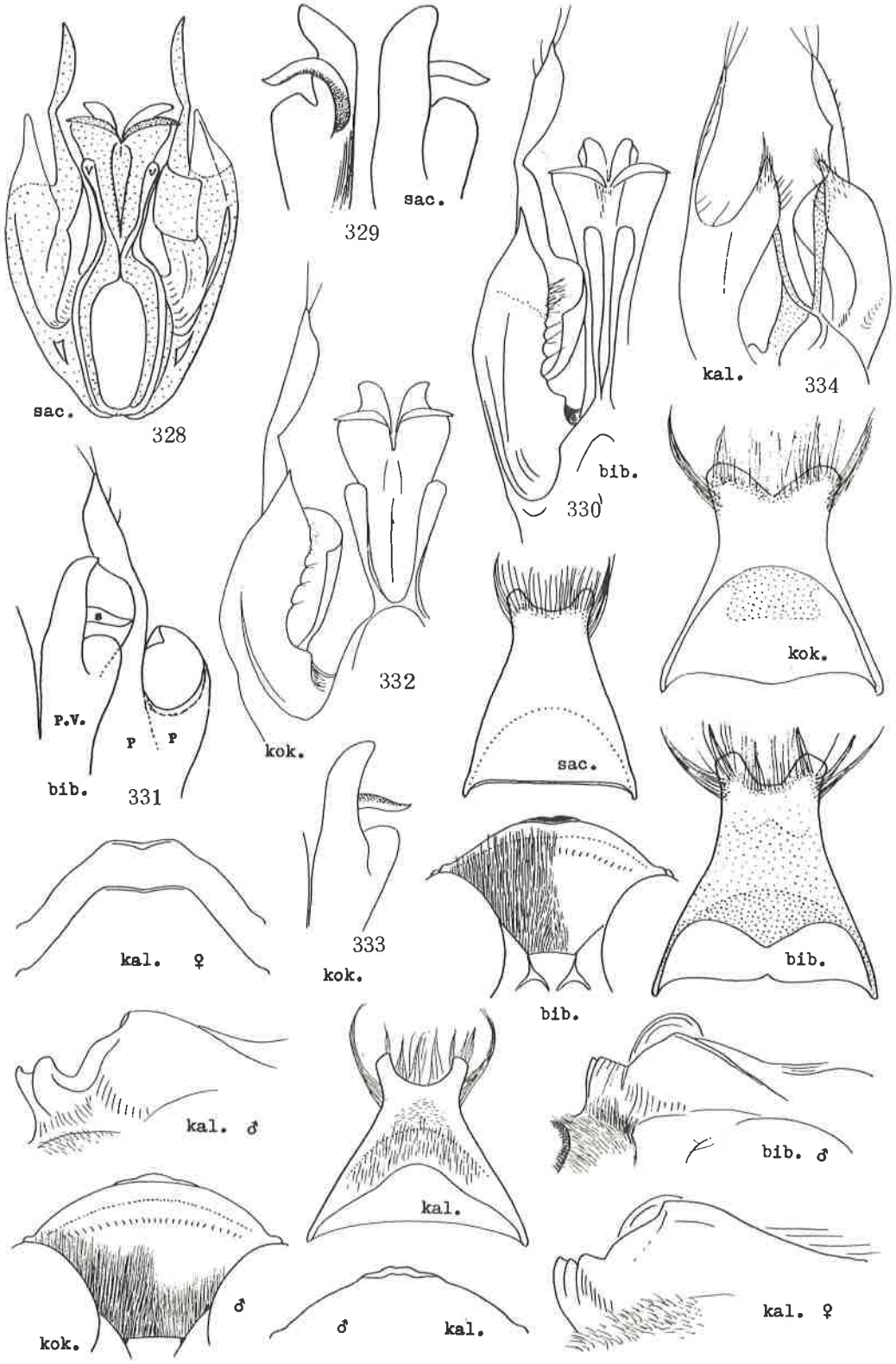
Known members 3. Genitalia in eximium: Figs. 335 (ventral), 336 (ventro-lateral), 337 (penis valve, dorsal), 338 (ssp. gracillimum Smith, ventral); in lae Ts.: Figs. 339 (ventro-lateral), 340 (dorso-vertical, right paramere omitted), 341,A (ventral), 341,B (ssp. baiyerum Ts., left paramere and volsella, ventral); in solomonense: Figs. 342,A (ventral), 342,B (ventro-lateral), 343 (dorsal).

Head transverse. Gl flask-shaped, =Max5-6. Propodeum without lateral carinae, often with very feeble ones, area dorsalis not enclosed with furrow, often feebly enclosed with weak furrow. Mesoscutum without microsculpture, shining, IODs=10:8-9 (♂) and 10:7.5-8 (♀). SAT moderately high nasiform, PAF shallow, wide-V-shaped or shallow and wide U-shaped in cross section, bottom line always up-curved. Clypeus roundly produced, with apical margin broadly truncate and medianly again produced, in ♂ apical truncation and prominence weak. A3=AWx2.2-3 (♂), ≒AWx5 (♀), Al3=Al0-12 or slightly longer. RC=B, Rl short. 13-20 mm.

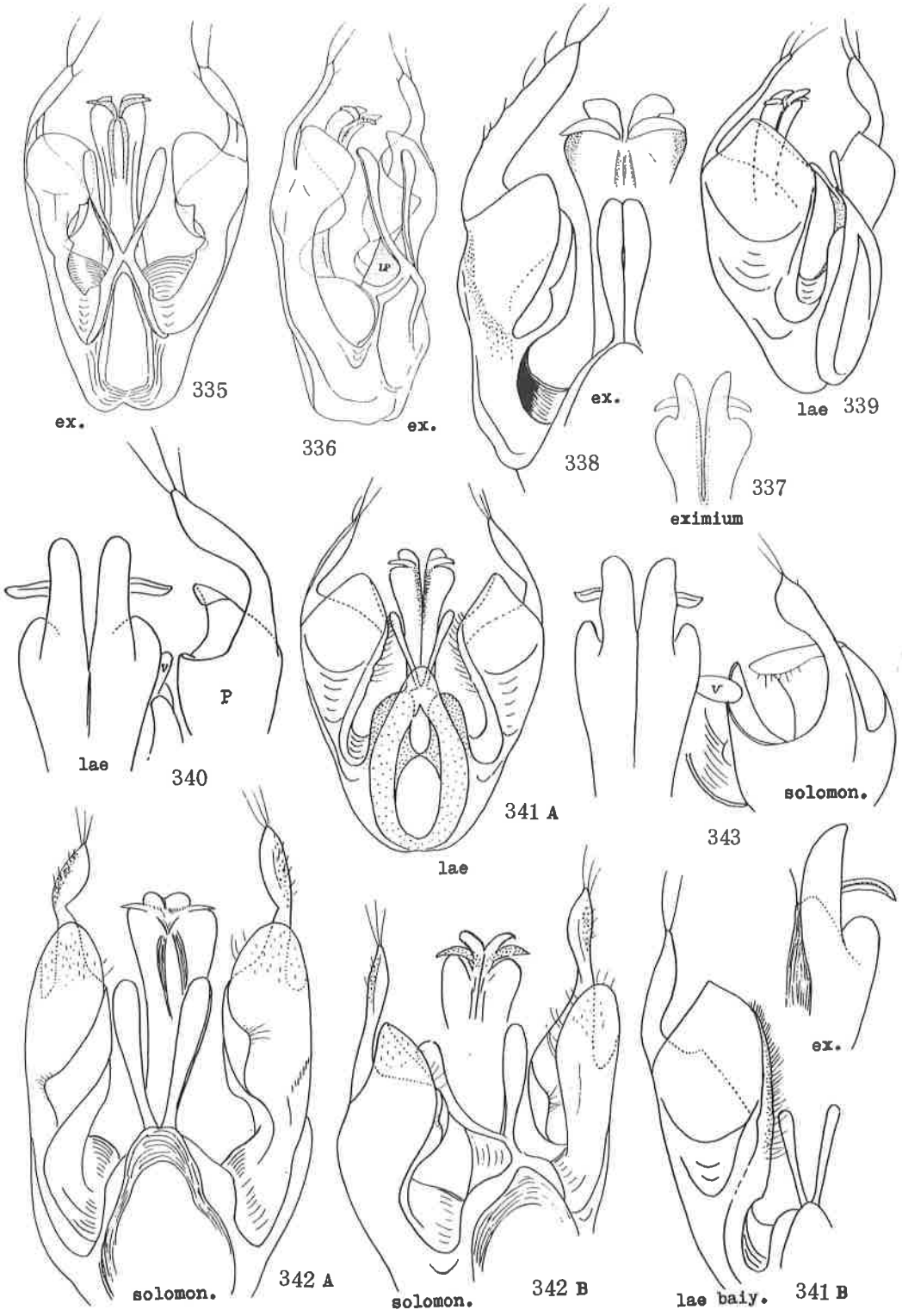
44. Group of malaisei Gussakovskij

Known member 1. Genitalia: Figs. 344 (ventral), 345 (dorsal) and 346 (paramere, lateral).

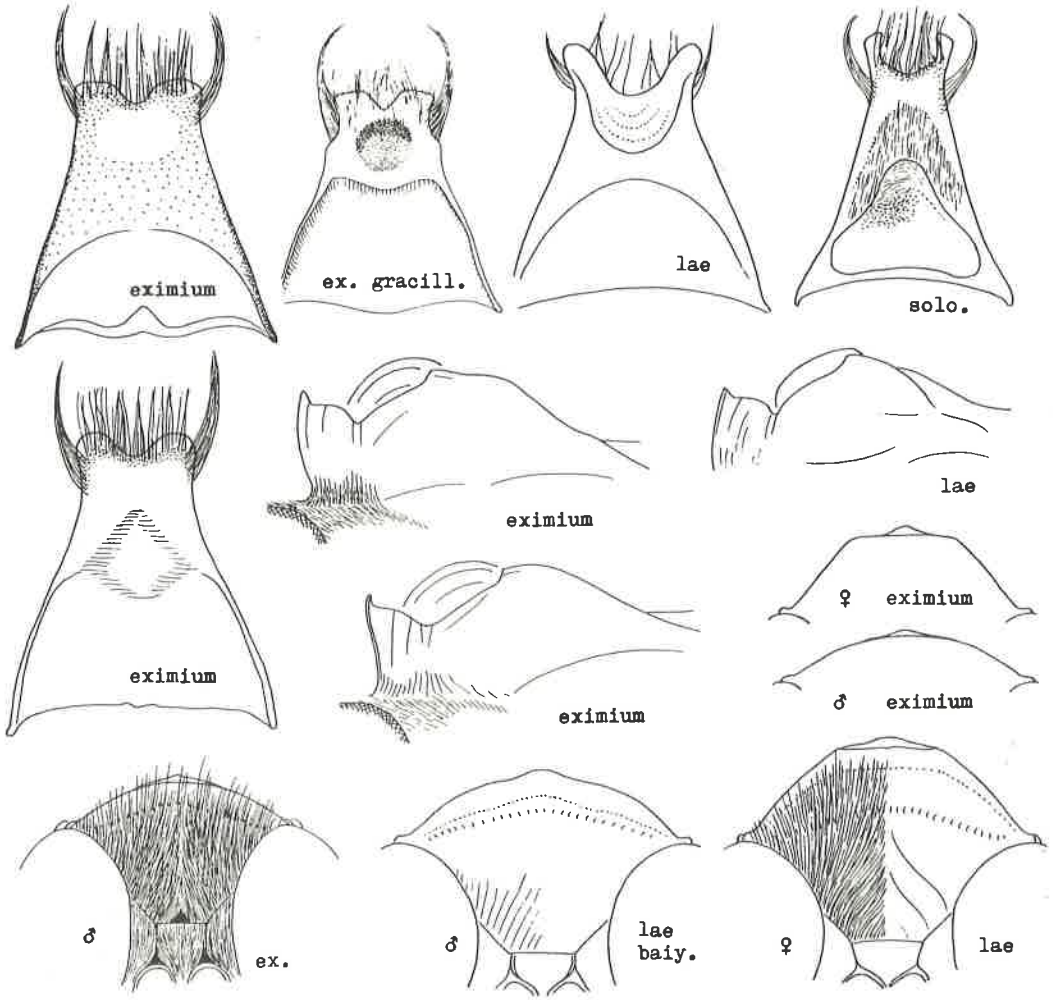
Head transverse. Gl flask-shaped, =Max5-6. Propodeum with lateral carinae, area



Figs. 328-334 and others. Group of <u>sacinasium</u> Tsuneki



Figs. 335-342. Group of <u>eximium</u> Smith.



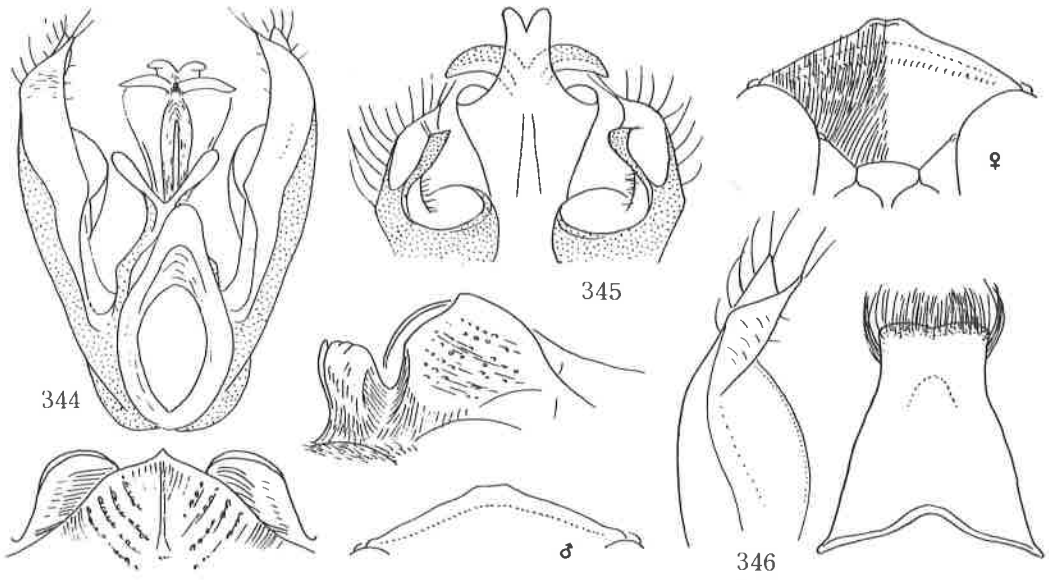
Figures of Group of eximium Smith

dorsalis enclosed with furrow. Mesoscutum without microsculpture, shining. SAT moderately high nasiform, PAF deep, flat-bottomed, U-shaped in cross section. Clypeus with medial prominence on anterior margin in middle, in ♀ stronger than in ♂. A3=AW×2 (♂), ×5 (♀), Al3≒Al0-12. RC=M, Rl short, but reaching close to wing apex. 13-16 mm.

45. Group of figulus Linneus

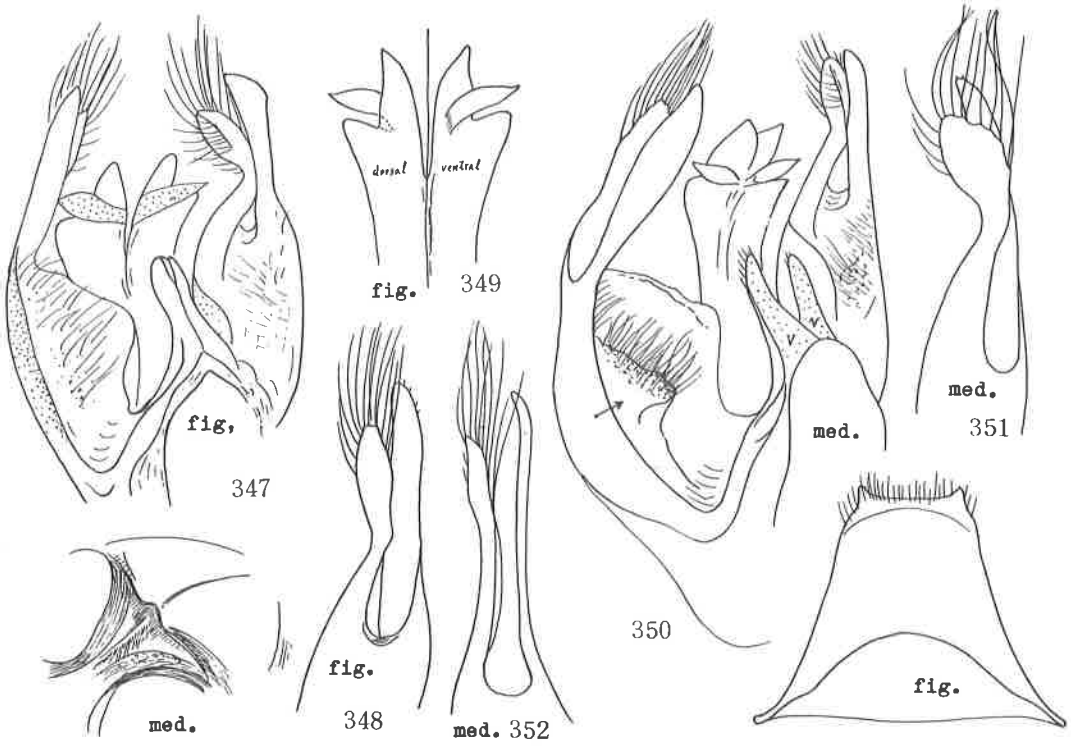
Known members 4. Genitalia in figulus L.: Figs. 347 (ventro-lateral), 348 (apical part of paramere, lateral), 349 (penis valve, dorsal and ventral); in medium B.: Figs. 350 (ventro-lateral), 351 (apical part of paramere, ventral), 352 (do., lateral); in frigidum: Figs. 356 (dorsal), 357 (apical part of paramere, lateral); in frigidum yamatonis: Figs. 353 (ventral), 354 (lateral); in fronticorne japonense: Figs. 358 (dorsal) and 359 (ventral).

Head transverse, but slightly thicker than usual, HW:HL=100:54-57. Gl clavate, =Ma×2-2.3. Propodeum with lateral carinae, area dorsalis without enclosing furrow, mesoscutum microcoriaceous. IODs=10:8-9 (♂), 10:10-11 (♀). Clypeus always with distinct medial prominence on anterior margin, sometimes apical margin broadly undulate.

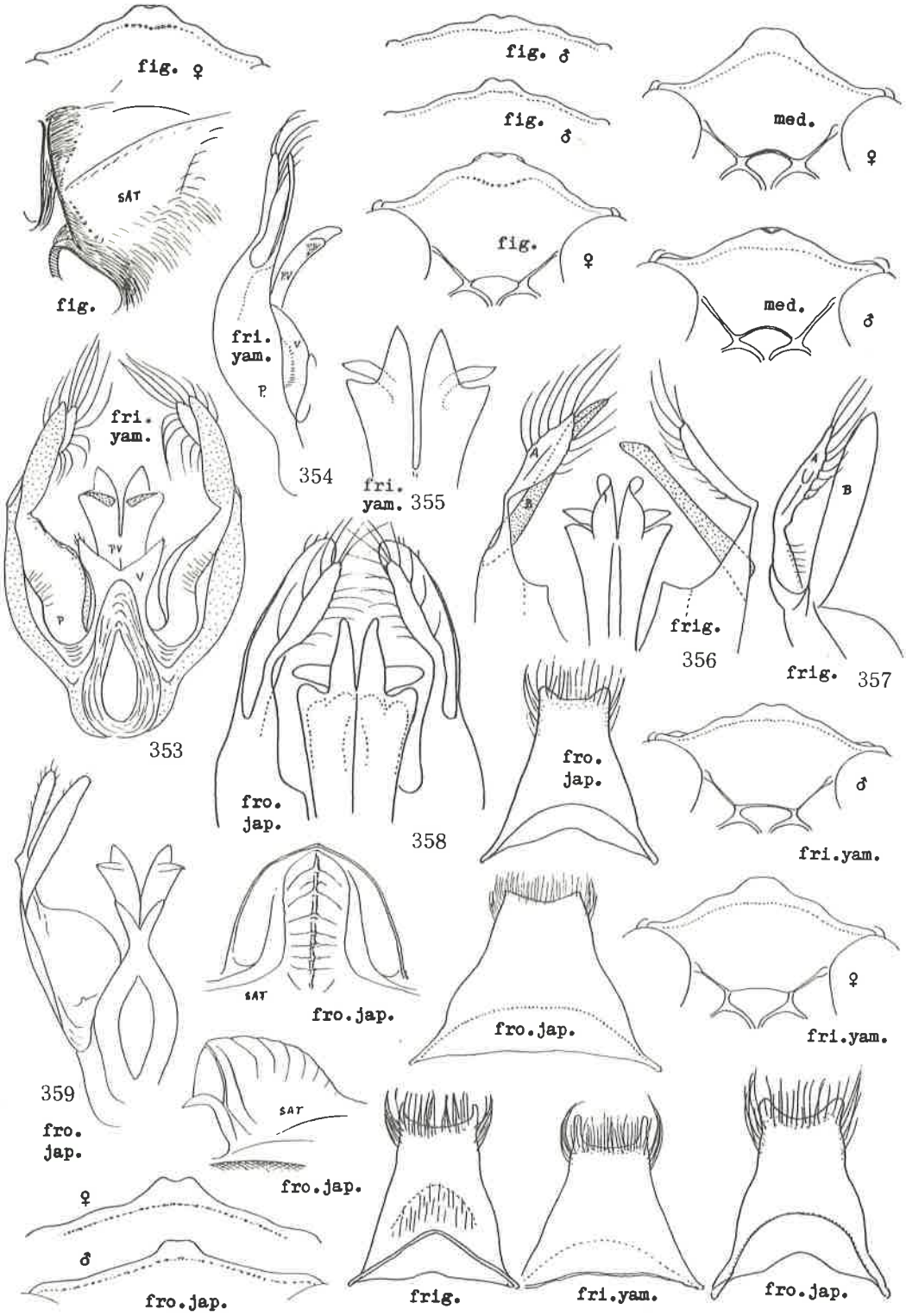


Figs. 344-346 and others. Group of malaisei Gussakovskij

SAT low broad nasiform, apical margin bordered with a transverse carina, carina reaching ASR, interrupting PAF, medial carina of SAT distinct, frequently extended on to IAA across transverse carina. A3=AW×1.8-2.3 (♂), ×2.0-3.3 (♀), A13=A9·10-12, but sometimes shorter, =A11-12. RC=B, R1 short. 8-12 mm.



Figs, 347-352. Group of figulus Linneus



Figs. 353-359. Group of <u>figulus</u> Linneus

KEY TO THE GROUPS BY THE EXTERNAL OR FEMALE CHARACTERS

The most serious shortening of the present key is the lack of the discriminating method of the three Major Groups.

1. Major Group I

1 Gl clavate, sometimes considerably long, but apical swelling always gradual 2
– Gl flask-shaped, apical swelling rather sudden 14
2 Propodeum without lateral carinae (IODs=3:1, head subcubic, vertex markedly broad, SAT low broad tuberiform, without anterior transverse carina, PAF shallow, ASR short, legs broadly ferruginous, gaster black)(ref. p. 26)
Group of jacobsoni
– Propodeum with lateral carinae 3
3 Mesoscutum distinctly microcoriaceous 4
– Mesoscutum without microsculpture, but sometimes under high magnification feeble microsculpture observed 11
4 Frons with shield-shaped enclosure (enclosure with inner and outer branch carinae, ref. p. 15)
Group of bakeri
– Frons without shield-shaped enclosure 5
5 Head thick, subcubic (HW:HL=100:65 or over) 6
– Head transverse 8
6 Gl, 2 and 3 each without fovea at apex, PAF deep and broad, but short, not reaching outer side (IODs=2:1, A3=AW×2.5, RC=C, Rl moderately long, area dorsalis enclosed with furrow, ref. p. 15)
Group of krombeini
– At least G2 and 3 each with a fovea at each apex, PAF completely covered with expanded SAT, SAT flat on dorsal side 7
7 Gl without fovea and comparatively short, =Ma×3. Rl markedly long, reaching wing apex (area dorsalis enclosed with furrow, ref. p. 25)
Group of singaporense
– Gl with a fovea at apex and comparatively longer, =Ma×4–5. Rl mocerately long, not reaching wing apex (area dorsalis without lateral furrows)
Group of suumi A
Group of maculipes B

A SAT at apical area smoothly and obliquely inclined to IAA, A3 > A2 (ref. p. 26)
B SAT at apical area transversely edged and thence perpendicularly steeply inclined to IAA and PAF, A3=A2 (ref. p. 28)

8 SAT at apical margin transversely carinate or acutely edged 9
– SAT without transverse carina or edge 10
9 SAT moderately high nasiform, with doubled anterior carinae, one reaching ASR and the other roundly curved backwards, clypeus subtriangularly produced (ref. p. 27)
Group of kambaitium
– SAT low broad nasiform, densely covered with hair, with a single anterior carina, the carina reaching ASR, clypeus broadly rounded at anterior margin (IODs=2:1, ref. p. 17)
Group of curvicorne
10 SAT low broad nasiform, narrowly extended as a round ridge on to IAA, PAF completely covered with SAT (ref. p. 29)
Group of capillatum
— SAT low round tuberiform, not extended on to IAA, not covering PAF, PAF shallow, broad-V-shaped in cross section (A3=AW×2, IODs=10:7, area dorsalis with distinct lateral furrows, RC=C, ref. p. 18)
Group of nodosicorne
11 Frons with shield-shaped enclosure (enclosure without both inward and outward branch carinae, ref. p. 17)
Group of sinuosiscutis
— Frons without shield-shaped enclosure 12
12 ASR roundly highly raised above top of SAT, with a large hollow at base in front (ref. p. 23–24)
Group of appendiculatum
— ASR not so highly raised (SAT low broad tuberiform) 13
13 PAF completely covered with expanded SAT (mesoscutum without microsculpture, finely very closely punctured, ref. p. 28)
Group of maai
— PAF not covered with SAT, shallow, down-curved in cross section (mesoscutum closely covered with punctures, under high magnification feeble microstriae observed on PIS, ref. p. 16)
Group of paulum

14 Propodeum without lateral carinae 15
— Propodeum with lateral carinae 17
15 SAT moderately high thick narrow nasiform, PAF deep, flat-bottomed, oval in cross section (ref. p. 23) Group of fulviventre
— SAT moderately high broad rounded nasiform, PAF deep, flat-bottomed 16
16 SAT medio-anteriorly with an oval, flattened and somewhat concave area (mesoscutum under high magnification feeble microsculpture observed, ASR bi-carinate, with hind carina reflected, ref. p. 19) Group of varipiloides
— SAT medio-anteriorly without flattened area (mesoscutum completely without microsculpture, ASR tri- or quadricarinate, hind carina not reflected, ref. p. 13) Group of prominens
17 Frons on each side of medial furrow very markedly roundly elevated (SAT high nasiform, PAF moderately deep, wide-V-shaped in cross section, bottom line up-curved, mesoscutum without microsculpture, area dorsalis with lateral furrows, IODs=3:2, ref. p. 21) Group of angoramum
— Frons not so highly elevated on each side of medial furrow 18
18 Hair golden, IODs=1:1, SAT low nasiform, with a round flat and hollowed area medio-anteriorly (PAF deep, flat-bottomed, oval in cross section, ref. p.22) Group of concinnum
— Hair silvery, IODs=5:4 or less, SAT without round flat and hollowed area medio-anteriorly 19
19 Mesoscutum under high magnification feeble microsculpture observed (SAT low nasiform, PAF shallow, wide-V-shaped in cross section, bottom line up-curved, IODs=5:4, ref. p. 14) Group of striolatum
— Mesoscutum completely without microsculpture 20
20 SAT low broad rounded nasiform, PAF moderately deep, wide-V-shaped in cross section, bottom line up-curved (ref. p. 22) Group of yogator
— SAT moderately high nasiform, PAF deep, flat-bottomed, V- or U-shaped in cross section Group of regium A
Group of taiwanum B

A Gl relatively shorter, =Ma×5, area dorsalis with lateral furrow (IODs=4:3, ref. p. 14)

B Gl relatively longer, =Ma×7, area dorsalis without lateral furrows (IODs=5:4, ref. p. 20)

2. Major Group II

1 Gl clavate, sometimes considerably long, but not more than as long as G2+3, with apical swelling always gradual 2
- Gl flask-shaped, apical swelling rather sudden 19
2 Frons with shield-shaped enclosure, sometimes enclosure partly incomplete.. 3
- Frons without shield-shaped enclosure 5
3 Frontal enclosure with distinct inward branch carinae (lower area of enclosure distinctly wider than upper area) Group of tainanense
- Frontal enclosure without inward branch carinae 4
4 Frontal enclosure with upper area subequal in length to lower area on the median line ..... Group of melanurum
- Frontal enclosure with upper area distinctly longer than lower area Group of scutatum
Group of scutifrons
Group of abdidum

5 G2 slender and long, approximately =AW×2 6
- G2 much robuster 11
6 Gl, 2, 3 or G2, 3 each with a fovea at apex 7
- Gl, 2, 3 without fovea 9
7 Gl without fovea (ref. p. 44) Group of bifoveatum
- Gl with a fovea 8
8 Frons coarsely punctured, without microsculpture (legs broadly black except whitish spurs, propodeum with lateral carinae, mesoscutum punctured without microsculpture, SAT low tuberiform, margined anteriorly with transverse carina, propodeal sternite absent, ref. p. 41) Group of buddha
- Frons microcoriaceous (legs broadly yellow, propodeum with lateral carinae, mesoscutum microcoriaceous, SAT low tuberiform, without anterior transverse

carina, propodeal sternite present, ref. p. 43) Group of flavipes

9 IODs=10:8 (♀), CV1=CV2×2 (G1=AW×6, propodeum with lateral carinae, area dorsalis enclosed with furrow, mesoscutum shining, SAT low broad nasiform, covering PAF, ref. p. 31) Group of mediator

– IODs smaller, CV1 relatively much longer 10

10 IODs=3:1, G2=AW×3 (G1=AW×4–5, propodeum with lateral carinae, area dorsalis with lateral furrows, mesoscutum without microsculpture, SAT short broad tuberiform, PAF shallow, down-curved in cross section, A3=AW×4 in ♀, ref. p. 42) Group of kuchingense

— IODs=2:1, G2=AW×2 (ref. p. 34) Group of testaceicorne

11 Hair silvery 12

— Hair golden ..... none

12 Propodeum with lateral carinae 13

— Propodeum without lateral carinae ..... none

13 Mesoscutum distinctly microcoriaceous or very finely and closely punctured with surface mat 14

— Mesoscutum smooth and shining, but under high magnification feeble microsculpture can be seen, G1 very short, =AW×2, subsessile (SAT moderately high nasiform, anteriorly with transverse carina interruping PAF, A3=AW×2 (♀), IODs ±5:3 (♀), ref. p. 34) Group of crassiventre

— Mesoscutum without microsculpture, shining and simply punctured ..... none

14 IODs=2:1 or less 15

— IODs=3:2, 4:3 or over 17

15 SAT without anterior transverse carina (gaster except G1 broadly ferruginous legs with broad yellowish areas, ref. p. 35) Group of vechti

— SAT with anterior transverse carina, carina connected with ASR, interrupting PAF 16

16 SAT on each side of apical end, just behind transverse carina very deeply excavated or hollowed, ref. p. 31 Group of nilgiriense

— SAT more or less excavated at the place, but not so deeply hollowed out Group of clavicerum A
Group of koikense B
Group of pacificum C
Group of varipes D

A SAT moderately high or high, broad or narrow nasiform, with more or less broad dorsal surface, with steep lateral inclinations, disc of clypeus distincly roundly swollen, trochanters largely or wholly black, ref. p. 46.

B SAT high narrow nasiform, with lateral inclination steep, disc of clypeus roundly tectate, trochaters black, ref. p. 33.

C SAT moderately high nasiform, with sides oblique, disc of clypeus roundly tectate, trochanters black, ref. p. 39–40.

D SAT moderately high nasiform, with sides oblique, disc of clypeus roundly tectate, trochanters yellowish, ref. p. 36.

17 Mandible with a short tooth on inner margin, male antenna 12-jointed, SAT is only the smooth extension of frons, not particularly raised, only gently inclined laterally, without transverse carina anteriorly and without median carina, ref. p. 32 Group of pygmaeum

— Mandible without distinct tooth on inner margin, male antenna 13-jointed, SAT raised and medianly carinate 18

18 SAT with anterior transverse carina (area dorsalis without lateral furrows, ref. p. 30) Group of chosenense

— SAT without transverse carina anteriorly (area dorsalis with lateral furrows, ref. p. 45) Group of planifrons

19 Propodeum without lateral carinae (mesoscutum without microsculpture) 20

— Propodeum with lateral carinae 21

20 SAT low broad tuberiform, at medio-apical part with a smooth and flattened area, PAF shallow, down-curved in cross section (area dorsalis without lateral furrows, ref. p. 32) Group of laosianum

— SAT moderately high tuberiform, anteriorly with transverse carina, interrupting PAF (area dorsalis enclosed with weak furrow) Group of catalactae

21 Mesoscutum microcoriaceous (PAF down-curved in cross section, shallow and broad, mesoscutum medianly longitudinally distinctly furrowed, IODs=10:9, area dorsalis with lateral furrows) 22

— Mesoscutum without microsculpture, shining 23

22 SAT moderately high short nasiform, carrying transverse rugosed carina medio-anteriorly (carina sometimes weak, antennal joints relatively somewhat longer,

ref. p. 37) Group of imayoshii

— SAT low tuberiform, without medio-anterior transverse carina (antennal joints relatively shorter, ref. p. 45) Group of ambiguum

23 SAT low nasiform, with a round flat area medio-anteriorly, PAF deep, flat-bottomed, oval in cross section (IODs=3:2, area dorsalis enclosed with furrow, legs broadly, gaster wholly ferruginous to pale yellow, ref. p. 41) Group of rufigaster

— SAT moderately high nasiform, PAF shallow, wide-U-shaped in cross section (IODs=3:1, area dorsalis not enclosed with furrow, legs broadly ferruginous, gaster black, only medianly reddish brown, ref. p. 33) Group of lumpurense

3. Major Group III

It must particularly be mentioned that the members of some of the genitalial groups of the present Major Group are considerably different from each other and, therefore, they are separated into several groups in the present key and appear at some places under the same genitalial group name.

1 Gl clavate (propodeum with lateral carinae) 2
- Gl flask-shaped 7
2 Mesoscutum without microsculpture 3
- Mesoscutum microcoriaceous, often very feebly so 4
3 Mesoscutum dull and opaque (rarely with very feeble microstriae on PIS), PAF deep, flat-bottomed, U-shaped in cross section, IODs=3:2 (♀) (ref. p. 73) Group of sapporoense

- Mesoscutum smooth and shining, PAF shallow, wide-V-shaped in cross section, bottom line up-curved, IODs=10:9 (ref. p. 53) Group of antennatum

4 Mesopleuron with pent-roof structure at subalar area, gaster very slender and long, Gl=Ma×7, G2>AW×2 (area dorsalis enclosed with furrow, PAF deep, flat-bottomed, U-shaped in cross section, ref. p. 57) Group of semperi

- Mesopleuron without pent-roof structure 5
5 SAT high narrow nasiform, without anterior transverse carina, PAF deep, flat-bottomed, U-shaped in cross section (microsculpture on mesoscutum weak, ref. p. 49) Group of insulare

- SAT low broad nasiform, anteriorly transversely carinated, carina interrupting PAF (microsculpture on mesoscutum distinct) 6
6 SAT comparatively low, IODs=1:1 (ref. p. 81-82) Group of figulus
- SAT moderately high, IODs=3:2 (ref. p. 72) Group of attenuatum

7 Propodeum without lateral carinae 8
- Propodeum with lateral carinae 11
8 SAT moderately high nasiform, with a round flat and hollowed area medio-anteriorly, hair on head golden-brassy, sometimes silvery (mesoscutum smooth and shining, but sometimes with feeble microsculpture, propodeum sometimes with weak lateral carinae, gaster broadly yellowish or ferruginous, ref. p. 59) Group of coloratum

- SAT without a round flat and hollowed area medio-anteriorly (mesoscutum without microsculpture) 9
9 PAF considerably (♀) or very (♂) deep, U-shaped in cross section (sometimes frontal elevations on both sides of medial furrow very marked, ref. p. 75) Group of bicolor

- PAF shallow, wide-V-shaped or down-curved in cross section 10
10 Apical margin of clypeus medianly markedly produced, area dorsalis without lateral furrows (hind Tl more or less dusky, ref. p. 80) Group of eximium

— Apical margin of clypeus medianly not markedly produced, area dorsalis with lateral furrows (hind Tl completely whitish, ref. p. 78) Group of sacinasium

11 Mesoscutum microcoriaceous, sometimes feebly so 12
— Mesoscutum without microsculpture (sometimes under high magnification feeble microsculpture defined) 17
12 Subalar area of mesopleuron with pent-roof structure 13
— Mesopleuron without pent-roof structure 14
13 Hair golden, area dorsalis without lateral furrows, gaster apically reddish yellow, PAF moderately deep, wide-U-shaped in cross section, ref. p. 54) Group of maculiventre

— Hair silvery, area dorsalis enclosed with furrow, gaster black, PAF deep, flat-bottomed, oval in cross section (ref. p. 50-51) Group of apicatum

14 Hair on clypeus golden to brassy, gaster largely or broadly ferruginous 15

— Hair on clypeus silvery, gaster largely or wholly black 16

15 SAT moderately high nasiform, without medio-apical flattened and hollowed area, PAF shallow, wide-V-shaped in cross section (ref. p. 51) Group of varicolor

— SAT similar in form, but always with a round flat and often hollowed area medio-anteriorly, PAF deep, flat-bottomed, U-shaped in cross section (ref. p. 59) Group of coloratum

16 SAT low broad nasiform, PAF shallow, down-curved in cross section, (microsculpture on mesoscutum feeble, under high magnification only observed (IODs= 5:4, ref. p. 63) Group of spangleri

— SAT high nasiform, PAF deep, flat-bottomed, U-shaped in cross section (IODs= 2:1, ref. p. 49) Group of insulare

17 Subalar area of mesopleuron with well-developed pent-roof structure (IODs= 1:1, SAT moderately high nasiform, PAF moderately deep, V-shaped in cross section, bottom line up-curved, ref. p. 50-51) Group of apicatum

— Mesopleuron without pent-roof structure 18

18 SAT with transverse carina anteriorly, carina interrupting PAF (IODs=1:1-5:4) 19

— SAT without transverse carina anteriorly (if acutely edged, it is at verge to PAF only) 25

19 Hair silvery 20

— Hair golden to brassy 23

20 SAT at anterior margin with a x-shaped carina (ASR not broadly expanded anteriorly, bicarinate on top, ref. p. 68) Group of srilankum

— SAT with a simple transverse carina or a shelf 21

21 ASR broadly flatly expanded anteriorly, SAT at apical margin sometimes with a transverse flat shelf or a simple carina, but sometimes without such and inclined smoothly to IAA, PAF shallow, down-curved in cross section (ref. p. 61) Group of formosicola

— ASR not so broad, transversely carinated on top, carina not interrupting PAF, PAF deep, flat-bottomed, U-shaped or oval in cross section 22

22 SAT with a flat, shining and hollowed area medio-anteriorly (ref. p. 62) Group of atricorne

— SAT without a flat, shining and hollowed area medio-anteriorly (ref. p. 68) Group of anamalaiense

23 Area dorsalis with lateral furrows (ref. p. 48) Group of rutilans

— Area dorsalis without lateral furrows 24

24 Collar of pronotum orange yellow (ref. p. 52) Group of luteocollare

— Collar black (ref. p. 51) Group of rufiventre

25 PAF deep, at least fairly deep, always flat-bottomed and U-shaped or oval in cross section 26

— PAF moderately deep or shallow, bottom line up-curved 34

26 IODs=1:1 - 5:4 27

— IODs=3:2 or smaller 31

27 ASR with a distinct hollow on posterior aspect (SAT acutely edged at verge to PAF, ref. p. 55-56) Group of mindanaonis

— ASR without hollow on posterior surface 28

28 Head with three highly raised swellings on vertex and frons (ref. p. 69) Group of trituberculatum

— Head not trituberculate 29

29 Median carina of SAT extended anteriorly to IAA (GSR not raised, ref. p. 77) Group of myitkyinae

— IAA without median carina 30

30 SAT at medio-anterior portion with a round flat and usually broadly foveate area (ref. p. 59) Group of coloratum

— SAT without round flat and foveate area medio-anteriorly (except specific differences no group-valued differences can be seen among the following groups)

Group of orientale ..... (ref. p. 71)
Group of melanocorne ..... (ref. p. 65)
Group of tawitawiense .... (ref. p. 70)
Group of salween ..... (ref. p. 73)
Group of menkei ..... (ref. p. 63)
Group of malaisei ..... (ref. p. 81)

31 ASR raised and truncate on top, forming round flat top, SAT medio-anteriorly produced and obliquely truncate at apical end, forming also a round flat area on top (area dorsalis without lateral furrows, ref. p. 61-62)
Group of kepongianum

— ASR and SAT not as such 32

32 SAT medio-anteriorly with a round flat and hollowed area (hind carina of ASR reflected, IODs=5:3, ref. p. 74) Group of hyperorientale

— SAT without round flat and hollowed area medio-anteriorly 33

33 IODs=3:2 (SAT moderately high tuberiform, medianly distinctly carinate, PAF fairly deep, bottom line nearly flat, U-shaped in cross section, ref. p. 57)
Group of nipponicum

— IODs=2:1 or less Group of errans

A IODs=2:1, SAT moderately high rounded nasiform, ASR not reflected, ref. p. 56 Subgroup of errans

B IODs=3:1, SAT narrow and acute nasiform, hind carina of ASR strongly reflected, ref. p. 56 Subgroup of miniovatum

34 Hair on head golden (IODs=10:8-10) 35

— Hair silvery 36

35 Apical margin of clypeus medianly produced, SAT low broad nasiform, with longitudinal mound that carries median carina, lateral furrows of area dorsalis distinct (PAF moderately deep, V-shaped in cross section, bottom line up-curved, ref. p. 64) Group of auropilosum

— Apical margin of clypeus simply rounded or nearly, SAT without particular median mound, area dorsalis practically without lateral furrows (ref. p. 70)
Group of fulvocollare A
Group of ornatigaster B

A Collar orange yellow (ref. p. 70)

B Collar black (ref. p. 72)

36 PAF gently down-curved or very wide V-shaped (with sinus rounded) in cross section 37

— PAF moderately deep, U-shaped in cross section, but with bottom line up-curved 42

37 ASR broadly expanded anteriorly, largely amber-yellow or translucent brown, surface smooth and shining (IODs=10:8-10, area dorsalis enclosed with furrow) 38

— ASR not so broad, not translucent brown in colour and more or less distinctly sculptured (IODs=10:7.5-9) 39

38 ASR nearly as long as wide, frons broadly flattened, almost without medial furrow (ref. p. 65) Group of membranaceum

— ASR wider than long, with top somewhat tectate, frons with shallow medial furrow (ref. p. 67) Group of vardyi

39 ASR irregularly coarsely rugose (apical margin of clypeus simply rounded, ref. p. 53) Group of giganteum

— ASR transversely striate 40

40 SAT low broad tuberiform, PAF shallow, gently down-curved in cross section (apical margin of clypeus simply rounded, area dorsalis without lateral furrows legs partly white, ref. p. 53) Group of albitarsatum

— SAT more highly raised, nasiform (apical margin of clypeus medianly produced area dorsalis distinctly enclosed with furrow, legs without white colouration, gaster black) 41

41 SAT medio-anteriorly with a round flat area (sternite 8 tridentate at apex, ref. p. 74) Group of viridaricola

— SAT without round flat area medio-anteriorly
Group of formosicola A
Group of takasago B

A Fore tarsus black, IODs=5:4 (ref. p. 61)

B Fore tarsus ferruginous, IODs=4:3 (ref. p. 60)

42 A3=AW×3.3-3.6, IODs=10:7 (clypeus gently rounded out, apical margin weakly waved and medianly distinctly produced and emarginate at apex, ref. p. 57)
Group of amatorium

— A3=AW×2.8, IODs=10:9 (clypeus almost not produced, but in middle narrowly produced, ref. p. 64) Group of sayabouryense

GROUPS OF THE MALE UNKNOWN SPECIES

According to the secondary keys that I have presented above some at least of the species that have been known by the female sex alone can be classified into groups that are made on the basis of the male genitalial characters, if they can be separated into three Major Groups. However, as mentioned earlier repeatedly there is no certain method discovered to assign the female specimens to the three major groups. In my present attempt, therefore, I used the following expedient means:

A male known species to which the female species in investigation is closest in the external or non-sexual characters is searched for. If such is present the species in question is considered to belong to the Major Group to which the compared species belongs. But if not further classification is impossible.

This first step of classification is, however, considered to be not always correct, because there are frequently the instances in which the resemblance of the external characters does not assure the resemblance of the structure of the male genitalial characters. Certainly in some cases there are two similar species present that belong to different Major Groups. In such a case the species in question was placed under the two Major Groups tentatively. Whether the presumation here tried is correct or not will be made clear when the male of the species concerned will be discovered in future.

1. Major Group I

(In the column of the group the name within parenthesis shows the closest but not completely coincident group)

Species (♀)	Group	Species (♀)	Group
bilobatum	?	bituberculatum	angoramum
bucidnon	striolatum	canlaon	?
cheesmanae	jacobsoni	chimbum	angoramum
crassifrons	maculipes	ferrugatum	? (nodosicorne)
ferrugineum	? (curvicorne)	gressitti	singaporense
hollandiae	angoramum	indianum	suumi
iriomotense	singaporense	kaitum	angoramum
kandyianum	? (prominens)	kedah	curvicorne
kitulgalaense	? (Major Group III)	lagunaense	?
lucidipes	?	mafuluense	angoramum
makassarense	? (prominens)	naviforme	?
obiense	?	oriomonis	angoramum
olthofi	angoramum	pagdeni	? (curvicorne)
pahangense	? (curvicorne)	popondettae	angoramum
rohweriellum	striolatum	ryukyuense	regium
sumbanicola	?	taihorinsho	nodosicorne
tengu	angoramum	townesorum	?
triangulum	?	truncatum	truncatum
walshae	?	warisum	angoramum

Results: Group of striolatum 2, Group of jacobsoni 1, Group of maculipes 1, Group of angoramum 10, Group of singaporense 2, Group of suumi 1, Group of curvicorne 1, Group of regium 1, Group of nodosicorne 1, Group of truncatum 1. Unknown groups 17.

2. Major Group II

Species (♀)	Group	Species (♀)	Group
banvaneum	vechti	bidenticulatum	varipes
bishopi	pygmaeum	borneanum	?
choiseulense	kuchingense	collinsi	rufigaster
crassipes	laosianum	culionis	flavipes
darjeeling	varipes	flavofasciatum	? (chosenense)
gampahae	pygmaeum	gressitti*	bifoveatum

kalabakan	? (vechti)	koshunicon	?
longipes	? (testaceicorne)	makiling	flavipes
malaiseiellum	varipes	malayana	varipes
minutum	?	mowchowense	nilgiriense
mulsanum	varipes	nasale	varipes
nathani	vechti	okinawanum	varipes
owrichardsi	kuchingense	palawanum	vechti
pendleburyi	pacificum	pinguiceps	flavipes
pusillum	pacificum	sauteri	varipes
scaposum	pacificum	trochanteratum	pacificum
williamsi	rufigaster		

Results: Group of vechti 3, Group of pygmaeum 2, Group of kuchingense 3, Group of laosianum 1, Group of varipes 8, Group of rufigaster 2, Group of flavipes 3, Group of bifoveatum 1, Group of pacificum 4, unknown 6.

Remarks. Species with asterisk appears also in Major Group I.

3. Major Group III

Species (♀)	Group	Species (♀)	Group
angustum	coloratum	apicum	insulare
atrum	orientale etc.	banoense	? (vardyi)
basilanum	? (insulare)	bellum	rufiventre
benten	insulare	bettotan	? (eximium)
bismarckianum	? (bicolor)	breviclypeatum	amatorium
buehleri	coloratum	bum	orientale etc.
cagrum	coloratum	cameroni	ornatigaster
cavum	? (maculiventre)	chichidzimaense	?
cidicum	?	cimmorum	? (ornatigaster)
cindjun	?	clypeatum	?
concinnum	coloratum	djampangense	ornatigaster
djun	?	eburneipes	amatorium
elegantulum	coloratum	ferox	?
flagellatum	maculiventre	fruticicola	spangleri
gentingense	apicatum	gracilescens	coloratum
guadalense	?	halcon	? (orientale)
kachin	apicatum	kalimantan	coloratum
kandyianum	?	kinabalum	? (spangleri)
konosuense	?	kuncheriae	? (maculiventre)
kunzui	bicolor	kutuense	amatorium
kyotoense	orientale etc.	laevidorsum	coloratum
lamellatum	orientale etc.	langkawiense	nipponicum
laosense	coloratum	licinum	vardyi
lieftincki	eximium	lobatifrons	? (atricorne)
longipilosum	coloratum	malaitae	eximium
martium	? (coloratum)	matheranicum	anamalaiense
mico	coloratum	moluccanum	? (apicatum)
morobense	sacinasium	nigricorne	orientale etc.
nigrifemur	coloratum	novaguineae	eximium
operculum	vardyi	outang	amatorium
paeninsulicola	? (coloratum)	pilosum	? (vardyi)
placidum	? (?Maj. Gr. iii)	pulchellum	maculiventre
pullatum	orientale etc.	rajang	? (coloratum)
rekabum	? (insulare)	ridleyi	membranaceum
samarense	bicolor	sarum	bicolor
sandakanum	maculiventre	sectum	? (amatorium)
sedlaceki	amatorium	sedonense	orientale etc.
selangor	maculiventre	semongoh	? (bicolor)
shanshan	hyperorientale	sibolangitum	errans
smithi	? (coloratum)	speciosum	coloratum
sumatraense	?	sumbanicola	ornatigaster
szechuen	orientale	taros	coloratum

tekuense	maculiventre	terbakarinum	amatorium
tirimen	maculiventre	tjiangsanum	amatorium
tomi	coloratum	townesi	eximium
urbanum	mindanaonis	varipilosum	coloratum
varipunctatum	? (coloratum)	venaticum	? (coloratum)
wauense	sacinasium	wegneri	? (eximium)
yanoi	miniovatum	yoshimotoi	nipponicum

Results: Group of coloratum 16, Group of orientale etc. 8, Group of insulare 2, Group of maculiventre 6, Group of apicatum 2, Group of bicolor 3, Group of eximium 4, Group of sacinasium 2, Group of vardyi 2, Group of amatorium 7, Group of errans 1, Group of hyperorientale 1, Group of rufiventre 1, Group of ornatigaster 3, Group of spangleri 2, Group of nipponicum 2, Group of anamalaiense 1, Group of membranaceum 1, Group of mindanaonis 1, Group of miniovatum 1, unknown Groups 33.

(Continued from p. 37)

If divided on the basis of this character a complete different grouping is possible.

In the external characters, except for those which are considered specific, no fundamental difference can be discovered between the two subgroups, as exemplified by pacificum and monticola. In the following, therefore, common characters or variation of characters as group of pacificum will be presented:

Head form seen from above uncertain, sometimes transverse (HW:HL=100:50-57), sometimes subquadrate (HW:HL=100:65-68) or intermediate (=100:60). Gl clavate, relative length to maximum width considerably varied, =Max 2-4.5. Propodeum always with lateral carinae, area dorsalis mostly with lateral furrows (exception: parvulum and koreanum), mesoscutum always microcoriaceous. SAT high narrow nasiform, always with transverse carina at apical margin, the carina connected with ASR, interrupting PAF. Apical margin of clypeus more or less produced, fairly strongly varied in form (see the figures given). IODs considerably varied, sometimes in ♀ and ♂ similar (2:1 or 3:1), sometimes in ♀ smaller than in ♂ (2:1 against 5:4 or 4:3, 4:1 against 5:3, 5:2 against 5:3 etc.). A3=AW×1.7-3.3, mostly ×2.5 in ♂, =AW×1.7-3.7, mostly ×3.5 in ♀. A6 in ♂ usually more or less distinctly excavated at base beneath, with exception of rubrocaudatum, sextum, quadriceps, tengmen and okeanskayanum. Relative length of A13 also considerably varied, sometimes =A10-12, sometimes =A9-10-12 or =A9-12 and sometimes =A11-12. RC=B, but sometimes somewhat close to C, but in some species it is completely =C. Rl varied in length, mostly moderately long, but sometimes long and sometimes short. Length 7-13 mm.

This group is an instance of "Similar in genitalial structure, but variable in external characters".

A P P E N D I X

The Distribution Table of the Indo-Australian and East-Asiatic Species

The abbreviations used in the following Table are:

Mdg. Madagascar. But +* shows that it is the species occurring on the Islands of the Indian Ocean, such as the Laccadives, Maldives, Chagos, Mauritius, Abdabras, Seychelles etc.
Ind. N. North Indian Peninsula, including Pakistan, North India, Nepal, Assam and Bengal.
Ind. S. South Indian Peninsula.
Ceyl Ceylon.
I-C. N. North Indo-Chinese Peninsula, including greater part of Burma, North Thailand, Laos, North Viet-Nam.
I-C. S. South Indo-Chinese Peninsula, South Thailand, Southern part of Burma, Cambodia, South Viet-Nam, Malay Peninsula and Singapore.
Sund Is. The Sunda Islands, including Sumatra, Java, the Lesser Sunda Islands till Timor.
East Ind. East Indies, including Borneo, Celebes, the Moluccas and the Islands of Banka Sea and Arafra Sea with Misoöl (Myssol).
N-G. Gr. New Guinea Group, including the Bismarcks, the Solomons and the Islands of the South Pacific excluding those lying north of the equator.
Aust Australia.
S. Chna South China, including Hongkong.
Phil The Philippines.
Form Formosa.
Jap. Japan. But +* indicates the species of the Ryukyus.
Eur. Europe. Only the species that are in the close relationships with those listin the following Table.
Afr. Africa. Ditto.

The specific tribial name with one asterisk in the left hand colomn shows that it is the South American species, while those with two asterisks the North American relatives.

In the Table presence is shown with + and absence is with •, but as to subspecies all marks of " . " are omitted.
The species that are listed together with their subspecies show only the typical form.

Species and ssp.	Mdg.	Ind. N.	Ind. S.	Ceyl	I-C. N.	I-C. S.	Sund Is.	East Ind.	N-G. Gr.	Aust	S. Chna	Phil	Form	East Asia	Jap.	Eur.	Afr.
albispinosum	.	+	+	.	.	.	.	.	.	.	+	.	.	.	.	.	.
albitarsatum	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
a. huonense									+	+							
a. muruanum									+								
amatorium	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
ambiguum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
anamalaiense	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
angoramum	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
angustum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
antennatum	.	.	.	.	+	+	+	.	.	.	.	.	.	+	.	.	.
a. longulum								+									
apicatum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
apicum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
appendiculatum	.	.	.	.	.	+	.	+	.	.	.	+	.	.	.	.	.
ashmeadi	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
atricorne	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.
atrum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
attenuatum	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	+	.
a. kashmirense		+															
auropilosum	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.
bakeri	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
balabacense	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
b. ovatum								+									
banahao	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
banoense	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
banvaneum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
basilanense	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
basilanum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
bellum	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
benten	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
betremi	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
bettotan	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
bibou	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
bicolor	.	+	+	.	.	+	+	+	.	.	.	+	.	.	.	.	.
b. ceylonicum				+													
bidenticulatum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
bifoveatum	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
bilobatum	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
biputeolum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
bishopi	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
bismarckianum	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
bituberculatum	.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.
b. biroi									+								
b. mysolense								+									
borneanum	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
breviclypeatum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
bucidnon	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
buddha	.	+	+	+	+	+	.	.	.	.	.	+	.	.	.	.	.
buehleri	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
bum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
burmaense	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
cagrum	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
cameroni	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
canlaon	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
capillatum	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
catalactae	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
c. madecassum	+																
cavum	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
cheesmanae	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
chichidzimaense	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+*	.	.
chimbum	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
chingi	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
choiseulense	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
chosenense	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
cidioum	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
cimmolum	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
cindjun	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
clavicerum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
c. exiguum															+		
c. gussakovskiji														+			
c. suifuense											+						

Species and ssp.	Mdg.	Ind. N.	Ind. S.	Ceyl	I-C. N.	I-C. S.	Sund Is.	East Ind.	N-G. Gr.	Aust	S. Chna	Phil	Form	East Asia	Jap.	Eur.	Afr.
clypeatum	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
collinsi	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
coloratum	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
compluvium	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
c. mindoronis												+					
c. panayanum												+					
c. samarianum					+							+					.
concinnum	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.
crassifrons	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
crassipes	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
crassiventre	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
cucurbitinum	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
culionum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
curbicorne	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
curbum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
daicoocum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
darjeeling	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
dentatum	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
djiampangense	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
djun	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
eburneipes	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
elegantulum	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
errans*	+*	+	+	+	+	+	+	+	.	.	+	+	+	.	+	.	+
eximium	.	.	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.
e. gracillimum								+	+								
e. obicola								+		.	.						
fenchihuense	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
ferox	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
ferrugatum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
ferrugineum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
figulus	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
f. koma														+			
f. yezo															+		
flagellatum	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
flavipes	.	.	+	+	+	.	.	+	+	+	.	.	.	.	.	.	.
f. breve												+					
flavofasciatum	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
fletcheri	.	+	.	.	+	+	+	.	.	.	.	.	+	.	.	.	.
f. baguionis												+					
formosicola	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
f. amamiense															+*		
f. inornatum														+	+*		
fortius	.	.	.	.	.	.	+	.	.	.	.	+	.	.	.	.	.
f. mulu								+									
frigidum**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
f. cornutum														+			
f. yamatonis															+		
frontlcorne	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.		.
f. assamense		+															
f. brevicorne		+															
f. burmanicum					+												
f. japonense															+		
f. obliquum													+				
f. shirozui													+				
f. seurense														+			
frutlcicola	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
fulviventre	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
fulvocollare	.	+	.	+	+	+	+	+	.	.	.	+	.	.	.	.	.
fumi	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.
funatui	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
gampahae	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
gentingense	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
giganteum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
gracilescens	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
gressitti	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
guadalense	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
halcon	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
himachalense	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
hollandiae	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
hollisi	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.

Species and ssp.	Mdg.	Ind. N.	Ind. S.	Ceyl	I-C. N.	I-C. S.	Sund Is.	East Ind.	N-G. Gr.	Aust	S. Chna	Phil	Form	East Asia	Jap.	Eur.	Afr.
hova	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+
hyperorientale	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
imayoshii	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
indianum	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
insulare	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
i. rufomaculatum												+					
interruptum	.	.	+	+	+	+	+	+	.	.	.	.	.	.	.	.	.
iriomotense	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+*	.	.
jacobsoni	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
javanense	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.
javanicum	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
kachin	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
kaitum	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
k. umboiense									+								
kalabakan	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
kalilicum	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
kalimantan	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.
kambaitium	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
kandyianum	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
kankauense	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
kansitakum	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
karimui	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
kedah	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
kepongianum	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
k. miserum								+									
khasiae	.	+	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.
kinabalum	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
kitulgalaense	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
kodamanum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
koikense	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
kokodaense	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
kolambuganum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
konosuense	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
koreanum	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
koshnicon	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
krombeini	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
kuchingense	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
kuncheriai	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
kutuense	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
kunzui	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
kyotoense	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
lae	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
l. baiyarum									+								
laeviceps	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
laevidorsum	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
lagunaense	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
lamellatum	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
langkawiense	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
laosense	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
laosianum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
licimum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
lieftincki	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
lobatifrons	.	.	.	.	+	.	.	.	.	.	.	+	+	.	.	.	.
longicorne	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
longipes	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
longipilosum	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
longiscutis	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
lucidipes	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
lumpurense	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.
luteocollare	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
luzonense	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
l. nigrum												+					
maai	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
maculipes	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
maculiventre	.	.	.	.	+	+	+	+	.	.	.	.	.	.	.	.	.
m. sayabouryicum					+												
mafuluense	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
makassarense	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
makiling	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
malaisei	.	.	.	.	+	.	.	.	.	.	.	.	.	+	+	.	.
m. arakanum					+												

Species and ssp.	Mdg.	Ind. N.	Ind. S.	Ceyl	I-C. N.	I-C. S.	Sund Is.	East Ind.	N-G. Gr.	Aust	S. Chna	Phil	Form	East Asia	Jap.	Eur.	Afr.
malaisellum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
malaitae	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
malayanum	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
mandibulatum	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
martium	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
matheranicum	.	+	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
mediator	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
medipolitum	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
medium	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
melanocorne	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
melanulum	+*	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
membranaceum	.	.	.	+		+	+	+	.	.	.	.	.	.	.	.	.
menkei	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
mico	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
mindanaonis	.	.	.	.	.	.	.	.	+	+	+	+	.	.	.	.	.
m. bakerianum						+											
miniovatum	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
minutum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
moluccanum	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
monticola	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
morobense	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
mowohowense	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
mulusanum	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
myitkyinae	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
nambui	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
nasale	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
nathani	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
naviforme	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
nesianum	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
ngum	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.
nigricorne	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
nigrifemur	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
nigripes	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
nilgiriense	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
n. shan					+												
nipponicum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
n. puliense	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
nishidai	.	.	+	.	+	.	.	.	.	.	.	.	.	.	.	.	.
nitidum*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
n. mooreaense									+								
nodosicorne	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
novaguineae	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
obiense	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
okeanskayanum	.	.	.	.	.	.	.	.	.	.	.	.	.	+*	.	.	.
okinawanum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+*	.	.
olthofi	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
operculum	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
orientale	.	+	.	.	+	+	+	.	.	.	.	.	.	.	.	.	.
o. ardjuno							+										
o. gedeh							+										
o. keralae			+														
oriomonis	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
ornatigaster	.	.	.	.	.	+	+	+	.	.	.	.	.	.	.	.	.
outang	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
owrichardsi	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
paeninsulicola	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
pacificum	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.
pagdeni	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
pahangense	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
palawanum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
panitianum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
papuanum	.	.	.	.	.	.	.	.	+	+	.	+	.	.	.	.	.
parvulum	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
paulum	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
pendleburyi	.	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
pensylvanicum**	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
petiolatum	+*	+	+	.	+	+	+	+	.	.	+	+	+	+	+	.	.
petioloides	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
p. isigakiense	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+*	.	.
pileatum	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
pilosum	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.

Species and ssp.	Mdg.	Ind. N.	Ind. S.	Ceyl	I-C. N.	I-C. S.	Sund Is.	East Ind.	N-G. Gr.	Aust	S. Chna	Phil	Form	East Asia	Jap.	Eur.	Afr.
pinguiceps	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
placidum Sm.	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.
planifrons	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
popondettae	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
p. woodlarkense	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
prominens	.	.	+	.	+	+	+	+	.	.	.	.	.	.	.	.	.
propinquum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
providum	.	.	.	.	.	.	.	+	+	.	.	.	.	.	.	.	.
pulchellum	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
pullatum	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
punctatissimum	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
punjabense	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
pusillum	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
pygmaeum	.	+	+	+	+	+	.	.	.	.	.	.	.	.	.	.	.
quadriceps	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
rajang	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
regium	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.
r. hatogayuum															+		
rekabum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
ridleyi	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
rohweriellum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
rubrocaudatum	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.
rufigaster	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
r. cavatum								+									
rufiventre	.	.	.	.	.	+	+	+	.	.	.	+	.	.	.	.	.
r. sutteri							+										
rutilans	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
ryukyuense	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+*	.	.
sacinasium	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
salween	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
samarense	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
sandakanum	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
sapporoense	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.
sarum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
sauteri	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
sayabouryense	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
scaposum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
schmiedeknechti	.	+	+	+	+	+	+	+	.	.	+	+	+	+	+*	?	?
s. connexum									+	+							
scutatum	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.
s. nursei		+															
scutifrons	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
s. aldabranum	+*																
s. mauritinum	+*																
s. seychellense	+*																
sectum	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
sedlaceki	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
sedonense	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
selangor	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
semicompluvium	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
semongoh	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
semperi	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
sextum	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
seyrigi	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
shakha	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.
shanshan	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
shimoyamai	.	.	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.
sibolangitum	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
sibuyaense	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
silvicola	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
simile	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
singaporense	.	.	.	.	.	+	.	+	.	.	.	.	.	.	.	.	.
s. surigaonis												+					
singator	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
sinuosiscutis	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
smithi	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
solomonense	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
spangleri	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
speciosum	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
srilankum	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
straatmani	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.

Species a d ssp.	Mdg.	Ind. N.	Ind. S.	Ceyl	I-C. N.	I-C. S.	Sund Is.	East Ind.	N-G. Gr.	Aust	S. Chna	Phil	Form	East Asia	Jap.	Eur.	Afr.
striolatum	.	.	.	.	+	+	+	+	.	.	.	+	.	.	.	.	.
suifuense	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
sumatraense	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
s. borneonis								+									
sumbanicola	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
sumbanum	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
suumi	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
szechuen	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.
tadaonis	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
tainanense	.	.	.	.	.	+	+	+	.	.	.	.	+	.	.	.	.
taiwanum	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
takasago	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
t. hongkongense											+						
t. kumaso															+*		
taros	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
tawitawiense	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
tekuense	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
tengmen	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
tengu	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
terbakarinum	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
testaceicorne	.	+	+	+	.	.	.	.	.	.	.	.	.	.	.	.	.
thaianum	.	.	+	+	+	+	+	+	.	.	.	.	.	+	.	.	.
t. ambonense								+									
t. borneoense								+									
t. dubiosum															+*		
t. philippinicum												+					
tirimen	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
tjiangkoedang	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
tjiangsanum	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
tomi	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.
townesi	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
townesorum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
triangulum	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.
trituberculatum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
trochanteratum	.	+	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
truncatum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
undatum	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
urbanii	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
vardyi	.	+	+	.	.	+	+	.	.	.	.	.	.	.	.	.	.
varicolor	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
varipes	.	.	.	.	.	.	.	.	.	.	.	.	.	+	+	.	.
v. nasutum														+			
varipiloides	.	.	.	.	.	.	.	+	.	.	.	+	.	.	.	.	.
varipilosum	.	.	.	.	.	+	+	+	.	.	.	+	.	.	.	.	.
varipunctatum	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
v. kiashi												+					
vechti	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
venustum	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
venaticum	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
vicinum	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
vientianense	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.	.	.
viridaricola	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
wallacei	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
walshae	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.	.
warisum	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
wauense	.	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.
wegneri	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
williamsi	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.	.
yanoi	.	.	.	.	.	.	.	+	.	.	.	.	.	.	.	.	.
yebissum	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
yogator	.	+	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
yoshimotoi	.	.	.	.	.	.	.	.	.	.	.	.	+	.	.	.	.
yumi	.	.	.	.	+	+	.	.	.	.	.	.	.	.	.	.	.
Total number		30	28	24	72	74	47	76	43	7	11	64	25	19	29		

P O S T S C R I P T U M

(1) The form of the shoulder of the penis valve in Major Group III shows the developmental degrees of the organs, namely, the roundly curved down shoulder is primitive, close to "without shoulder", while the roundly raised shoulder is most advanced. So far observed the character is constant to the species. Especially as to the advanced form it is confirmed with rich material from Japan.

However, in some species having the shoulder at some intermediate state of development a considerable variation is sometimes observed.

A specimen of T. albispinosum from Is. of Hongkong shows the shoulder broadly rounded at the corner, with its apical margin not raised, but nearly horizontal (Fig. 216, p. 55). While in the same species, in a specimen from Laos (Fig. 407, p. 56) and a specimen from South India (Fig. 408, p. 56) the shoulder is distinctly roundly raised. Whether the variation is the local one or not could not be confirmed because of the insufficient material.

Although it seems to me that the case is exceptional, the fact is worthy of special notice, because it throws a doubt upon the treatment of the Submajor Groups in Major Group III.

(2) During the course of reinvestigation of genitalial characters of the mindanao-group the following alteration of the taxonomic status is considered proper:

T. mindanaonis fortius Tsuneki ⟶ T. fortius Tsuneki

This is based on the difference in the structure of the apical part of the paramere in both forms. See Figs. 212-215 in mindanaonis and Figs. 217-218 in fortius on p. 55.

T. mindanaonis mulu Tsuneki ⟶ T. fortius mulu Tsuneki

(3) New synonym:

T. taihorinsho Tsuneki ⟶ T. fletcheri Turner.

INDEX OF GROUP NAMES

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