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STUDIES ON THE FORMOSAN SPHECIDAE (V)
THE SUBFAMILY CRABRONINAE (HYMENOPTERA)
WITH A KEY TO THE SPECIES OF CRABRONINI OCCURRING IN
FORMOSA AND THE RYUKYUS

(With X Plates)

BY K. TSUNEKI

SEPTEMBER 30, 1968

STUDIES ON THE FORMOSAN SPHECIDAE (V)
THE SUBFAMILY CRABRONINAE (HYMENOPTERA)
WITH A KEY TO THE SPECIES OF CRABRONINI OCCURRING IN
FORMOSA AND THE RYUKYUS

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The present paper deals with 25 species of Crabronini and 3 species of Oxybelini, including one new genus (*Leclercqia*) of Crabronini and two new subgenera of *Crossocerus* (*Apoides* and *Alicrabro*). The new species and subspecies involved are:

Ectemnius (*Clytochrysus*) *nigrifrons taiwanus*, *Ectemnius* (*Cameronitus*) *alishanus*, *Crossocerus* (*Apoides*) *alticola*, *Crossocerus* (*Alicrabro*) *rufiventris*, *Crossocerus* (*Ablepharipus*) *tsuifengensis*, *Crossocerus* (*Ablepharipus*) *taiwanus*, *Crossocerus* (*Coelocrabro*) *nitidicorpus*, *Crossocerus* (*Coelocrabro*) *tanoi*, *Leclercqia formosana*, *Dasyproctus formosanus*, *Rhopalum* (*Latrorhopalum*) *erraticum*, *Rhopalum* (*Latrorhopalum*) *taipingshanum*, *Rhopalum* (*Latrorhopalum*) *changi*, *Rhopalum* (*Calceorhopalum*) *spinicollum* and *Oxybelus nipponicus formosus*.

While, other species dealt with in the present paper are:

Ectemnius (*Metacrabro*) *chrysites*, *Ectemnius* (*Hypocrabro*) *orius cetonicus*, *Ectemnius* (*Hypocrabro*) *schlettereri sakaguchii*, *Crossocerus* (*Crossocerus*) *takasago*, *Piyuma prosopoides iwatai*, *Entomognathus* (*Koxinga*) *siraiya*, *Dasyproctus buddha*, *Dasyproctus ceylonicus*, *Rhopalum* (*Latrorhopalum*) *shirozui*, *Rhopalum* (*Calceorhopalum*) *formosanum*, *Rhopalum* (*Calceorhopalum*) *bohartorum*, *Oxybelus lamellatus bicolorisquama* and *Oxybelus lewisi*.

During the course of this study I received some interesting specimens of Crabronini from Mr. B. S. Chang, Kuangyin, Taiwan, and Dr. T. Shirôzu, Kyushu University, which were collected by each of them at the places where I did not visit in 1966. These specimens including new species are also recorded in the present paper. To the two kind colleagues above mentioned I express here my heartiest thanks.

I. Tribe CRABRONINI

1. *Ectemnius* (*Metacrabro*) *chrysites* (Kohl, 1892)

- Crabro chrysites* Kohl, Ann. k. k. naturh. Hofmus. Wien, 6 (3): 197, 1892 (♀, Sikkim).
Crabro auricornus Bingham, Faun. Brit. Ind., Hym., I: 327, 1897 (♀, Assam); —: Turner, Ann. Mag. Nat. Hist., (8), 10: 376; 1912; —: Leclercq, Bull. Inst. R. Sci. Nat. Belg., 25 (23): 10, 1950.
Crabro khasianus Cameron, Ann. Mag. Nat. Hist., (7), 10: 61, 1902 (Assam).
Crabro (*Crabro*) *chrysites*: Kohl, Ann. k. k. naturh. Hofmus. Wien, 29: 47, 1915 (♀♂, Sikkim, Formosa).
Crabro (s. str.) *chrysites*: Gussakovskij, Ark. Zool., 24 A, 10: 15, 1932 (Ussuri).
Crabro chrysites: Iwata, Trans. Kansai Ent. Soc., 4: 8, 1933 (Korea).
Crabro (*Crabro*) *chrysites*: Yasumatsu, Mushi, 14 (2): 87, 1942 (Amami Is., the Ryukyus).
Ectemnius (*Metacrabro*) *chrysites*: Leclercq, Monogr. Crabro, p. 288, 1954; Bull. Ann. Soc. R. Ent. Belg., 94 (3-4): 115, 1958 (keyed).

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Ectemnius (Metacrabro) chrysites: Tsuneki, Life Study (Fukui), 6 (1): 7, 1962 (Amami Is.).

Specimens collected: 5 ♀♀ 4 ♂♂, Nantou Pref. (Penpuchi), 13. VII., 26-30. VIII. 1966; 1 ♂, Chiai Pref (Chuchi), 21. VII. 1966, K. Tsuneki leg.

Remarks. As compared with the original description the legs of the examined specimens are more broadly ferruginous brown: Greater part of trochanters and upper half and posterior aspect of all femora and inside of all tibiae more or less, especially broadly so on hind tibia. In three out of five females the abdominal band on tergite 2 is medianly interrupted. The bands on tergites 3 and 4 in females and those on tergites 2-4 in males are always interrupted in the middle.

Distribution: India (Northern highland), Formosa, the Ryukyus, Korea and the Ussuri Region.

2. *Ectemnius (Clytochrysus) nigrifrons taiwanus* subsp. nov.

(Pl. I, Figs. 1-5)

Ectemnius (Clytochrysus) nigrifrons: Tsuneki, Etizenia, 15: 8, 1966 (♀, Formosa).

The slight differences in characters from the typical race shown by the female specimen which were ignored as mere intra-specific variations at the time of my first record of the species from Formosa are now considered to be subspecific by the new examination of the male specimen below described.

The new subspecies appears to be more or less intermediate between *nigrifrons* and *cavifrons* in many characters, especially in the structure of the clypeus (♀♂) and antenna (♂), but rather closer to *nigrifrons*. It seems better to place the specimens as a subspecies under *nigrifrons* than to deal with them as distinct.

♂. In maculation of antennae, pronotum and abdomen very similar to both the species above compared. Scutellum black, postscutellum wholly yellow (as in some specimens of the two species), abdominal tergite 1 carries two maculae (ditto); legs with femora generally lighter than in *nigrifrons*, rather close to *cavifrons*, but the tibiae darker than in the latter and rather close to the former. Fore femur ferruginous, beneath yellow, with lateral margins of underside irregularly black; mid femora with upper side ferruginous, adorned with yellow stripe in middle and apical half beneath yellow; hind femora on apical half above ferruginous, with yellow touch in middle; fore tibia with inside and beneath ferruginous, above narrowly yellow and posterior aspect black; mid tibia beneath broadly ferruginous, with median edge black and basal half above yellow; hind tibia black, at base above narrowly yellow. Front tarsus from apex of metatarsus to joint 4 yellow, lateral margins variegated with ferruginous and black, apical joint ferruginous; mid tarsus black, beneath ferruginous. Tibial spurs in fore legs black, in hind legs ferruginous.

Head from above with temples straightly convergent posteriorly, only on apical third rounded (in both species compared roundly convergent), with surface contour rather close to *nigrifrons* (upper frons not depressed as in *cavifrons* and the surface not so shining), but with upper frons much more faintly furrowed than in *nigrifrons* and the punctures closer and finer. Clypeus: Pl. I, Fig. 1, rather similar to that of *nigrifrons*. Antenna (Pl. I, Figs. 2, 3 and 4) comparatively thicker and shorter than in both species, joint 3 intermediate in structure, but rather closer to *nigrifrons*. Collar of pronotum with antero-lateral vertical carinae stronger than in *nigrifrons*, but less strong than in *cavifrons*; scutellum appears more highly raised than in both species; on mesopleuron precoxal ridge more strongly produced than in both. Structure of propodeum rather similar to that of *nigrifrons*, especially in that posterior aspect more distinctly angulated on both

sides. Mid tibia similarly crooked and dilated, but generally slenderer than in both, the following metatarsus also similarly structured; hind tarsus much thicker.

♀. Black, yellow are: Mandibles at base externally and on upper half, antennal joint 1, medianly widely interrupted band on collar of pronotum, a narrow band on postscutellum, a transverse macula on each side of abdominal tergites 1-5. Legs wholly black. Ferruginous: Apical half of flagellum beneath, ligula of mouth part, tegulae posteriorly and hind tibial spurs. Clypeus: Pl. I, Fig. 5, rather intermediate between both species compared, but rather closer to *nigrifrons*, upper frons similar to *nigrifrons* in the state of depression, but punctures on this area and vertex finer and closer, with surface less shining. Precoxal ridge of mesopleuron more highly raised, seen from above dentiform; structure of propodeum on posterior aspect as in ♂, similar to *nigrifrons*.

Holotype: ♂, Chiai Pref. (Mt. Ali, 2400 m), 27. VII. 1966, T. Tano leg.

Paratype: 1 ♀, Nantou Pref. (Sung kang, 2400 m), 31. V. 1965, T. Shirôzu leg. (Coll. Kyushu Univ.).

3. *Ectemnius (Hypocrabro) schlettereri sakaguchii* (Matumura et Uchida, 1926)

Ectemnius (Hypocrabro) schlettereri sakaguchii: Tsuneki, Etizenia, 15: 7, 1966 (with references).

Specimens collected: 3 ♀♀ 1 ♂, Nantou Pref. (Penpuchi), 27-29. VIII. K. Tsuneki leg.; 2 ♀♀, Chiai Pref. 22. VII. 1966, K. Tsuneki leg.; 3 ♂♂, Ilan Pref. (Tsukeng), 19-20. VIII. 1966, K. Tsuneki et T. Tano leg.

Remarks. The Formosan specimens are the brightest coloured specimens of this species, more brightly coloured than that described as bright by Kohl (1915) and more brightly so than those described by Leclercq (1963, p. 32) and by myself (1966, p. 8):

In ♀ yellow: Antennal joints 1 and 2 wholly, pronotum, humeral angles, axillae, scutellum and postscutellum both wholly, a large macula on anterior area of mesopleuron, frequently occupying whole the area, two large spots on tergite 2, a transverse macula on each side of tergite 3, a band on tergites 4 and 5; legs from apical half of femur to tarsal joint 2 or 3, except small inner macula on tibia. In ♂, similar, but macula on mesopleuron smaller, scutellum and postscutellum with apical marginal area black and legs with yellow maculae somewhat less developed.

Distribution: The Ryukyus and Formosa.

4. *Ectemnius (Cameronitus) orius cetonicus* Leclercq, 1958

Ectemnius (Cameronitus) orius cetonicus Leclercq, Bull. Ann. Soc. R. Ent. Belg., 94 (5-6): 154 (13 ♀♀ 6 ♂♂, Formosa).

? *Ectemnius (Cameronitus) palitans*: Tsuneki, Ins. Matsumurana, 22 (3-4): 98, 1959 (Formosa).

Ectemnius (Cameronitus) orius: Leclercq, Bull. Ann. Soc. R. Ent. Belg., 99 (1): 31, 1963.

Ectemnius (Cameronitus) orius cetonicus: Tsuneki, Etizenia, 15: 8, 1966 (2 ♀♀ 3 ♂♂, Formosa).

Specimens collected: 42 ♀♀ 7 ♂♂: 29 ♀♀ 5 ♂♂, Nantou Pref. (Penpuchi), 12-14, VII, 25-28. VIII. 1966; 1 ♀, Nantou Pref. (Puli), 25. VIII.; 12 ♀♀ 2 ♂♂, Chiai Pref. (Fenchihu), 24, 25. VII. 1966, K. Tsuneki et T. Tano leg.

Remarks. As to the classification of the *palitans*-group of *Cameronitus* opinions were twice published by J. Leclercq (1958, 63). It is obvious that there is no problem regarding the separation of the Japanese *radiatus* Pérez (= *mizuho* m.) from the Formosan species dealt with here, since they are markedly different not only in the punctuation, but also in structure (especially in ♂). However, in so far as the recent explanation of Leclercq goes that concerns mainly the difference in the colour tone and the maculation I can not be free from doubt as to his classification. To my feeling *palitans*, *palitoides*, *paxinus* and *orius* seem to be conspecific.

By the way, the area shown by Leclercq with the term "l'aire epicnemiale" or "epicnenum" is different from the area usually called such by the majority of the Hymenopterologists. It is the area of mesopleuron lying anterior to "anterior oblique suture" (Richards, 1956) of mesopleuron. In the present paper the area is called anterior mesopleuron or anterior episternum of mesopleuron, while the area termed prepectus by Leclercq is shown by the epicnemial area or epicnenum according to the usual use of the term.

In the present subspecies of *orius*, now I call such, the maculae of the thorax and abdomen are always deep orange, the areas: Pronotum, humeral angles, a macula on anterior mesopleuron, scutellum and postscutellum wholly and the lateral marks on tergites 2-4 (♀♂). While the mark on area dorsalis almost always present in ♀ and always lacking in ♂. The small spot or spots on epimeral area, antero-lateral corners of pronotum, and the lateral marks on tergite 5 are variable with individuals, but the last mentioned markings are constantly present in ♂. The variation is as follows:

1. A touch on epimeral area: ♀, in 32/44 present, ♂, in 1/9 present.
2. Marks on antero-lateral corners of mesonotum: ♀, in 17/44 present, of which in 3 on one side only, and in 4 two spots present; ♂, in 2/9 present.
3. Maculae on area dorsalis of propodeum: ♀, in 43/44 present, though markedly varied in development; ♂, always absent. One of the females carries two spots on the posterior aspect.
4. Maculae on tergite 5: ♀, in 21/44 present, though markedly variable in size; ♂, always present.

The developmental degrees of these maculae are, as a rule, without the correlative relationship. Therefore, for example, the specimens having the maculae on the antero-lateral areas of the mesonotum are not always adorned on the 5th abdominal tergite with maculae. The maculae on the tibiae of the legs markedly varied in development, but always present.

This species is comparatively common in Formosa, ranging from the lowland valleys to mountains as high as 1300 m.

Distribution: Formosa. (Typical race in Java, subsp. *bornicus* in Borneo.)

5. *Ectemnius (Cameronitus) alishanus* sp. nov.

(Pl. I, Figs. 6-9)

According to the key of Leclercq (1958) this species comes to a deadlock at No. 7. It has the dorsal area of propodeum subradiately striate and area dorsalis not marked off by the furrow, but at the same time it has the collar of pronotum without transverse carina and the first segment of abdomen twice as long as broad at apex.

♂. Length about 8 mm. Black, yellow: Antennal scape, collar of pronotum, humeral angles, a touch on upper end of prepectus, scutellum, axillae, postscutellum, medianly narrowed band across middle of tergite 2, a large mark composed of two ovale maculae fused together on tergite 5, a macula from dorsal apex to middle beneath of fore and mid femora, outer side broadly of all tibiae. Labrum with its stiff hairs and inside of tibiae ferruginous to brown. Wings hyaline, slightly darkened throughout, more strongly so anteriorly, stigma and veins black. Hairs on sides of lower frons and clypeus silvery, appressed, on vertex black and erected, on thorax and abdomen brownish, on tergites 2-5 except yellow areas short, black and somewhat stiff.

Head from above with temples roundly convergent posteriorly, ocelli in a low triangle, the median slightly smaller, OOD : POD : OCD = 14 : 10 : 14, postocellus relatively 4 in width; vertex gently rounded, simple, no notable contour, frontal furrow almost absent; head in front with antennal sockets in touch with each other and with eyes, clypeus and mandibles: Pl. I, Fig.

6, head in profile with eye subtriangular and temple subrectangular, nearly as wide as eye, occipital carina complete. Antenna with joint 1 more than twice as great in length as minimum interocular distance, without distinct carina (but the lateral margins of outer face more or less angulated), joint 3 approximately twice as long as broad at apex, thence each joint slightly more widened apically and slightly reducing in length till joint 6 which is nearly as long as wide, joints 6-11 subequal in length, ultimate joint slightly longer and normally rounded at apex, joints 3-6 beneath gently roundly swollen out, no excision nor protuberance on any joint. Pronotal collar transversely, roundly raised, comparatively thick, with a small incision on posterior margin in middle, without transverse carina, lateral angles rounded; mesonotum simply rounded, mesopleuron with transverse precoxal carina. Propodeum without enclosed area dorsalis, no transverse carina between dorsal area and posterior inclination, also without lateral carinae, posterior inclination medianly distinctly furrowed, the furrow with the bottom line somewhat broad and glittering. Abdominal segment 1 subpetiolate, twice as long as wide at apex, apical portion nodulous, segment 2 suddenly widened, with dorsal surface flattened (Pl. I, Figs. 7 and 8), subsequent two segments also slightly depressed anteriorly, pygidial area well margined by carina (Pl. I, Fig. 9, seen from apex). Wing venation normal, recurrent vein 1 received by cubital cell 1 at about 3/4 from base. Legs without particular character.

Vertex covered with minute hair points, with intervallic spaces slightly wider than points, and the surface fairly shining, punctures on upper frons larger than those on vertex, distinctly outlined, very close, subreticulate, mesonotum finely rugoso-reticulate, with wide rugose carinae on intervals, mesopleuron sparsely covered with medium-sized punctures, averaged intervals somewhat larger than punctures, surface shining, in some light with aeneous shimmer; metapleuron longitudinally striate and mixed with punctures, sides of propodeum longitudinally, very finely and closely striate, dorsal aspect of propodeum coarsely obliquely striate, on apical portion mixed with fine striae and a few punctures, remaining portions of the segment closely rugoso-punctate. Tergite 1 coarsely striate at base (Pl. I, Fig. 8), rest of the tergite rather sparsely punctured, punctures generally medium-sized, mixing smaller ones, deep, without flattened bottom, tergite 2 basally finely, sparsely punctured, punctures posteriorly finer, turning into minute hair-points, tergites 3 and 4 practically impunctate, tergites 5 and 6 again punctured as on basal area of tergite 2; sternites smooth and polished.

♀. Unknown.

Holotype: ♂, Chiai Pref. (Mt. Ali. at 1600 m), 23. VII. 1966, T. Tano leg. (Coll. Tsuneki).

Crossocerus subgenus *Apoides* subgen. nov.

Type: *Crossocerus (Apoides) alticola* sp. nov.

The new subgenus is erected on the basis of the female. It apparently resembles subgen. *Apocrabro* Pate, differs from it, however, in that the mandible tridentate at apex in females occipital carina and its protuberances (genal teeth) much weaker, pronotum without the lateral carinae except on posterior portion, mesopleuron with precoxal tubercle rather vestigial (first segment of abdomen elongate, subpetiolate as in *Apocrabro*, but pygidial area elongate triangular with apical portion gutterwise excavated, hind tibiae strongly clavate and spined). This subgenus is also close to *Cuphopterus* Morawitz, differs from it, at least in ♀, in that the first segment of abdomen much longer, petiolate and the pygidial area more elongate and gutterwise excavated on apical portion.

6. *Crossocerus (Apoides) alticola* sp. nov.

(Pl. I, Figs. 10-14)

♀. Length about 8.5 mm. Wholly black; mandibles near apex, articulations of antennal joints 1, 2, 3 and of legs, and apical portion of caudal segment ferruginous. Wings hyaline, apically broadly somewhat darkened, especially strongly so on radial cell and its outer area. Hairing normal; clypeus, temples below, mesopleuron below covered with silvery hairs, the hairs on propodeum except dorsal area and broad anterior portion of the sides of the segment grayish white.

Head from above comparatively thick, ratio of width to length in middle 60 : 34, ocelli in a near equilateral triangle, OOD : POD : OCD = 2 : 1 : 3, POD = width of postocellus, frontal furrow distinct, weakly extending posteriorly on to the ocellar region between postocelli; frontal impressions (markings) fairly well defined at the lateral portion of the medial ocellus, elliptic in form, located somewhat oblique and narrowly extending anteriorly along eyes. Head in front with interocular area narrow, with minimum distance somewhat above base of the antennae and approximately a third as long as antennal scape; clypeus: Pl. I, Fig. 10, markedly raised towards apex, mandibles: Ditto. Head in profile with temple as broad as eye, occipital carina not reaching hypostomial carina, suddenly ending, but the apices not produced into a tooth. Antennae with joint 1 fairly sharply edged along antero-lateral line, but not carinated, approximately as long as joints 2-5 combined, joint 2 comparatively large, as long as joint 4, joint 3 thrice as long as broad at apex, joint 7 nearly as long as broad. Collar of pronotum (Pl. I, Fig. 11) with antero-lateral corners somewhat angulated and provided with a small transverse tubercle, medial furrow very narrow and weak, on both its sides the surface more or less raised, a transverse impressed line present in front of the posterior margin. Mesonotum with anterior margin perpendicularly inclined into a transverse furrow between pro- and mesonotums, with the inclined area forming a long lunate smooth posterior bank of the furrow, on disc antero-medial scutal furrow fairly deep, prescutal suture in a short carina which is markedly roundly raised in lateral view, parapsidal sutures rather obsolete, represented by the punctureless lines, posterior margin without crenae; postscutellum highly raised. Mesopleuron markedly distinctly margined anteriorly by the epicnemial carina, anterior oblique furrow coarsely crenate, episternal scrobe not large, precoxal carina short and rather weak, with anterior end not raised into a spine nor tubercle, but gradually disappeared. Area dorsalis not enclosed by the furrow, only on posterior portion vestigial crenate furrow very feebly definable, but the medial furrow distinct, narrow and deep, margined on each edge by a fine carina, the furrow extended to posterior inclination and widened into a large excavation; lateral carinae on posterior inclination located slightly inside of the extreme side, curved up for a short distance, thence as fine weak carina reaching about middle of the inclination. Abdominal segments 1 and 2 : Pl. I, Fig. 12, in lateral view: Fig. 13. Pygidial area: Ditto, Fig. 14, basal portion gently raised and faintly longitudinally carinated, apical portion excavated; mat area of sternite 2 indistinct. Fore coxae with antero-lateral corners acutely pointed, hind tibia strongly clavate and spinose on outer side. Fore wing with accessory cell widely open at apex.

Vertex and upper frons smooth and polished, with very minute punctures very sparsely scattered; pronotum also practically impunctate. Mesonotum finely closely punctured, punctures on central broad region longitudinally more or less rugosely confluent, but not crenate on posterior margin, scuto-scutellar furrow crenate, scutellum finely, more closely, longitudinally rugoso-punctate or striato-punctate, mesopleuron impunctate and polished, only on lower portion finely punc-

tured; metapleuron and broad anterior portion of the propodeal side also polished. Area dorsalis coarsely foveolate at base, disc covered with very fine feeble wrinkles, only on posterior portion smooth, rest of the segment closely clad with fine hair-bearing punctures. Abdomen practically impunctate and polished, apical two tergites only finely sparsely punctured. Hypopygium closely, somewhat coarsely punctured.

♂. Unknowh.

Holotype: ♀, Chiai Pref. (Mt. Ali, about 2400 m), 27. VII. 1966, K. Tsuneki leg.

***Crossocerus* subgenus *Alicrabro* subgen. nov.**

Type: *Crossocerus* (*Alicrabro*) *rufiventris* sp. nov.

Erected on the characters of the female alone. Mandible tridentate at apex, the teeth nearly in a crossed line (Pl. II, Fig. 3), without tooth on inner margin, antennal sockets contiguous with each other and with eyes, frons without transverse carina, but the anterior portion of upper frons on both sides of frontal furrow somewhat roundly swollen out and shining, with the dorsal surface flattened, giving us an impression that the two portions of frons separated from each other by the swelling (Pl. II, Figs. 1 and 2), occipital carina at the end diverted toward middle of the underside of mandibles, not toward buccal carina (Pl. II, Fig. 4); antennal scape ecarinate, pronotum in middle half notched from behind, mesopleuron without precoxal carina nor tubercle, the area anteriorly margined by epicnemial carina; abdomen wholly red, slender, with first segment more than 1.5 times as long as wide at apex, pygidial area triangular, flattened, at base gently raised, distinctly carinate on both sides; section 1 of cubital vein in fore wing equal in length to section 2.

This subgenus apparently close in coloration and many other characters to *Pseudoturneria* (= *Turneriola*) Leclercq, but differs from it in that the mandible tridentate at apex, in the structure of the clypeus and in the character of the occipital carina.

7. *Crossocerus* (*Alicrabro*) *rufiventris* sp. nov.

(Pl. II, Figs. 1-8)

♀. Length 8.3 mm. Head and thorax black, abdomen wholly ferruginous red. Yellow or pale yellow: Antennal scape at base and on outer side, a band on pronotum, humeral angles, base in part of wings (not tegulae), posterior lateral lines of scutellum, postscutellum with its posterior lateral lines, mid and hind coxae at apex, mid and hind trochanters except above, fore tibia externally, mid tibia externally on basal 2/3 and hind tibia at base. Basal half of first abdominal segment semitransparent white. Mandible except peripheral areas dark reddish brown; tegulae, fore tibia in front, rest of mid tibia, all tibial spurs, fore and mid tarsi except apical segment brown, hind tarsi in part brownish. Wings hyaline, slightly clouded throughout, anterior margin of radial cell much darker.

Head seen from above: Pl. II, Fig. 1, comparatively thick, ratio of width to length 60 : 36 OOD : POD : OCD = 9 : 5 : 12, postocellus relatively 5, disposition subequilateral, slightly wider at base, frontal markings not impressed, but defined by the difference of the sculpture, smooth and polished, comparatively large, elongate oval, frontal furrow distinct, the areas on both sides roundly raised. Head seen in front: Pl. II, Fig. 2, clypeus strongly tridentate at apex, mandible: Pl. II, Fig. 3. Head seen in profile with eye slightly wider than temple; head seen from beneath: Pl. II, Fig. 4 (*vide* occipital carina). Pronotum with antero-lateral corners rounded, with posterior half discoloured, mesonotum medio-anteriorly deeply impressed, median scutal sutures in two glittering lines, slightly divergent posteriorly, reaching about 2/3 of the scutum, interspace of the

lines gently raised (not impressed). Prosternum with a transverse strong raised line near apex, distinctly tuberculate at the ends. Mesopleuron without precoxal carina or tubercle, area dorsalis on propodeum marked off by a feeble impressed line on each side and medianly deeply furrowed (Pl. II, Fig. 5). Abdomen: Ditto, Fig. 6, pygidial area: Fig. 7, wing venation: Fig. 8. Antennae simple, joint 3 from above 1.5 times as long as wide at apex, joint 7 as long as wide.

Vertex microscopically very weakly coriaceous, with scattered, very minute hair-points, the surface not polished, but fairly shining; upper frons on inclining area more distinctly, closely punctured, mesonotum and scutellum finely sparsely punctured, with intervals larger than punctures and very minutely and somewhat more distinctly coriaceous than on vertex, on posterior margin without crenae, scuto-scutellar furrow without crenulae. Mesopleuron very finely, rather sparsely punctured, metapleuron and side of propodeum longitudinally, finely, closely striate, area dorsalis: Pl. II, Fig. 5, rest of propodeum including posterior aspect finely, closely punctured. Abdomen practically impunctate, pygidial area with a few fine punctures scattered, intervals minutely, weakly coriaceous. Clypeus closely covered with appressed silvery pubescence, temples, humeral angles, mesopleuron, mesosternum, dorsal and posterior aspects of propodeum except area dorsalis also closely covered with silvery pile.

♂. Unknown.

Holotype: ♀, Chiai Pref. (Mt. Ali, at about 1700 m), 29. VII. 1966, T. Tano leg.

Remarks. The specimen was captured on a tree at the road side. For the purpose of collecting further specimens we searched about the area for two hours, but we could not find another individual.

8. *Crossocerus (Ablepharipus) tsuifengensis* sp. nov.

(Pl. II, Figs. 9-13)

This species (♂) is very similar in many characters described to *Crossocerus indonesiae* Leclercq (1961, ♀), but, apart from the sexual characters, differs from it in that the clypeus with medio-apical produced area much narrower, the pronotum medianly with a furrow and mesonotum besides the coriaceous microsculpture sparsely punctured, scutellum gently rounded and the yellow maculae less developed. On the other hand, the structure of the legs and the pilosity of ventral side of the thorax of this species is markedly different from *Crossocerus podagricus* to which, it was said, *indonesiae* is very similar.

♂. Length 5.8 mm. Black with the following portions yellow: A narrow line on each side of anterior margin of pronotal collar, humeral angles, fore tibiae in front narrowly, base of hind tibiae and fore and mid metatarsi except base and apex. Apex of mandibles, basal tubercles of antennae, rest of fore and mid tarsi except dark brown apical joints ferruginous; palpi, tagulae, stigma and veins of wings dark brown. Wings hyaline, slightly darkened on apical half, antero-apical area somewhat strongly fuscous.

Sides of lower frons and clypeus covered with silvery pubescence as usual; the following portions covered with long white pubescence: Prosternum, fore coxae and trochanters beneath, fore femora from outside to beneath except apical portion, anterior area of mesopleuron, mesosternum, mid and hind coxae and trochanters beneath and mid femora from outside to beneath except apical portion. The pubescence long, soft, but not so dense as to form hair bundles. Propodeum outside area dorsalis and on posterior aspect, abdominal sternite 1 on medio-apical area and whole of sternite 2-5 covered with somewhat short, fine, whitish pubescence, not dense, but fairly close.

Head from above ratio of width to length in middle 41 : 26, ocelli in an equilateral triangle,

OOD : POD : OCD = 7 : 4 : 7, ocelli comparatively small, with width relatively 3, ocellar region not raised, but median ocellus strongly inclined anteriorly, the depressions outside postocelli rather weak, frontal impressions shallow, defined in oblique light as polished areas along eyes, on the transverse line including median ocellus, their posterior ends reaching slightly behind the posterior margin of the ocellus, in form sublunate, with the length greater than that of the ocellus and connected with postocelli by a narrow impressed line sent from their posterior ends. Head in front with interocular distance at base of antennae greater than half the length of antennal scape (8 : 6.5), antennal sockets comparatively large, the basal tubercles can not fill whole the space (Pl. II, Fig. 9); clypeus (ditto) apically raised and medianly bluntly elevated, mandible bidentate at apex, with a short tooth behind middle; head in profile with eye more than as wide as temple, occipital carina not highly raised, terminating gradually at the ends. Antennal joint 1 with antero-outer margin ridged, joints 3-9 (at least) beneath very sparsely fringed with pubescence of moderate length, joint 3 approximately twice as long as wide at apex (dorsal view), succeeding joints slightly reducing in length and slightly increasing in width, joint 9 slightly longer than wide, (from joint 10 apically lacking), joints 3-9 (at least) beneath with tyloidea, slightly ferruginous in colour (Pl. II, Fig. 10). Pronotum: Pl. II, Fig. 11, with surface flattened and polished, with antero-lateral areas slightly reflected, mesonotum with medio-anterior area somewhat depressed, with median scutal lines about twice as long as prescutal lines, the intervals raised into a blunt median carina, scuto-scutellar, scutello-postscutellar furrows both very fine, not foveolate, prosternal tubercles simply rounded, mesopleuron with a precoxal tooth located on the side of mesosternum, far apart from mesocoxa than in usual case, anterior oblique groove fine, delicately crenulate, but not well visible by the covering of appressed pubescence; propodeum with area dorsalis not margined with furrows, only the sides of basal area marked off with carinae, the area defined rather by the difference of sculpture and pilosity, but with the median furrow fine and crenulate, the furrow extending to posterior inclination and deepened and widened (V-shaped in cross-section), lateral carinae on posterior inclination defined only shortly on posterior portion. Abdominal segment 1 much longer than wide at apex (29 : 16). Caudal tergite (Pl. II, Fig. 12) medianly broadly flattened, but not margined with carinae. Sternite 4 with a pair of ovate tubercles (only gently rounded) on medio-apical area and sternite 5 with a similar tubercle medianly at apex. Fore and mid legs normal, mid tibia as long as femur, with two spines at apex, hind tibia strongly clavate, without spine on outer face, the following metatarsus also incrassate (Pl. II, Fig. 13)

Vertex, mesonotum and scutellum very minutely coriaceous, mat, and sparsely scattered with fine punctures, punctures on upper frons slightly larger and the ground microsculpture on scutellum weaker, with surface more shining; episternum of mesopleuron smooth and polished, anterior area covered with fine hair-points, metapleuron very minutely coriaceous; area dorsalis on propodeum at base coarsely crenate, interspaces of crenae microscopically delicately coriaceous, disc longitudinally, very finely, closely, also very delicately striate, the oblique carinae delimiting basal sides of the area strong, accompanying a few shorter weaker carinae on their insides till stigmatae, posterior inclination of the segment transversely, finely, closely striate, mixing micropoints between, sides obliquely finely closely coriaceous-striate. Abdominal tergites impunctate except apical two segments that are sparsely and finely punctured, each tergite on basal portion broadly covered with transverse, close, very delicate striae; sternites on haired areas covered with fine punctures.

♀. Unknown.

Holotype: ♂, Nantou Pref. (Tsui Feng, 2700 m), 15. VII. 1966, K. Tsuneki leg.

Remarks. The specimen was captured on the flower of *Aralia cordata* Thunb., Umbelliferae.

9. *Crossocerus* (*Ablepharipus*) *taiwanus* sp. nov.

(Pl. III, Figs. 1-8)

Very closely allied to the preceding species, separable therefrom, however, by that the clypeus is different in form, flagellar joints of antennae shorter and fringed beneath with more abundant pubescence, frontal markings not impressed, but raised, pronotum less developed, anterior area of mesopleuron, posterior aspect of propodeum and abdominal sternites not covered with pubescence, pubescence on underside of thorax much denser, caudal tergite without flattened area, fore tarsi widened, and coloration and sculpture also somewhat different.

♂. Length about 5.5 mm. Black, vertex with aeneous shine, yellow are: Antennal scape in front (apically somewhat darkened), small spots on pronotum, humeral angles, fore tibiae in front, mid tibiae at base externally and mid metatarsi except apex. Mandibles at apex glossy red, palpi, basal tubercles and tyloidea of antennae and tibial spurs ferruginous; tegulae, base of wings, fore tarsi and rest of mid tarsi dark brown; end tarsal joints nearly black.

Clypeus, sides of lower frons closely covered with appressed silvery pubescence, mandibles on basal half fairly closely covered with comparatively long pubescence, chin region with close short pubescence. Pubescence on latero-posterior tubercles of prosternum, fore coxae, trochanters and femora beneath and mesosternum very long and dense, silky white in colour, haired area of mesopleuron below distinctly bordered from the upper glabrous area; pubescence on mid coxae, trochanters and basal half of femora beneath somewhat shorter, less close, fore tarsi beneath densely covered with appressed silvery pubescence; abdominal tergites 4, 5 and 6 on each side and sternite 5 at apical margin with a patch of short silvery hairs.

Head from above with ratio of width to length in middle approximately 3 : 2, ocellar region not raised, OOD : POD : OCD = 6 : 3.5 : 6, width of postocellus slightly less than as wide as POD, frontal furrow in an impressed line, extending posteriorly till between postocelli, frontal markings semicircular in form, obliquely located, not impressed but raised and polished. Head in front antennal sockets large, median tubercle above them similar to that of *tsuifengensis*. Clypeus: Pl. III, Fig. 1, mandible: Ditto, Fig. 2, with apex bidentate, with the tooth on inner margin rather small. Head in profile with occipital carina suddenly terminate, with apex angulate but not toothed. Antennal joint 1 ecarinate, joint 3 about 1.5 times as long as wide at apex, and subequal to each of joints 4-8, the following joints gradually somewhat shorter, but even penultimate joint longer than wide, ultimate joint longer, slightly curved, apically compressed, with apex in lateral view rounded, flagellar joints beneath fringed with pubescence, more abundant than in *tsuifengensis* and joints 3-13 provided beneath with cariniform tyloidea (Pl. III, Fig. 3). Collar of pronotum transversely bluntly ridged across middle, the ridge medianly interrupted by a furrow and somewhat acute at the lateral ends, but the sides, seen from above, simply rounded (Fig. 4), mesonotum without medio-anterior depression, median scutal lines about twice as long as prescutal lines, scuto-scutellar furrow very narrow, not crenate, scutellum roundly raised, postscutellum with a lunate impression in front, the bottom furrow not crenate. Prosternal tubercles simply rounded, on mesopleuron anterior area not covered with hairs, anterior oblique furrow rather coarsely crenate, episternum provided with a precoxal tooth, not acute, but distinct (in paratype very weak), on propodeum area dorsalis, roughly say, without enclosing furrow, under 30× enlargement margined by a line formed of the row of very delicate short striae, median furrow comparatively broad, attenuate apically, posterior inclination medianly with an elongate oval impression, with in middle a glittering bottom furrow, lateral carinae of the segment defined only on apical third

of the posterior inclination. Abdominal segment 1 longer than wide at apex (approximately 3 : 2), caudal tergite (Pl. III, Fig. 5) with apex broadly truncate, with sides rounded, without flattened area on disc; sternites 5 and 6 gently roundly emarginate at apex, 7 triangularly incised. Wing venation normal. Fore tarsus: Pl. III, Fig. 6, mid tarsus: Fig. 7, shortness of joint 2 remarkable, hind tibia and tarsus: Fig. 8.

Vertex and upper frons very minutely delicately coriaceous, half-mat, and scattered very sparsely with very minute points (easily overlooked), upper frons with a few medium-sized, more distinct punctures, mesonotum also delicately coriaceous, but somewhat more distinctly so than on vertex and also sparsely scattered with fine punctures, the punctures nearly as large as those on upper frons and anteriorly somewhat more numerous, scutellum sculptured as on mesonotum, but the punctures sparser; mesopleuron smooth and polished, with fine scattered points, intervals in some places very feebly, delicately coriaceous, metapleuron longitudinally weakly striate on upper portion and finely, sparsely punctured on lower portion. Area dorsalis at base coarsely crenate, the surface of the area very minutely coriaceous, mat, disc polished, on posterior portion longitudinally finely feebly striate, lateral areas of dorsal aspect finely punctured, punctures sparser inwards, closer outwards, posterior aspect transversely finely closely punctate-striate, sides of the segment longitudinally closely, very delicately striate, partly coriaceous. Abdominal segments smooth and polished, tergites 2 and 3 and base of 4 transversely, very finely, very delicately striate, the surface showing aeneous shine, mat, tergite 7 with a fine scattered punctures on apical portion, sternites 4-7 with minute delicate sculpture.

♀. Unknown.

Holotype: ♂, Nantou Pref. (Tsuifeng, 2700 m), 10. VII. 1966, K. Tsuneki leg.

Paratype: 1 ♂, the same place, 15. VII. 1966, K. Tsuneki leg. (Types in my collection).

Remarks. The specimens were also captured on the flower of *Aralia cordata* Thunb.

10. *Crossocerus (Coelocrabro) nitidicarpus* sp. nov.

(Pl. III, Figs. 9-16; Pl. IV, Figs. 1-2)

This species is characteristic in its broadly polished body, peculiarly tridentate clypeus and the marked concave impression on the 2nd abdominal tergite. In the key of Kohl (1915) the female come to a deadlock at No. 19 and the male at No. 28.

♂. Length about 3.5 mm. Black and shining. Yellow are: Mandibles on basal half and antero-outer aspect, antennal joint 1 except a brownish apical spot, collar of pronotum largely, humeral angles, basal half of scutellum, a large spot on anterior portion of tegulae, median plate at base of fore wing, each trochanter at apex, fore and mid femora except black macula on underside (in fore legs divided into two stripes by a median yellow streak), each tibia except inner dark brown macula, tibial spurs of mid and hind legs, fore and mid tarsi except apical joint and hind tarsi on basal 2/3. Palpi ferruginous yellow, antennae beneath dark brown, with the swollen areas (tyloidea) ferruginous. Tegulae transparent, fore trochanters and tibial spurs and all tarsi apically pale brown. Wings hyaline, anterior apical portion slightly clouded.

Lower frons on each side and clypeus wholly covered with silvery pubescence, mesopleuron on anterior and lower portions and mesosternum fairly closely covered with short whitish pubescence.

Head from above: Pl. III, Fig. 9, vertex gently, rather evenly roundly raised, ocelli in an equilateral triangle, slightly higher than wide, OOD : POD : OCD = 4 : 2 : 7, width of postocellus relatively 3.5, frontal furrow distinct but not strong, frontal impressions comparatively large. Head in front with narrow oculo-antennal space, clypeus (Pl. III, Fig. 10) short, less than half

as long as antennal scape, at apex peculiarly tridentate, median tooth much wider and the lateral teeth obliquely produced, anterior margin near the side with a large rounded notch. Mandibles bidentate at apex. Head in profile similar to that of ♀ (Pl. III, Fig. 14), occipital carina not strong on dorsal margin, on the sides strong, very broad, coarsely crenate in front and suddenly ending at apex, but not toothed. Antennae with flagellar joints modified, apparently serrate (Pl. III, Fig. 11). Pronotum as in ♀ (Pl. III, Fig. 16). Prosternal tubercles in front of fore coxae acutely dentate; mesopleuron unarmed, propodeum also similar to that of ♀ (Pl. IV, Fig. 1), but with median furrow on area dorsalis reaching the apical margin, lateral carinae on posterior aspect defined only on posterior portion. Tergite 1 distinctly longer than wide at apex (approximately 3:2), apical margin in middle slightly produced, tergite 2 at base in middle deeply roundly concave, the posterior margin of the impression reaching slightly beyond middle of the segment, end tergite small, margined by a carina (Pl. III, Fig. 12), mat areas on sternite 2 defined, comparatively large, flattened, but not so much mat as in the majority of the species. In fore wing abscissa 1 of cubital vein very slightly shorter than abscissa 2, subequal, accessory cell open at apex. No modification on legs, hind tibia with a few comparatively long spines on outer margin.

Body smooth and highly polished. Vertex finely, very sparsely punctured, on occiput and upper temples more closely so, upper frons at the inclining area punctures somewhat larger, but sparse. Mesonotum and scutellum finely, fairly closely punctured, but the intervals still larger than points, mesonotum without crenation on posterior margin, scuto-scutellar furrow with a median carina only, not foveolate. Mesopleuron with haired portion finely very sparsely punctured, metapleuron polished, propodeum wholly glabrous, highly polished, area dorsalis at base coarsely crenate, lateral furrows on posterior portion and median furrow on basal portion crenate, the sides of the segment on upper portion minutely, weakly wrinkled, not shining. Tergite 1 finely sparsely punctured on basal portion, 2 punctureless, polished, 3 and 4 on each basal half except the sides finely, weakly, but fairly closely punctured, punctures indistinct on the outline and very shallow, pygidial area with a few fine punctures scattered. Sternites smooth, only posterior half of 3, 4, 5 and 6 covered closely with very minute hair-points.

♀. Length 5-6 mm. Very similar to ♂ including the coloration. Lower frons without silvery hairs. Head from above: Pl. III, Fig. 13, in profile: Fig. 14, clypeus: Fig. 15. Pronotum: Fig. 16, prosternal tubercles in front of procoxae strongly dentate. Propodeum: Pl. IV, Fig. 1, pygidial area: Fig. 2. Tergites 2 with a large rounded deep impression in all the specimens. Hind tibia with long whitish spines on outer margin, very conspicuous. Punctuation similar to ♂.

Holotype: ♂, Chia Pref. (Fenchihu, about 1400 m), 25. VII. 1966, K. Tsuneki leg.

Paratypes: 1 ♂ 4 ♀♀, the same place, 24-27. VII.; 2 ♀♀, Nantou Pref. (Penpuchi), 27. VIII. 1966, K. Tsuneki leg.

Remarks. The specimens from Fenchihu were captured on the bamboo grass heavily infested by aphids.

11. *Crossocerus (Coelocrabro) tanoi* sp. nov.

(Pl. IV, Figs. 3-8)

According to the key of Kohl (1915) this species (♂) comes to a deadlock at No. 17, since the end joint of antenna obliquely truncate at apex and the area dorsalis not marked off with the furrow. Further, it is characterized by the short and apically strongly tridentate clypeus, unidentate mesopleuron, and the propodeum not laterally margined with carinae. The strongly clavate hind tibia, the markedly incrassate following metatarsus and the tridentate clypeus made me recollect

the group of *capitosus-cinxius*, but in many characters it is distinctly different from these species.

♂. Length 4.5–5 mm. Black, only basal two joints of fore and mid tarsi ferruginous yellow. Mandibles at apex, palpi, disc of median tooth of clypeus, basal tubercles of antennae and articulations of legs ferruginous; tegulae, apical portions of fore and mid tarsi brown; antennal flagella beneath dark brown. Wings hyaline, antero-apical portion slightly clouded, more or less strongly so on anterior half of radial cell, stigma and veins dark brown.

Head from above: Pl. IV, Fig. 3, with vertex gently, rather evenly rounded, OOD : POD : OCD = 6 : 3.5 : 7 (width of postocellus relatively 3), frontal furrow in an impressed line, frontal impressions at the sides of front ocellus along eyes, lunate in form; head in front antennal sockets in touch with each other and with eyes; clypeus: Pl. IV, Fig. 4, with medial lobe tridentate at apex, mandibles apically bidentate, without tooth on inner margin. Head in profile with eye much wider than temple, occipital carina ending in a short tooth at each apex. Antennal joint 1 with antero-external margin ridge-formed, considerably acute, but not carinated, joint 3 about 1.7 times as long as wide at apex, joint 4 slightly less than as long as joint 3, ultimate joint (Pl. IV, Fig. 5) somewhat curved, apically flattened, with apex obliquely truncate and postero-apical corner distinctly angulated, fringe of hairs defined on basal seven flagellar segments beneath, very short and whitish. Pronotum comparatively well developed, laterally widened and constricted across middle (Pl. IV, Fig. 6), prosternal tubercles in front of procoxae simply rounded, mesonotum with medio-anterior area between prescutal sutures broadly depressed, mesopleuron with a precoxal tooth, short but distinct; propodeum with area dorsalis not marginated by the furrow, but with distinct median furrow, posterior inclination medianly above broadly impressed, with bottom of the impression longitudinally canaliculate, lateral carinae defined up to middle of the inclination. Abdominal tergite 1 much longer than wide at apex (about 5 : 3), at base with a large impression which is margined with carinae on both sides (Pl. IV, Fig. 7), caudal tergite broad triangular, with apex broadly rounded. Fore and mid legs normal, hind tibia strongly incrassate apically and clavate, with a few short spines on outer side (Fig. 8), following metatarsus also incrassate. Wing venation normal, accessory cell widely open at apex.

Head above smooth and polished, vertex very sparsely scattered with minute points, upper frons with a few slightly larger punctures, occiput covered with indistinct hair-points; mesonotum with punctures slightly larger, closer, but on disc intervals far larger than punctures, on anterior portion punctures finer and closer, posterior margin not areolate, but scuto-scutellar furrow crenulate, mesopleuron smooth and polished, on lower portion scattered with fine hair-bearing points, on anterior area with similar punctures somewhat closer; metapleuron polished, with postero-ventral suture coarsely crenate. On propodeum area dorsalis at base coarsely striate, median furrow smooth, sides of dorsal aspect and posterior inclination sparsely covered with hair-bearing punctures, but the latter area fairly shining. Abdomen impunctate and polished, apical two tergites with sparse fine punctures, punctures on caudal tergite slightly larger than on the preceding one, but not so large as in *Crossocerus* s. str., sternite 6 covered with very fine punctures.

♀. Unknown.

Holotype: ♂, Chiai Pref. (Mt. Ali, at about 1600 m), 29. VII. 1966, T. Tano leg. (Coll. Tsuneki)

Paratype: 1 ♂, the same as above (Coll. Tano).

12. *Crossocerus* (*Crossocerus*) *takasago* Tsuneki, 1966

(♂: Pl. IV, Figs. 9–12)

Crossocerus (*Crossocerus*) *takasago* Tsuneki, Etizenia, 15: 3, 1966 (♀♂, Formosa).

Specimens collected: 2 ♀♀, Chiai Pref. (Fenchihu), 24, 25. VII. 1966, K. Tsuneki leg.

Remarks. In one of the specimens the macula on the scutellum is splitted into three small spots and the yellow marks on the tibiae are much reduced in extent. In both specimens the band on the collar of the pronotum is much narrower than in the types of the species.

Distribution: Formosa.

13. *Piyuma prosopoides iwatai* (Yasumatsu, 1942)

Crabro (*Crossocerus*) *iwatai* Yasumatsu, Mushi, 14 (2): 88, 1942 (1 ♀. Kuaru, 1 V. 1937).

Piyuma koxinga Pate, Amer. Midl. Nat., 31 (2): 358, 1944 (1 ♀ 6 ♂♂, Tairin, IV, V, XI. 1909; 1 ♂, Tainan, 22. VII. 1919; 5 ♀♀ 1 ♂, Koshun, VI. 1912).

Crabro (*Crossocerus*) *iwatai*: Iwata, Mushi, 14 (1): 8-11, 1941 (biology).

Piyuma iwatai: Leclercq, Monogr. Crabr., p. 210, 1954 (listed).

Piyuma koxinga: Leclercq, Bull. Inst. R. Sci. Nat. Belg., 32 (16): 1, 1956 (1 ♀, Taihanroku, IV. 1908, with 5 ♀♀ 6 ♂♂ from India).

Piyuma makilingi: Leclercq, Bull. Ann. Soc. R. Ent. Belg., 99 (1): 59, 1963 (ex parte).

Specimens collected: 1 ♀, Nantou Pref. (Penpuchi), 10. VII. 1966, T. Tano leg.; 1 ♀, Chiai Pref. (Chuchi), 20. VII. 1966, K. Tsuneki leg.; 3 ♀♀, Pingtung Pref. (Kuaru), 9. VIII. 1966, K. Tsuneki leg.

Remarks. Pate (1944) distinctly described the differences between *koxinga* and *prosopoides* which relate mainly to the coloration and sculpture. Leclercq (1956, 57, 63) dealt with *makilingi* Williams, *iwatai* Yasumatsu and *koxinga* Pate as conspecific, but *prosopoides* as a separate species, though he seems to believe the conspecific relationships between the two groups. While, the specimen from Thailand examined by me was intermediate between the two groups. Basing upon this fact I dealt with all the four forms as conspecific (Etizenia, 4: 39, 1963). However, these forms clearly represent the geographical races and should be separated at the subspecific rank:

① *P. prosopoides porsopoides* (Turner), from Australia and New Guinea.

② *P. prosopoides makilingi* (Williams), from the Philippines.

③ *P. prosopoides iwatai* (Yasumatsu), from Formosa.

④ *P. prosopoides*, another subspecies, from S. and S. E. Asiatic regions.

② and ③ similar in sculpture, but differs markedly in colour (antenna and legs), the former much brighter. ① and ② similar in colour in general (① somewhat much brighter), but differs in sculpture of metapleurons and propodeum. While ④ similar in colour to ① and ② generally and intermediate in sculpture.

Piyuma dentipleuris (Cameron) from Borneo may be different from the species dealt with here, because of the difference in the structure of the clypeus (apex broadly rounded) and in the sculpture of the propodeum. But in colour apparently similar to ①, ② and ④.

The Formosan subspecies, *iwatai*, can easily be distinguished from others by that the scape of the antennae wholly dark brown and the yellow maculae on scutellum and legs less developed.

Distribution Endemic to Formosa.

Genus *Leclercqia* gen. nov.*

Type: *Leclercqia formosana* sp. nov. (Formosa).

The new genus is so close to *Piyuma* Pate, 1944, that it seems included within this genus by slightly enlarging its original diagnosis. But the characters of the head and the marked sexual

* It was dedicated to Prof. Jean Leclercq, Gembloux.

differences are considered deserved of its separation at the generic level.

Generic characters. Generally similar to *Piyuma* (including those of pronotum, wing venation, first abdominal segment, pygidial area and the number of the antennal segments in both sexes), differing from it in the following points:

1. Upper frons distinctly margined in front by a transverse carina which is medianly interrupted by the frontal furrow (as in *Vechtia* or in *Piyumoides*) and extended backward along inner orbits.
2. Occipital carina complete, reaching the posterior carina of buccal opening at its sides.
3. Ocelli in a nearly equilateral triangle.
4. Antennal scape ecarinate (latero-posterior edge more or less angulated, but not keeled).
5. Medial longitudinal carina of clypeus reaching the anterior margin.
6. Mandible (bidentate at apex in both sexes) with a small weak tooth on inner margin toward middle.
7. Mesopleuron without precoxal carina, but with a trace of tooth (♀) or blunt tooth, more or less lengthened transversely into a weak ridge.
8. Abdomen (very similar) with 2nd sternite at base transversely furrowed and more or less roundly raised medianly just behind the furrow.
9. Sexual characters of the male appeared in the antennae, legs (especially fore legs), mesopleuron, mesosternum, pygidial area and second sternite.

14. *Leclercqia formosana* sp. nov.

(Pl. V, Figs. 1-12; Pl. VI, Figs. 1-8)

♂. Length about 8.5 mm. Black, with the following portions orange yellow: Antennal joint 1' except inner apical spot, collar of pronotum, humeral angles, a spot on tegulae, scutellum, postscutellum, fore femur except three stripes beneath, fore tibia and tarsus except inside of both, mid femur except a short stripe beneath at base, mid tibia and following two joints of tarsus wholly, a short stripe at apex above of hind femur, hind tibia and next two joints of tarsus, of which scape, humeral angles and posterior aspect of fore femur rather cream yellow and mid femur more or less ferruginous. Mandibles dark brown on apical half except tip, antennae darkest brown, on joints 2-10 beneath ferruginous; tegulae and bases of wings semitransparent ferruginous; posterior margin of pronotum, latero-posterior margins of scutellum and postscutellum, and posterior margin of each abdominal segment amber-yellow, end tergite light brown, rest of tarsi ferruginous to dark brown. Wings hyaline, slightly clouded except basal portion, stigma black, veins apically black, basally brown.

Clypeus and sides of lower frons covered with decumbent silvery pile; hairs on temples, occipital margin, neck region, mesopleuron, under half of all femora comparatively long, soft and white; hairs on underside of femora: In fore femur basally longer, apically curved backward and slightly shorter; in mid femur defined on basal half only; in hind femur slightly yellowish, throughout long except apical 1/8. Hairs on dorsal surface of head and thorax short, sparse, yellowish, on abdominal tergites and sternites yellowish brown, comparatively long, fairly abundant, especially on marginal area of each tergite.

Head from above: Pl. V, Fig. 1, OOD : POD : OCD = 10 : 6 : 14, postocellus relatively 5, slightly larger than front ocellus (pupil ! distinctly distinguished from the corneal circle), frontal furrow broad and deep. Head in front: Pl. V, Fig. 2, scapal sinus glabrous, medianly with a fine impressed line, interocular distance comparatively broader, about 2/3 the length of antennal scape; oculo-antennal distance : width of antennal socket : interantennal distance = 2 : 4 : 3; median lobe

of clypeus with a strong carina in middle, curved in lateral view (Pl. V, Fig. 3), not reaching apex. Head in profile (ditto) with temple much less than as wide as eye, occipital carina complete, reaching postero-lateral corners of hypostomial carina. Antenna 13-jointed (Pl. V, Fig. 4, seen from above), joint 1 without distinct longitudinal carina, as long as joints 3-8 united and provided with two spines on inner apical margin which are different in length (ditto), flagellum in posterior view: Ditto, Fig. 5, joint 3 markedly incrassate beneath toward apex, joint 4-7 cylindrical, with under surface flattened and provided with tyloidea on posterior margin and fringe of hairs on anterior margin, joint 9 markedly, 10 and 11 more or less modified (ditto), all with tyloidea, joints 12 and 13 normal, 13 nearly twice as long as 12, apically attenuate, with apex rounded. Collar of pronotum highly raised, with sides rounded, with posterior margin deeply impressed, rather transversely furrowed (Pl. V, Fig. 6). Mesonotum with median scutal lines and prescutal sutures simply impressed, similar in length, reaching approximately 1/4 of the scutum, parapsidal furrows distinct, scuto-scutellar furrow fairly deep, with bottom line coarsely foveolate, scutellum (ditto, Fig. 7) highly raised, with lateral excavations markedly deep, postscutellum (ditto) with anterior lunate impression markedly deep, area dorsalis on propodeum (ditto) approximately semi-circular, distinctly marked off by the coarsely crenate deep furrows, median furrow also deep, comparatively broad and crenate, extending to posterior aspect and widened into a large, deep suboval excavation, lateral carinae strong, originating slightly behind stigmata and reaching apex of the segment, the carinae accompanied on the outside with a crenate furrow. Mesopleuron (Pl. V, Fig. 8) smoothly rounded, central area raised, with surface flattened and deeply pitted with the scrobe, no scrobal furrow, the area anteriorly inclined to oblique furrow which is broad, deep and coarsely crenate, upward roundly inclined, posteriorly flatly inclined and ventrally rather concavely inclined, with the precoxal area between the two inclinations obliquely ridged, middle of the ridge slightly produced into a low obtuse tooth, anterior area strongly margined in front with acute carina which is bent in middle. Mesosternum broadly, roundly and deeply excavated over whole the area, with an impression medio-anteriorly, thence a median carina running posteriorly and ends in a small impression before apex. Abdominal tergites 1 and 2: Fig. 9, remaining tergites slightly constricted at each base, tergite 6 medianly roundly emarginate (Pl. V, Fig. 10), apical tergite with disc broadly, gently roundly impressed, without marginal carinae. Abdomen in lateral view: Pl. V, Fig. 11, sternite 2 at base broadly deeply furrowed, with the subsequent area medianly roundly raised, apical margin of sternite 5 broadly rounded, of 6 gently emarginate and of 7 more deeply emarginate. Wing venation: Pl. V, Fig. 12 (as in *Piyuma*). Fore leg (Pl. VI, Figs. 1-3) modified, femur roundly expanded on posterior face, tibia markedly incrassate, tarsus broadly widened, metatarsus roundly produced on inner margin. Mid leg (Pl. VI, Figs. 4 and 5) also slightly modified, femur roundly expanded beneath, with inside at base broadly excavated, tibia incrassate, tarsal joints dilated, beneath hollowed, metatarsus curved; hind leg (Pl. VI, Fig. 6) with tarsal joints incrassate, metatarsus more thickened toward middle.

Vertex and upper frons sparsely punctured with medium-sized punctures, with intervals slightly larger than punctures, the punctures slightly closer towards frontal carina and on the inclining area becoming finer, closer and subreticulate; clypeus rather coarsely, somewhat rugosely punctured. Collar of pronotum finely, sparsely punctured, anterior inclination smooth and polished and neck region transversely rugoso-striate in middle; mesonotum closely, uniformly punctured, punctures as large as on upper frons, with intervals narrower than punctures, without striae on posterior margin, the narrow groove along lateral carinae smooth, not crenate, scuto-scutellar furrow distinctly crenate, scutellum similar in punctuation to mesonotum, but medianly more sparsely punctured, lateral excavations with a few rugose striae on bottom, those of postscutellum

longitudinally, somewhat arcuately coarsely striate; mesopleuron punctured as on mesonotum, but posteriorly and ventrally punctures finer and closer, precoxal obtuse ridge without puncture, polished, anterior oblique furrow strongly coarsely crenate, mesosternal excavation very minutely, very closely covered with hair-bearing points. Metapleuron finely closely punctured. Area dorsalis on propodeum finely, moderately closely punctured, remaining areas more coarsely, closely, partly rugosely punctate, sides of the segment smooth and polished, with an irregular band of short longitudinal striae on anterior portion and covered with close punctures on dorsal portion, posterior portion rather coarsely rugoso-punctate. Abdominal tergites except each apical membraneous marginal area fairly closely covered with fine hair-bearing pin-plicked punctures, punctures on sternite 2 similar except basal impunctate furrow, from sternite 3 apically punctures much finer and closer.

♀. Length about 9 mm. Similar in coloration to ♂, but ferruginous on underside of flagellum of antenna darker, scutellum medianly on basal half darkened, pygidial area nearly black, tarsi of legs more broadly yellow.

Head from above and in front similar in form and structure to ♂, clypeus with lateral short protuberances on apical margin slightly more distinct (Pl. VI, Fig. 7), antennal scape with similar spines at apex, flagellum normal, joint 1 (scape) approximately as long as joint 3-7 united, joint 3 about 1.7 times as long as wide at apex (dorsal view, in lateral view 1.5 times so), the succeeding joints slightly decreasing in length and increasing in thickness toward penultimate joint, joint 7 as long as wide. Structure of thorax-complex similar to that of ♂, but mesopleuron more roundly raised, with precoxal obtuse ridge indistinct, only with a very weak tubercle, mesosternum not deeply excavated, only roundly inclined towards median line; propodeum very similar. Abdominal segment 1 relatively slightly shorter ($L/W = 53/40$), with apical expansion less strong. Pygidial area (Pl. VI, Fig. 8) apically attenuate, distinctly margined on both sides with carinae and medianly strongly carinated. Legs comparatively thick, but not modified. Punctuation similar.

Holotype: ♂, Nantou Pref. (Penpuchi), 27. VIII. 1966, K. Tsuneki leg.

Paratypes: 2 ♀♀, the same place, 27, 28. VIII. 1966, K. Tsuneki leg.

Remarks. The specimens were captured when they came on the leaves of bamboos to lick the nectar of the bamboo aphids.

15. *Entomognathus (Koxinga) siraiya* Pate, 1944

(Pl. VI, Figs. 9 and 10)

Entomognathus (Koxinga) siraiya Pate, Amer. Midl. Nat., 31 (2): 341, 1944 (♂♀, Formosa).

Entomognathus (Koxinga) siraiya: Leclercq, Monogr. Crabr., p. 201, 1954 (listed).

Entomognathus (Koxinga) siraiya: Leclercq, Bull. Ann. Soc. R. Ent. Belg., 94 (3-5): 101, 1958 (2 ♀♀, Formosa; 1 ♂, Selangor).

Entomognathus (Koxinga) siraiya: Leclercq, Bull. Ann. Soc. R. Ent. Belg., 99: 47, 1963 (♂, N. Vietnam).

Specimens collected: 6 ♀♀ 6 ♂♂, Nantou Pref. (Chienching), 9. VII. 1966, K. Tsuneki leg.

Remarks. The specimens well agree in characters with the detailed original description, apart from the variation in colour of the abdomen in males.

This subgenus is characteristic in having the vertical and longitudinal precoxal carinae on the mesopleuron, forming, together with the epicnemial carina, roughly a U-shaped (or more correctly a L-shaped) carina on the marginal area of the mesopleuron and the costa of fore wing extended beyond apex of the radial cell and that the radial cell has the transverse radial vein markedly oblique, forming an acute angle (about 60°) with the costa.

This species is characterized by the form of its clypeus (Pl. VI, Figs. 9 and 10), rich yellow maculation on thorax and legs, and ferruginous (♀) and black (♂, excepting yellow maculation on tergites 5 and 6, and brownish apical margin of each tergite) abdomen. The structure of the propodeum is also characteristic.

Variation in colour of abdomen in males (excluding the yellow maculation):

Example 1. Tergite 1 on apical half more or less brownish.

Example 2. Tergite 1 broadly brownish.

Example 3. Tergite 1 broadly, tergite 2 on apical portion ferruginous.

Examples 4 and 5. Tergites 1-4, except for each central area, ferruginous.

Example 6. Tergites wholly ferruginous, except for medio-basal black on tergites 2 and 3.

General coloration: Body black, polished, yellow are: Mandibles at base externally, clypeus except apical margin, antennal joint 1, pronotum, humeral angles, anterior area of mesopleuron, axillae, scutellum (in ♀ disc black) and postsutellum including the lateral marginal lines (in ♂, further, broad band on tergite 5 and a spot on 6) and legs except greater part of coxae, femora and a large brown macula on hind tibiae. Tarsal joints apically brown. (A male from Selangor, according to Leclercq, has a fairly different maculation of the abdomen).

Propodeum at base on dorsal aspect with about 6 subquadrate areoles, on each side of this series a subtriangular area present which is enclosed with carinae and has the surface irregularly sculptured, posterior inclination perpendicular, flattened, sectioned by carinae into three lobes, the median lobe inverted bell-shaped in form.

Distribution: Formosa and S. E. Asia.

16. *Dasyproctus buddha* (Cameron, 1889)

Rhopalum buddha Cameron, Mem. Proc. Manchester Lit. Phil. Soc., (4) 2: 18, 1889 (India).

Crabro brooki Bingham, Faun. Brit. Ind., Hym., I: 323 (♀).

Crabro buddha: Bingham, Ibid., 323 (♂).

Dasyproctus buddha: Leclercq, Bull. Soc. R. Sci. Nat. Belg., 26 (15): 11, 1950 (with synonymy); Monogr.

Crabro, p. 258, 1954 (ditto): Bull. Ann. Soc. R. Ent. Belg., 92 (6-7): 147, 1956; Bull. Soc. R. Sci. Liège, 26 (1): 53, 1957; Expl. Park. Nat. Uppenba, 45, Hym. Sphec.: 40, 41, 60, 1958; Bull. Ann. Soc. R. Ent. Belg., 99: 15, 1963.

Dasyproctus buddha: Tsuneki, Ins. Mats., 22 (3-4): 97, 1959 (Formosa).

Specimens collected: 21 ♀♀, Taitung Pref. (Chulu), 12. VIII. 1966, K. Tsuneki et T. Tano leg.

Remarks. It must especially be noted as to the rounded impression on the disc of tergite 2. This impression is invariably observable in all the specimens above listed. Hence it is not due to the post-embryonic mechanical factor, but must be due to the gene origin and must be counted as a character of the species.

The specimens were captured at their nests which were made in the log pillar of a barn, to which they were provisioning with Dipterous insects belonging to Antomyiidae.

Distribution: India, Malaya, Burma, Vietnam, Philippines and Formosa.

17. *Dasyproctus ceylonicus impetuus* (Cameron, 1901)

Crabro impetuus Cameron, Proc. Zool. Soc. London, 2: 16 (♂, Singapore).

Dasyproctus philippinensis Ashmead, Proc. U. S. Nat. Mus., 28: 129, 150 (♀♂, Luzon).

Dasyproctus ceylonicus impetuus: Leclercq, Bull. Ann. Soc. R. Ent. Belg., 92 (7-8): 166, 1956 (incl. Formosa); Ibid., 99: 18, 1963. (synonymy and distribution).

Dasyproctus ceylonicus: Tsuneki, Ins. Mats., 22 (3-4): 96, 1959 (Formosa).

Dasyproctus ceylonicus impetuus: Baltazar, Pac. Ins. Mon., 8: 355, 1966 (synonymy and distribution, after Leclercq).

Specimens collected: 31 ♀♀ 19 ♂♂: 1 ♀, Ilan Pref.; 11 ♀♀ 11 ♂♂, Nantou Pref.; 16 ♀♀ 4 ♂♂, Chiai Pref.; 2 ♀♀ 1 ♂, Taitung Pref.; 4 ♀♀ 3 ♂♂, Pingtung Pref., VII, VIII. 1966, K. Tsuneki et T. Tano leg.

Remarks. This species is widely and commonly distributed over the Island. We could collect it from the coastal area to the mountains as high as 2000 m (Nantou Pref.: Chienching). Coloration and structure of the Formosan specimens well agree in general with the explanation of *impetuus* by J. Leclercq (1956, 63). In connection with the character of abdominal tergite 2 in the preceding and succeeding species it seems worthy of mention that there is no such an impression on the tergite in this species.

Distribution: Malay Archipelago, Philippines and Formosa.

18. *Dasyproctus formosanus* sp. nov.

(Pl. VI, Figs. 11-13)

This species (♂), in the key of Leclercq (1958), meets with first inconsistency at No. 43, because it has the black scutellum and at the same time, normal mandibles. If we follow the other branch we come to a deadlock at No. 48. If we follow again the other way, because antennal joint 3 in this species is, in the lateral view, less than thrice as long as broad at apex, we at once stop at the next branch, at No. 49.

This species is characteristic in that the frontal transverse carina present, pronotal carina runs backward to humeral angle, scape and pronotum with humeral angles yellow, while the abdomen completely immaculated or with very small maculae on tergites 3 and 4, petiole approximately thrice as long as broad at apex, and tergite 2 with a large rounded concave hollow on disc.

♂. Length about 6.5 mm (paratypes about 8 mm). Black, yellow are: Greater part of outer and anterior faces and apex of antennal scape, collar of pronotum (medianly interrupted), humeral angles, a spot at apex of femora, outer face of fore tibia and base externally of mid tibia; in one paratype a small transverse macula on each side of abdominal tergites 3 and 4 and a line on outer apical area of mid tibia also yellow. Apical margin of each abdominal segment semitransparent ferruginous, on ventral plates more broadly so, apical portion of abdomen beneath broadly ferruginous, stigma and veins of wings black.

In general body structure very similar to *D. ceylonicus*, but differs in some characters:

Clypeus with the produced angles at lateral margins more strong and distinct (Pl. VI, Fig. 11), with the apical width approximately 1.5 times the width of antennal socket; mandible pitchy black, without the brownish area, with the small tooth on inner margin slightly more developed than in *ceylonicus*. Frontal carina less distinct, irregular in height and generally lower, but with the anterior face deep black and shining, scapal sinus shallower, before the carina only gradually inclined anteriorly. Antennal joint 1 normally bicarinate, but the postero-lateral ridge also fairly strongly angulate, joint 2 not sinuate beneath, 3 approximately 2.7 times as long as wide at apex in dorsal view, in lateral view only 2.3 times so, joint 4 approximately 4/5 the length of joint 3, joint 8 as long as wide. Vertex and upper frons distinctly more coarsely punctured, on vertex intervals as large as punctures, on upper frons punctures much closer, frontal impressions small, nearly rounded. Mesonotum with punctures fine, but comparatively larger than in *ceylonicus*, on posterior margin similarly crenate, scutellum sparsely punctured, with longitudinal striae weaker, confined to lateral areas only (in paratype weakly and narrowly observable on posterior marginal area), with the disc medianly longitudinally shallowly impressed; propodeum very coarsely, ir-

regularly reticulate with rugose carinae, metapleuron and sides of propodeum longitudinally, strongly and coarsely striate, but different from *ceylonicus* in that the intervals smooth and polished. Abdominal segment 1 (Pl. VI, Figs. 12 and 13) thrice as long as wide at apex, (ratio of length, maximum and minimum width 50 : 17 : 7.5), in lateral view (ditto, Fig. 13) strongly swollen on posterior portion, tergite 2 broadly roundly concave on disc (ditto), within the excavation bases of each hair slightly produced into a small tubercle.

♀. Unknown.

Holotype: ♂, Taitung Pref. (Chulu), 12. VIII. 1966, K. Tsuneki leg. (Coll. Tsuneki)

Paratype: 2 ♂♂, Pingtung Pref. (Shatao), 5, 7. VIII. 1966, T. Tano leg. (Coll. Tano)

19. *Rhopalum (Latrorhopalum) erraticum* sp. nov.

(Pl. VIII, Figs. 1, 2 and 20; Pl. X, Figs. 1-4)

Rhopalum (Latrorhopalum) shirozui: Tsuneki, Etizenia, 15: 12, 1966 (♀, nec ♂, 1965)

In my previous paper cited above I dealt with a female specimen from Formosa as the female of *Rhopalum shirozui* which was described by me the preceding year basing on a male specimen also from Formosa. But the acquisition of the topotypical three female specimens during our journey which were much closer in characters to the type of *shirozui* and must be the true female of this species led me to a comparative study between the specimens. As a result it was determined that the first mentioned female is distinct from *shirozui* and belongs to an undescribed species. Hereupon, a new species was proposed to receive the specimen.

The description was given already in detail with four figures. But the following additions must be given:

- (♀) 1. Pronotum in the dorso-posterior view with antero-lateral carinae distinctly produced into a tooth on each side (Pl. VIII, Fig. 1).
 2. Latero-posterior tubercles of prosternum triangularly produced in lateral view.
 3. Petiole of abdomen: Ditto, Fig. 20.
 4. Medio-basal short carina on pygidial area strongly raised in middle, seen from the side distinctly triangularly produced (Pl. VIII, Fig. 2).
 5. In fore wing accessory cell almost closed at the apex (similar to *shirozui*).
 6. Punctures on vertex and mesonotum much sparser, with the ground microsculpture comparatively weak and the surface more shining than in *latronum* or *shirozui*.

♂. Unknown.

Holotype: ♀, Nantou Pref. (Sungkang, 2400 m), 31. V. 1965, T. Shirozn leg. (Coll. Kyushu Univ.)

20. *Rhopalum (Latrorhopalum) shirozui* Tsuneki, 1965

(Pl. VI, Figs. 14-17; Pl. VIII, Figs. 21-22; Pl. X, Figs. 5-13)

Rhopalum (Latrorhopalum) shirozui Tsuneki, Spec. Bull. Lep. Soc. Jap, 1: 169, 1965.

As described in connection with *R. erraticum*, the true female of this species was newly discovered by us in the neighbourhood of the type locality.

♀. Length about 9.5 mm. Very similar to ♂ in general structure and sculpture. But more stoutly built, with the abdomen much thicker. Coloration darker: Humeral angle on posterior half alone yellow or whitish yellow, sometimes antennal joint 1 at base somewhat yellowish. Mandibles nearly wholly, labrum, base of antennal joint 1, from middle to penultimate joint of antennae beneath, apex of fore femora, fore tibiae in front and the spur, and apical two joints of fore tarsi ferruginous. Tegulae on posterior half and veins and stigma of wings dark brown.

Pilosity normal, as in ♂.

Head from above with structure and punctuation generally as in ♂, but the temples more developed, approximately as long as eye, OOD : POD : OCD = 11 : 6 : 16 (in ♂ approximately 8 : 6 : 11), ocelli in an isosceles triangle, slightly lower than the equilateral, POD approximately twice as long as space between front and postocelli, postocellus with width relatively 5 and larger than front ocellus; frontal marks comparatively larger, the depression outside postocelli broader and deeper. Head in front with minimum interocular distance comparatively broad, about half as great as at front ocellus and $2/3$ the length of antennal scape, oculo-antennal space more or less present, interantennal tubercle roundly raised, with a short carina from upper end upwards; clypeus and labrum: Pl. VI, Fig. 14, clypeus at base suddenly raised, mandibles bidentate at apex, with the broad obtuse protuberance on inner margin towards middle (ditto). Head in profile with temple much wider than eye (Pl. VI, Fig. 15). Antenna: Ditto, 16, joint 3 shorter than joint 2, in dorsal view about 1.5 times, lateral view 1.2 times as long as wide at apex, ultimate joint wedge-shaped towards apex. Pronotum as in ♂, seen from above and behind: Pl. VI, Fig. 17; mesonotum medio-anteriorly somewhat impressed, with median scutal suture in two glittering lines, reaching posteriorly $2/5$ of the scutum, prescutal sutures much weaker, parapsidal lines also in glittering lines, slightly impressed, scutellum medio-posteriorly gently raised, prosternal tubercles somewhat flattened conical, with apex rounded, mesopleuron without precoxal tubercle. Propodeum as in ♂, area dorsalis defined by the difference of sculpture, broad triangular, at base very coarsely crenate, the surface of the disc longitudinally, finely, closely striate, median furrow deep and narrow, without crenae, on posterior inclination it becomes wider and deeper, lateral carinae short, defined on posterior portion only, sides of the segment distinctly divided by an oblique furrow into anterior and posterior halves, the former obliquely, very finely, closely striate and the latter microscopically granulate. Abdominal segment 1: Pl. VIII, Fig. 22 (in ♂, Fig. 21), medianly not carinated; on pygidial area medio-basal short carina in lateral view roundly raised. Wing venation as in ♂, accessory cell nearly closed at apex; legs with fore and mid femora markedly incrassate and hind tibiae strongly clavate as in ♂, but fore and mid tarsi normal, with joint 2 longer than wide, in hind tarsi joints 1 and 2 incrassate. Punctuation and sculpture as in ♂.

Specimens: 3 ♀♀, Nantou Pref. (Tsui Feng near Sungkang, 2700 m), 10, 15. VII. 1966, K. Tsuneki leg.

Distribution: Formosa.

21. *Rhopalum* (*Latrorhopalum*) *taipingshanum* sp. nov.

(Pl. VII, Fig. 15-20; Pl. VIII, Figs. 16-19)

The head, pronotum and mesonotum of the specimen which was made as type were heavily crushed and the annexed Figures were restored from the fragmented parts. But the antennae and the clypeus were without damage.

♂. Length about 8 mm. Black, with the following portions cream yellow: Antennal joint 1 except dorso-apical black macula covering half of the joint, humeral angles, apico-lateral macula on fore and mid femora and fore tibiae in front broadly. Basal three joints of fore and mid tarsi semitransparent yellowish white. Labrum, palpi, antennal joints 3-10 beneath and apical two joints of fore and mid tarsi ferruginous. Wings hyaline, stigma and veins dark brown.

Head from above ocelli in an isosceles triangle, lower than the equilateral one, with front ocellus smaller than postocellus, OOD : POD : OCD = 6 : 4.5 : 9, postocellar width relatively 3.5, frontal marks along inner orbits at the sides of front ocellus, slightly obliquely located, not

well outlined, but well impressed, frontal furrow broad and distinct, with sides inclining toward median line. Head in front with clypeus: Pl. VIII, Fig. 16, head seen in profile with eye more than as wide as temple; antenna seen in front: Pl. VIII, Fig. 17, basal four joints seen from above: Fig. 18, ultimate joint wedge-shaped in lateral view. Pronotum seen from above: Pl. VIII, Fig. 19, prosternal tubercles conical, with apex rounded, mesonotum medio-anteriorly not impressed, on posterior margin not crenate and scuto-scutellar furrow narrow, not crenate, but the furrow between scutellum and postscutellum crenate, postscutellum also foveolate on posterior margin. Propodeum with area dorsalis indistinctly marked off by feeble furrow, at base coarsely crenate and in middle narrowly furrowed, the furrow extends to posterior inclination, retaining the feature of a narrow impressed line and bordered on both brims with fine carinae, and reaching near apex of the segment, lateral carinae of the inclination completely lacking. Abdomen slenderly built, segment 1 (Pl. VII, Fig. 15) with ratio of length to maximum width before apex approximately 9 : 1, as long as hind coxa, trochanter and femur combined, slightly longer than tergites 2 and 3 taken together (60 : 55). In fore wing recurrent vein received by cubital cell slightly behind middle, 1st abscissa of radial vein slightly longer than half the 2nd abscissa, angle between radial and transverse radial veins 90°, that between the latter and costa more than so, accessory cell narrowly open at apex. Fore legs slender, not modified (Pl. VII, Figs. 16 and 17), mid legs also the same (Pl. VII, Fig. 18), hind legs with femur acutely carinated beneath (Pl. VII, Fig. 19), with tibia strongly clavate and metatarsus incrassate (Pl. VII, Fig. 20).

Vertex, pro- and mesothorax very minutely, very closely punctulate, nearly mat, on mesopleuron punctures finer, slightly weaker and the surface more or less shining, metapleuron similarly punctulate, on area dorsalis of propodeum basal coarse crenae reaching near middle of the disc, intervals and posterior portion finely striate, first longitudinally, then transversely, remaining portions of the segment transversely, finely closely striate, sides of the segment smooth and polished, with an oblique fine groove toward middle. Abdominal tergites with very minute hair pits closely distributed.

♀. Unknown.

Holotype: ♂, Ilan Pref. (Mt. Taiping, about 2000 m), 5. VIII. 1967, B. S. Chang leg.

22. *Rhopalum (Latrorhopalum) changi* sp. nov.

(Pl. VII, Figs. 1-14)

This species (♂) closely resembles *R. (L.) shirozui*, but is different from this in the details in the structure of the antennae, clypeus, pronotum, legs and the 8th sternite.

♂. Length 9.3 mm. Black and opaque. Yellow: Humeral angles and apico-external maculae on fore femora. White, in some places more or less brownish: Antennal joint 10 at apex, 11-12 except above, apical portion of tarsal joint 1 to 4 of fore and mid legs and apex of mid tibiae. Ferruginous: Mandibles (slightly whitish toward middle), antennal joints 2-6 beneath, apical half of fore femora in front, apex of mid femora, fore tibiae in front, base externally of fore and mid tibiae and fore and mid tibial spurs. Wings hyaline, apically broadly clouded, stigma and veins dark brown. Pubescence normal.

Head from above transverse, with ratio of width to length in middle 53 : 25, frontal median furrow narrow and distinct as in *shirozui*, ocelli in an isosceles triangle, somewhat lower than equilateral one, with front ocellus slightly smaller, OOD : POD : OCD = 9 : 6 : 10, width of postocellus relatively 3.5, depressions outside postocelli mediocre in depth, frontal marks distinctly outlined, elongate oval, concave and shining. Head in front interocular distance at base of antennae comparatively broad, slightly less than as long as antennal joint 1 (17 : 14), with a

more or less oculo-antennal space, antennal socket large, interantennal tubercle comparatively large at above sockets. Clypeus (Pl. VII, Fig. 1) medianly broadly, highly raised, median tooth on apical margin slightly inclined below, while the lateral broad protuberances with inner apical areas slightly reflected (Pl. VII, Fig. 2, seen from beneath). Head seen in profile with temple slightly less than as wide as eye, with posterior margin subparallel with the outer orbit, lower portion posteriorly, closely covered with long greyish white pubescence. Antenna markedly modified (Pl. VII, Fig. 3), the broadly expanded ultimate joint characteristic, apical three joints in lateral view: Pl. VII, Fig. 4. Pronotum: Pl. VII, Fig. 5, prosternal tubercles dentiform, with apex rounded, mesonotum medio-anteriorly not impressed, but the posterior margin distinctly crenate, the crenae longer laterally, scuto-scutellar furrow and scutello-postscutellar furrow also crenate, scutellum medianly with a gentle raised line, postscutellum on posterior margin feveolate, mesopleuron with anterior oblique furrow coarsely crenate, without precoxal tooth. Area dorsalis on propodeum not marked off by the furrow, at base coarsely striate, with a distinct median furrow on disc which is comparatively broad and deep, extending to posterior inclination and slightly widened and much deepened. Abdominal segment 1 (Pl. VII, Fig. 6) medianly carinate except at base and on apical swollen portion, end sternite: Pl. VII, Fig. 7. Wing venation as in *R. taipingshanum*, but with accessory cell completely closed at apex. In fore legs femur strongly incrassate and tarsus modified (Pl. VII, Figs. 8, 9 and 10), in mid legs tarsus modified (do., Fig. 11), in hind legs tibia strongly clavate (do., Fig. 14) and the tarsus also modified (do., Figs. 12 and 13), with joint 1 incrassate and joint 2 crooked.

Head and thorax finely, closely punctured, mat; scutellum longitudinally finely closely punctato-striate; disc of area dorsalis at base next to the crenate furrow and in middle longitudinally, finely, closely striate, the remaining area of the disc obliquely, finely punctulato-striate, rest of the dorsal aspect and posterior inclination finely, closely striate, with a tendency of rugulose; sides of the segment divided by an oblique feeble furrow into anterior and posterior parts, the former obliquely finely, closely, the latter rather longitudinally, similarly but much more delicately striate; abdominal tergites covered with very minute hair-points.

♀. Unknown.

Holotype: ♂, Ilan Pref. (Mt. Taiping), 5. VIII. 1967, B. S. Chang leg. (Coll. Tsuneki)

23. *Rhopalum (Calceorhopalum) formosanum* Tsuneki, 1966.

(Pl. VIII, Fig. 23; Pl. X, Figs. 14-18)

Rhopalum (Calceorhopalum) formosanum Tsuneki, Etizenia, 15: 13, 1966 (Formosa).

Specimens collected: 4 ♀♀ 6 ♂♂, Chia Pref. (Fenchihu), 25, 26. VII. 1966, K. Tsuneki leg.; 1 ♀ 2 ♂♂, Mt. Ali (at about 1800 m), 29. VII. 1966, T. Tano leg.

Remarks. In the holotype (♂, captured at Sungkang, 2400 m) area dorsalis is without median furrow, while in the paratype (♀, collected at Fenchihu, 1400 m) it is distinct. Among the specimens newly collected by us those captured in Fenchihu all have the furrow, while those collected at the higher area of Mt. Ali all have not. In other characters, however, there is no note-worthy difference observable.

The form of the fore metatarsus given in the original text was insufficient and here it is shown in Pl. VIII, Fig. 23.

Distribution: Formosa.

24. *Rhopalum (Calceorhopalum) spinicollum* sp. nov.

(Pl. VIII, Figs. 3-15)

In the structure of the antennae and clypeus this species is very similar to the preceding one, but in the structure of the pronotum it is rather close to those of the subgenus *Latrorhopalum* described in the present paper, having the distinctly spined lateral angles. Further, in the colour of the abdomen this species is wholly black, without the ferruginous maculation and the body size generally comparatively large. The male genital organs, however, show distinctly the type of the *Calceorhopalum* as given in Pl. VIII, Fig. 10.

♂. Length 5.3-6.5 mm. Black and considerably shining. Yellow are: Mandibles except the marginal areas, antennal joint 1 except a large macula on dorsal side (sometimes the area wholly black), humeral angles, a spot of axillary sclerites of wings, apical half externally and beneath of fore femora, a spot on corresponding area of mid femora, fore and mid tibiae and tarsi except inside of tibiae and apical joint of tarsi, and basal ring of hind tibiae; articulations of legs more or less broadly yellowish white. Ferruginous: Marginal area of mandibles, palpi, antennal joints 2-6 beneath, abdominal sternites 7 and 8, and hind tibial spurs. Tegulae transparent amber yellow, rest of tarsal joints brownish black. Wings hyaline, apically somewhat clouded, stigma nearly black, veins dark brown. Pilosity normal, on head slivery, apical portion of abdomen covered sparsely with comparatively long brownish pubescence, especially on sternites.

Head from above comparatively thick, with ratio of width to length in middle 43 : 23, ocelli in an isosceles triangle, widest at base, with front ocellus somewhat smaller, OOD : POD : OCD = 7 : 3 : 10, the width of postocellus relatively 4, impressions outside postocelli rather weak, frontal marks indistinct, in some specimens under oblique light lunate flattened areas observable along inner orbits on the line including front ocellus, but in most specimens not defined; frontal furrow weak, no vertical furrow between postocelli. Head in front interocular distance at base of antennae slightly less than as long as antennal scape (ratio 9 : 11), antennal sockets comparatively large, leaving no oculo-antennal space, interantennal wad longitudinally rounded, not incrassate nor raised above sockets; clypeus: Pl. VIII, Fig. 3, more or less varied in form (ditto, Fig. 4), mandible bifid at apex, without tooth on inner margin. Head in profile, with eye much wider than temple, occipital carina weak, gradually ending before reaching hypostomial carina. Antenna with joint 1 (scape) thick, medianly widened, as long as joints 2 and 3 united, in form: Pl. VIII, Figs. 5 and 6. Pronotum (ditto, Fig. 7) with a tooth on each side, prosternal tooth in lateral view conical, with apex rounded, mesonotum medio-anteriorly weakly impressed, no crenae on posterior margin and on scuto-scutellar furrow; on mesopleuron precoxal tooth lacking, anterior oblique furrow distinct, crenulate. Area dorsalis on propodeum defined by the polished surface in the punctulate and pubescent surroundings, medianly weakly grooved, on posterior aspect the median furrow V-shaped in cross section. and widened toward middle, lateral carinae defined only on posterior portion. Abdominal segment 1: Pl. VIII, Fig. 13, tergite 7 medianly with an elongate rounded impression, in some specimens it is very weak. Genitalia: Pl. VIII, Fig. 10, sternite 8: Fig. 11, venation in fore wing: Fig. 12, transverse radial vein sometimes somewhat curved outward, sometimes straight. Fore metatarsus: Pl. VIII, Figs. 8 and 9; mid metatarsus slender, about 2/3 as long as preceding tibia or as long as subsequent joints 2, 3 and 4 taken together; hind tibia strongly clavate, with metatarsus incrassate, joint 2 also slightly so.

Vertex finely sparsely punctured, shining, upper frons toward inclining area closely punctured, mesonotum finely sparsely punctured, on scutellum, punctures somewhat closer, bottom of the furrow between scutellum and postscutellum finely crenulate, mesopleuron covered with very dil-

icate hair-bearing points, almost impunctate, metapleuron and sides of propodeum smooth and polished, punctures outside area dorsalis on propodeum all hair-bearing, finer, sparser upwards, and slightly coarser and denser posteriorly, the area at base coarsely crenate. Basal half of abdominal petiole with microsculpture, tergite 6 finely closely punctured, others punctured as on mesopleuron.

♀. Length 6.5-7.3 mm. Very similar to ♂ including coloration. Head from above somewhat thicker (width to length in middle 50 : 28), temples more developed, OOD : POD : OCD = 9 : 4 : 13 (width of postocellus relatively 4.3). Clypeus: Pl. VIII, Fig. 14. Head in profile with eye only slightly wider than temple, occipital carina as in ♂. Antennal joint 1 slightly longer, ratio to interocular distance at base of antennae 15 : 10, remaining joints comparatively robust and thick, joint 3 in dorsal as well as lateral view 1.3 times as long as wide at apex, succeeding joints progressively slightly shorter and slightly thicker till joint 7, thence to penultimate joint nearly equal in length and gradually slightly attenuate apically. Pronotum as in ♂, but contour somewhat stronger, rather close to that of *R. changi*. Petiole of abdomen: Pl. VIII, Fig. 15. Fore metatarsus normal, hind tibia strongly clavate and on outer side with about 7 or 8 strong spines. Punctuation similar. In fore wing recurrent vein received by cubital cell always beyond middle (in ♂ always in middle or slightly before middle).

Holotype: ♂, Chiai Pref. (Fenchihu), 25. VII. 1966, K. Tsuneki leg.

Paratypes: 4 ♀♀ 4 ♂♂, the same place and time; 1 ♂, Nantou Pref. (Chienching), 9. VII. 1966, K. Tsuneki leg.; 4 ♀♀ 3 ♂♂, Chiayi Pref. (Mt. Ali), 29. VIII. 1966, T. Tano leg.; 2 ♂♂, Miaori Pref. (Peihao), 10. IV. 1967, T. Shirozu leg.

25. *Rhopalum (Calceorhopalum) bohartorum* Tsuneki, 1966 (nom. emend.)

Rhopalum (Calceorhopalum) bohartum Tsuneki, Etizenia, 15: 15, 1966 (♀, the Ryukyus: Ishigaki Is.)

Specimen collected: 1 ♀, Chiai Pref. (Fenchihu), 25. VII. 1966, K. Tsuneki leg.

Remarks. Among some ten specimens of subgen. *Calceorhopalum* collected in Fenchihu, about 1400 m above sea level, a single example was found to belong to the present species. It differs from the type specimen captured on the Island of Ishigaki in that the POD relatively slightly shorter (OOD : POD : OCD in this example 13 : 4.5 : 13, while in the type 12 : 7 : 13). In other respects well agrees with the type.

Some supplementary notes: Vertex gently smoothly roundly raised, almost without the impressions outside the postocelli (in *formosanum*, a related and sympatric species, the area distinctly impressed) and the pronotum with antero-lateral corners shortly angulated, but not toothed. As in pronotum the portion of the area dorsalis is also partly covered with short silvery pile (in *formosanum* and *calceatum* area dorsalis completely glabrous and distinct by that fact from the haired surrounding area). Antennal joint 2 and mid femur above completely yellow and by such difference in colouration easily separable from the two resembling species compared. End joint of mid tarsus pale brown. In both species mentioned black. The blackish colour at the tip of the yellow mid legs is very conspicuous and common to the majority of the *Calceatum*-group.

Distribution: The Ryukyus and Formosa.

II. Tribe OXYBELINI

1. *Oxybelus lamellatus bicolorisquama* Strand, 1923 (conj. nov.)

Oxybelus bicolorisquama Strand, Internat. Ent. Zeitschr., 16 (21): 172, 1923 (♂, Formosa: Tainan, Koshun,

IV, V, 1912, including var. *kankauensis*)

Oxybelus bicolorisquama: Sonan, Trans. Nat. Hist. Soc. Formosa, 30 (196): 21, 1940 (1 ♀ 1 ♂, Formosa: Tainan, IV, 1925, 28.).

Oxybelus (Oxybelus) bicolorisquama: Pate, Philip. Jour. Sci., 64 (1937): 388, 1938 (listed).

Specimens collected: 1 ♀, Pingtung Pref: Hengchun (Koshun), 2. VIII. 1966, T. Tano leg.; 6 ♂♂, Pingtung Pref.: Shatao, 9. VIII. 1966, T. Tano leg.

Remarks. In my previous paper (1961) I recorded a male of this species from Thailand as a geographical race, under the name, *O. andalusiacus thaianus*, and referred to the fact that several species recorded as distinct will be included within the category of this species. Such synonymizing attempts have already partly been made by Turner (1917) and Pate (1938). But it seems strange that the latter author did not include his *aequipunctatum* and *banksi* Ashmead within this specific category, since these are considered mainly the colour variations (melanism) with only a slight change in structural distinction. (By the way, *O. philippinensis* Pate must be a subspecies of *O. diphyllus* (Costa))

The Formosan subspecies differs from the typical race in that the lateral spines of the abdomen shorter, with the disc of mesonotum very gently depressed between the parapsidal sutures. In the latter character it resembles *O. banksi* (Ashmead) of the Philippines, but differs therefrom in the punctuation of mesonotum and in the maculation of the abdomen.

Distribution: Formosa.

2. *Oxybelus nipponicus formosus* subsp. nov.

? *Oxybelus agilis* Smith, Cat. Hym. Brit. Mus., 4: 387, 1856; —: Bingham, Faun. Brit. Ind., Hym. I: 316, 1897; —: Turner, Mem. Dept. Agr. Ind. Ent. Ser.; 5 (4): 190, 1917.

Oxybelus agilis: Sonan, Trans. Nat. Hist. Soc. Formosa, 30 (196): 21, 1940 (Formosa: Chuchi, Kao-Hsiang).

The subspecies newly erected seems to be similar to *O. agilis* Smith as was previously identified by Sonan. I have not the specimen of this species at hand. But, in so far as the descriptions of the previous authors go, it differs therefrom at least in the sculpture of the propodeum and somewhat in the maculation of the thorax and the legs. Further, as they did not touch upon many of the characters having the taxonomical value it seems too haste to determine the identity between them. I therefore left this problem unsettled and compared the specimens with the Japanese species well known to me.

The Formosan specimens listed below closely resemble *O. nipponicus* not only in general characters including clypeal, squamal, propodeal, colorific and sculptural distinctions, but also in the disposition of ocellus, relative frontal width, temporal keel, slightly depressed mesonotum, in the precoxal carina of mesopleuron and in the form of pygidial area. They differ, however, in that the lateral spines of abdominal segments 3-5 more developed (♂), maculae on scutellum and postscutellum much larger (♀♂) and punctures on sternite 2 generally distinctly coarser.

Holotype: ♂, Pingtung Pref. (Hengchun), 2. VIII. 1966, K. Tsuneki leg.

Paratypes: 4♀♀ 21 ♂♂, Pingtung Pref. (14 ♂♂, Hengchun, 2, 8. VIII.; 3 ♀♀ 6 ♂♂, Shatao 7, 9. VIII.; 1 ♀ 1 ♂, Fangliao, 31. VII.); 1 ♀ 5 ♂♂, Taitung, Pref. (1 ♀ 2 ♂♂, Taitung, 11, 15. VIII.; 1 ♂, Chihpen, 12. VIII.; 2 ♂♂, Taoyeh, 14. VIII.); 1 ♂, Ilan Pref. (Tsukeng, 16. VIII.) 1966. K. Tsuneki et T. Tano leg.

Remarks. If in future the identity between *agilis* and *nipponicus* is ascertained the three form will represent respectively a geographical race and the Japanese and Formosan forms may be called respectively *agilis nipponicus*, *agilis formosus*.

3. *Oxybelus lewisi* Cameron, 1890

- Oxybelus lewisi* Cameron, Mem. Proc. Manchester Lit. Phil. Soc., (4) 3: 282, 1890 (Japan and Ceylon).
Oxybelus lewisi: Bingham, Faun. Brit. Ind., Hym., 1: 320, 1897.
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Oxybelus sakuranus Tsuneki, Etizenia, 16: 7, 1966 (Japan: Honshu)
Oxybelus lewisi: Tsuneki, Etizenia, 27: 7, 1968 (Formosa and Japan)

Specimens collected: 2 ♂♂, Taipei Pref. (Yingko), 6. VII. 1966, K. Tsuneki leg.; 2 ♂♂, Ilan Pref. (Liyuchih), 16. VIII. 1966, K. Tsuneki et T. Tano leg.

Remarks. One of the specimens collected at Liyuchih carries 5 pairs of maculae on the abdomen, while in all others 3 pairs alone are present on tergites 1-3.

Distribution: India, Formosa and Japan

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ADDENDUM

The following species of Crabronini escaped from the list (K. Tsuneki, 1966) of the known species from Formosa:

Lestica (Solenius) constricta Krombein, 1949

Crabro (Ceratocolus) quadriceps: Yasumatsu (nec Bingham, 1897), Mushi, 12 (2): 153, 1939 (♂, Palaus).

Crabro (Ceratocolus) quabriceps: Yasumatsu (nec Bingham, 1897), Mushi, 14 (2): 83, 1942 (♂♀, E.

- China and Formosa: Mt. Taiping, Mt. Ali, Pianan-Sikiku).
Crabro quadriceps: Townes (nec Bingham), Rept. 14, U. S. Comm. Co. Surv. Micronesia, p. 51, 1946 (Palau).
Lestica (Solenius) constricta Krombein, Proc. Hawaii. Ent. Soc., 13 (3): 389, 1949 (Palau).
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Lestica (Solenius) constricta: Leclercq, Bull. Ann. Soc. R. Ent. Belg., 94 (3-4): 81, 1958 (China, Philippines, Formosa, Celebes).
Lestica (Solenius) constricta: Leclercq, Ibid., 99 (1): 48, 1963 (Philippines).
Remarks. We could not collect the specimen of this species.

KEY TO THE SPECIES OF CRABRONINI OCCURRING IN FORMOSA AND THE RYUKYUS

- 1 Mandible at least in ♀ with apex simple, pygidial area in ♀ triangular, flattened 2
- Mandible with apex bi- or tridentate, if simple pygidial area of ♀ gutterwise excavated 6
- 2 Mandible beneath near base deeply incised 3
- Mandible entire, without incision beneath 4
- 3 Eyes covered with short pubescence (Clypeus: Pl. VI, Figs. 9 and 10; black maculated with yellow, in ♀ abdomen ferruginous red, in ♂ only partly so), length 6-7 mm, Formosa
 - Eyes naked (not occurring in the related region, *Entomocrabro*, *Encopognathus*, *Anacrabro*)
 - 4 Mandible in both sexes simple (not known from the region, *Lindenius*, *Quexua*)
 - Mandible in ♀ simple, in ♂ bifid at apex 5
 - 5 Clypeus at apex quadridentate, abdomen yellow maculated, occipital carina terminating in a tooth (not occurring in the related region, subgen. *Hoplocrabro* of *Crossocerus*)
 - Clypeus at apex more or less truncate, abdomen wholly black, occipital carina not terminating in a tooth or carina, propodeum with area dorsalis well-defined by the furrow, area pygidialis subequilateral triangular, with surface flattened, length 4.5 mm (♀), Formosa (Taipei, III, 1912)
 - *Crossocerus (Microcrabro)* (= *Yuchiha*) *melanochilos* Pate, 1943
 - 6 Maxillary palpi 5-jointed and labial palpi 3-jointed 7
 - Maxillary palpi 6-jointed and labial palpi 3- or 4-jointed 18
 - 7 Recurrent vein of fore wing received by cubital cell beyond middle of its vein (not known from the related areas, *Podagritus*)
 - Recurrent vein received by cubital cell before or at the middle of its vein 8
 - 8 Epicnemial carina distinct, marginating anterior area of mesopleuron (not known from the related areas, *Moniaecera*)
 - Epicnemial carina absent, with anterior episternum rounded on anterior border
 - genus *Rhopalum* Kirby ... 9
 - 9 Frontal marks (impressions) distinct, head and thorax opaque (cardo of male genitalia Y-shaped, in species of Formosa pronotum always toothed latero-anteriorly)

- subgen. *Latrorhopalum* Tsuneki ... 10
- 10 ♀ (antenna 12-jointed, normal; pygidial area present, medianly carinate in *taipingshanum* and *changi* unknown) 11
- 10 ♂ (antenna 13-jointed, joints 2 and 3 at least modified, pygidial area absent in *erraticum* unknown) 12
- 11 Length about 10 mm, head in profile with temple much wider than eye, clypeus: Pl. VI, Fig. 14, ultimate antennal joint longer than two preceding joints united (Pl. VI, Fig. 16), pronotum with antero-lateral teeth produced sideways (do., Fig. 17, other ref., Pl. VI, Fig. 15; Pl. VIII, Fig. 22), Formosa
- Rhopalum (Latrorhopalum) shirozui*, Tsuneki, 1965
- 11 Length about 7 mm, head in profile with temple approximately as wide as eye, clypeus: Pl. X, Fig. 2, ultimate antennal joint slightly shorter than two preceding joints united, pronotum with antero-lateral teeth shorter, directing somewhat latero-posteriorly (ref. Pl. VIII, Figs. 1, 2, 20; Pl. X, Figs. 1-4), Formosa
- Rhopalum (Latrorhopalum) erraticum* Tsuneki, 1968
- 12 Fore metatarsus not dilated, not modified (Pl. VII, Fig. 17), fore tibia broadly bright yellow (other characters, ref. Pl. VII, Figs. 15-20; Pl. VIII, Figs. 16-19), length about 9.5 mm, Formosa
- Rhopalum (Latrorhopalum) taipingshanum* Tsuneki, 1968
- 13 Fore metatarsus dilated and modified, fore tibia without bright yellow marking 13
- 13 Antenna markedly modified, with ultimate joint dilated and expanded (Pl. VII, Fig. 3), clypeus with anterior margin medianly produced into a tooth (Pl. VII, Fig. 1), mid tarsal joints 2 and 3 at least white (other ref. Pl. VII, Figs. 1-14), length 9.5 mm, Formosa
- Rhopalum (Latrorhopalum) changi* Tsuneki, 1968
- 13 Antenna less markedly modified, with ultimate joint not so dilated nor expanded (Pl. X, Fig. 8), clypeus without tooth on anterior margin in middle (Pl. X, Fig. 7), mid tarsus black or brownish black (ref. Pl. X, Figs. 5-13), length about 9.5 mm, Formosa
- Rhopalum (Latrorhopalum) shirozui* Tsuneki, 1965
- 14 In ♀ pygidial area medianly carinate, in ♂ genitalia with parameres nearly as long as penis valve subgen. *Calceorhopalum* Tsuneki 15
- 14 In ♀ pygidial area without medial carina, in ♂ genitalia with parameres more than 2.5 times as long as penis valve subgen. *Rhopalum Kirby*, s. str. also 15
- 15 Pronotum with antero-lateral corners distinctly toothed, abdomen without ferruginous coloration, trochanters and femora of fore and mid legs largely black (others ref. Pl. VIII, Figs. 3-15), length ♀, 7-8 mm, ♂, 5.5-7 mm, Formosa
- Rhopalum (Calceorhopalum) spinicollum* Tsuneki, 1968
- 16 Pronotum with antero-lateral corners not distinctly toothed (sometimes angulated), abdomen with more or less ferruginous area, fore and mid legs largely yellow 16
- 16 Mesonotum without medio-anterior impressed line, antennal joint 2 brownish black, vertex and mesonotum distinctly closely punctured, less shining, clypeus: Pl. X, Fig. 22, tergite 7 marginated laterally with feeble carinae, fore metatarsi not modified (ref. Pl. X, Figs. 23-25), length 5.3 mm, Formosa (♀ unknown)
- Rhopalum (Rhopalum ?) tayarum* Tsuneki, 1966, ♂
- 16 Mesonotum with a distinct medio-anterior impressed line, antennal joint 2 wholly or largely yellow, vertex and mesonotum very minutely and sparsely punctured, well shin-

- ing 17
- 17 Antennal joint 2 and mid femur wholly yellow, pronotum fairly closely covered with silvery pile, with antero-lateral corners slightly angulated, vertex without small shallow impressions outside postocelli, medio-anterior impressed lined on mesonotum reaching middle of the scutum (ref. Pl. X, Figs. 19, 21), length 5-6 mm, S. Ryukyus and Formosa
Rhopalum (Calceorhopalum) bohartorum Tsuneki, 1966
- Antennal joint 2 apically above and mid femur above more or less brownish, pronotum almost glabrous, with antero-lateral corners rounded, a small shallow impression outside each postocellus well-defined, medio-anterior impressed line on mesonotum shorter, not reaching middle of the scutum (♂, antennae and fore metatarsus modified) (ref. Pl. VIII, Fig. 23; Pl. X, Figs. 14-18), length 5-6 mm, Formosa
Rhopalum (Calceorhopalum) formosanum Tsuneki, 1966
- 18 Labial palpi 3-jointed (*Tracheliodes*, *Enoplolindenius*, *Arnordita*, not occurring in the related region)
- Labial palpi 4-jointed 19
- 19 Mesopleuron with two epicnemial areas, one anteriorly for receiving fore femur, the other posteriorly for receiving mid femur, both margined with carinae (body mat, black with yellow maculae, head thick, subcubic, abdominal segment 1 peduncular)
 genus *Dasyproctus* Lepeletier et Brullé... 20
- Mesopleuron with one epicnemial area anteriorly 22
- 20 Carina on anterior margin of pronotal collar extending vertically downward at the sides, not turning backward to humeral angles (abdominal tergite 2 broadly roundly impressed at base, abdomen with 4 pairs of lateral maculae), length 11-13 mm, Formosa, Philippines, S. China, S. E. Asia and India
Dasyproctus buddha (Cameron, 1889)
- Carina on anterior margin of pronotum turning posteriorly and reaching humeral angles, length 8-11 mm 21
- 21 Scutellum black, abdomen wholly or nearly wholly black; legs largely black, tergite 2 with a broad rounded impression on disc, length about 8 mm, Formosa
Dasyproctus formosanus Tsuneki, 1968
- Scutellum yellow maculated, abdominal tergites 1-5 with lateral markings, sometimes lacking on 3, legs broadly yellow, tergite 2 without impression on disc, length 8-11 mm, Formosa
Dasyproctus ceylonicus impetuus (Cameron, 1901)
- 22 Fore wing with recurrent vein received by cubital cell near middle of cubital vein, at most abscissa 1 less than twice as long as abscissa 2, abdomen sessile or subpetiolate ... 23
- Fore wing with recurrent vein received by cubital cell much nearer to the apex of the cell, abscissa 1 more than twice as long as abscissa 2, antenna 12-jointed in both sexes abdomen sessile, rarely subpetiolate 35
- 23 . Ocelli in an equilateral triangle, or nearly so 24
- Ocelli in a low isosceles triangle ——— scape strongly bicarinate, collar of pronotum transversely roundly raised, without medial furrow, mesopleuron with a transverse precoxal carina, propodeum with lateral margins distinctly thoroughly carinated, abdominal segment 1 longer than wide at apex, nodose on posterior portion, between segments 1 and 2 distinctly constricted genus *Piyuma* Pate, 1943
 Collar of pronotum, humeral angles, scutellum, base of tibiae more or less, tarsi largely

yellow, clypeus bluntly tridentate at apex (mandible bifid at apex, area dorsalis not enclosed by the furrow), length about 8-9 mm, Formosa

Piyuma prosopoides iwatai Yasumatsu, 1942

- 24 Upper frons not bordered by carina on anterior margin, pygidial area in ♀ medianly not carinate, abdominal segment 1 sessile, sometimes elongate, but not nodose on posterior portion genus *Crossocerus* Lepeletier et Brullé, 1834 ... 26

- Upper frons bordered by carina on anterior margin 25

- 25 Pygidial area in ♀ medially obsoletely carinate, or without carina, on mesopleuron precoxal carina present, antennal scape strongly bicarinate, abdominal segment 1 subsessile (not occurring in the related region, *Piyumoides*)

- Pygidial area medianly strongly carinate, on mesopleuron without precoxal carina, antennal scape ecarinate, abdominal segment 1 subpetiolate and more or less nodose on posterior portion (collar of pronotum transversely roundly raised without median furrow, propodeum on both sides thoroughly margined by carinae ... genus *Leclercqia* Tsuneki, 1968

Clypeus subtriangular, area dorsalis enclosed by the furrow, scape, pronotum, humeral angles, scutellum, postscutellum and legs largely yellow, (ref. Pl. V.) length 8.5-9 mm, Formosa

Leclercqia formosana Tsuneki, 1968

- 26 Abdomen except the whitish base wholly ferruginous (abdominal segment 1 subpetiolate, upper frons on anterior margin somewhat swollen out, with upper side flattened, mandible tridentate at apex (♀), the teeth nearly in a cross line, occipital carina at the ends beneath head slightly diverted toward mandibles (ref. Pl. II, Figs. 1-8), length about 8 mm, Formosa

Crossocerus (Alicrabro) rufiventris Tsuneki, 1968

- Abdomen not ferruginous red 27

- 27 Abdominal segment 1 more than twice as long as wide at apex 28

- Abdominal segment 1 less than twice as long as wide at apex 29

- 28 Mandible bidentate at apex in ♀, pronotum constricted across middle, area dorsalis enclosed by the furrow, end of occipital carina strongly produced into a tooth, mesopleuron strongly dentate in ♀, weakly so in ♂ (scape of antenna ecarinate, but with a longitudinal ridge, pygidial area in ♀ elongate triangular and gutterwise excavated on apical portion, body and legs wholly black (ref. Pl. IX, Figs. 1-3), length ♀, 8-9 mm, ♂, 6.5-7 mm, Formosa

Crossocerus (Apocrabro) aeta loa Pate, 1943*

- Mandible tridentate at apex in ♀, pronotum not constricted across middle, end of occipital carina suddenly terminate, but not strongly produced, the carina also weaker, mesopleuron without tooth, wholly black) (ref. Pl. I, Figs. 10-14), length ♀ about 8.5 mm, Formosa (Mt. Ali)

Crossocerus (Apoides) alticola Tsuneki, 1968

- 29 Pygidial area in ♀ with a broad Y-shaped impression, in ♂ thorax beneath and base of legs beneath densely covered with long whitish pubescence, mesopleuron with a precoxal tooth, mandible with a small tooth on inner margin toward middle (subgen. *Ablepharipus*) 30

- Pygidial area in ♀ triangular, either flattened or gutterwise excavated on apical portion, in ♂ thorax beneath not so densely covered with long pubescence 31

- 30 ♂, clypeus: Pl. II, Fig. 9, antennae: Pl. II, Fig. 10 (others ref. Pl. II, Figs. 11-13),

* In my previous paper (Etizenia 15, 1966), I followed Leclercq in dealing with Formosan *loa* as a synonym of Philippine *aeta*, but it now seems proper to place the Formosan form as a geographical race of the Philippine form, basing on the differences explained in the original paper by Pate.

length 5.8 mm, Formosa (high altitude, ♀ unknown)

***Crossocerus (Ablepharipus) tsuifengensis* Tsuneki, 1968**

- ♂, clypeus: Pl. III, Fig. 1, antenna: Pl. III, Fig. 3 (ref. Pl. III, Figs. 2, 4-8), length 5.5 mm, Formosa

***Crossocerus (Ablepharipus) taiwanus* Tsuneki, 1968**

- 31 Abdominal segment 1 considerably longer than wide at apex, some of tergites yellow or white maculated, mandible with a tooth on inner margin toward middle, ♀ with pygidial area elongate triangular, with surface flattened and shining, ♂ with mandible and legs modified (subgen. *Cuphopterus*).

Tergite 1 with white maculae, in ♀ pygidial area usually with a white fleck, hind tibial spur comparatively broad, in ♂ hind femur with an excavation and a tooth near base beneath, length ♀ 8-10 mm, ♂ 7-10 mm, Japan and Formosa

***Crossocerus (Cuphopterus) hakusanus* Tsuneki, 1954**

- Abdominal segment 1 nearly as long as wide at apex, or slightly longer; as a rule abdomen immaculate, mandible without a tooth on inner margin 32
- 32 Pygidial area in ♀ flattened, not excavated into a gutter on apical portion, in ♂ end tergite more strongly punctured than in the preceding tergite (subgen. *Crossocerus*).

Clypeus bluntly tridentate at apex of medial lobe, mesopleuron without precoxal tubercle, propodeum with area dorsalis well defined by the furrow, medianly furrowed, with disc polished, and delicately longitudinally striate, posterior face with lateral margins distinctly carinated (tergite 1 slightly longer than wide at apex, scape in front, pronotum, scutellum (sometimes as small spots and in ♂ immaculate), all tibiae on external side more or less yellow), (ref. ♂, Pl. IV, Figs. 9-12), length 5-6 mm, Formosa

***Crossocerus (Crossocerus) takasago* Tsuneki, 1966**

- Pygidial area in ♀ excavated on apical portion into a gutter, in ♂ puncturation on last tergite as on preceding tergite (subgen. *Coelocrabro*) 33
- 33 Second tergite with a large rounded impression, body highly polished (clypeus peculiarly tridentate at apex: Pl. III, Figs. 10 and 15, mesopleuron without precoxal tooth, area dorsalis enclosed by the furrow, tergite 1 longer than wide at apex; mandible largely, scape, pronotum, humeral angles, scutellum and legs broadly yellow, ref. Pl. III, Figs. 9-15; Pl. IV, Figs. 1 and 2), length ♀ 6-7 mm, ♂ 4-5 mm, Formosa

***Crossocerus (Coelocrabro) nitidicarpus* Tsuneki, 1968**

- Second tergite without large impression 34
- 34 Area dorsalis not enclosed by furrow, mesopleuron with a distinct precoxal tooth, clypeus: Pl. IV, Fig. 4 (hind tibia clavate, body wholly black, fore and mid tarsi pale brown, rest of legs dark brown, body fairly shining, vertex polished, with frontal impression distinct, ref. Pl. IV, Figs. 3-8), length about 5 mm, Formosa

***Crossocerus (Coelocrabro) tanoi* Tsuneki, 1968, ♂**

- Area dorsalis enclosed by furrow, mesopleuron without precoxal tooth, clypeus: Pl. IX, Fig. 5 (hind tibia not clavate, scape in front and humeral angles yellow, all tibiae at base externally with a yellow spot, mid femur broadly semitransparent ferruginous, body not shining, frontal impression indistinct, ref. Pl. IX, Figs. 4-7), length 6.5 mm, the Ryukyus (Is. Amami-Ohshima)

***Crossocerus (Coelocrabro) hirashimai* Tsuneki, 1966, ♂**

- 35 Vertex without distinct frontal impressions, mesopleuron not coarsely punctate, abdomen impunctate or finely punctate (♂ with mid tibial spur) genus *Ectemnius* Dahlbom 36

- Vertex with distinct frontal impressions, mesopleuron strongly coarsely punctate, abdomen distinctly coarsely punctate (♂ without mid tibial spur) ... genus ***Lestica* Bilberg**

Abdominal segments strongly constricted, pronotum with antero-lateral corners acutely pointed, ♂ with legs more or less modified (lateral maculae on tergites 1-4 and legs broadly yellow), length 9-10 mm, Palau and Formosa

***Lestica (Solenius) constricta* Krombein, 1949**

- 36 Mesopleuron at least on episternum simply punctured (mandible with a strong tooth on inner margin, scape unicarinate) 37
- Mesopleuron longitudinally or obliquely striate, rugoso-striate or rugoso-punctate 42
- 37 Mesonotum transversely, on posterior portion obliquely, closely striate (black with rich yellow maculation, legs nearly wholly yellow, with ferruginous maculae), length ♀ 13-15 mm, ♂ 12-13 mm, India, Formosa, the Ryukyus, Korea, Ussuri

***Ectemnius (Metacrabro) chrysites* (Kohl, 1892)**

- Mesonotum not distinctly striate 38
- 38 Mesonotum strongly coarsely punctured, punctures partly longitudinally confluent (mandible and legs black, scape in front, 2 or 3 pairs of lateral maculae and a fleck on tergites yellow, constriction between abdominal segments stronger than in typical race, sides of abdomen with comparatively long greyish white hairs, in ♀ apical margin of tergite 5 and sides of 6 densely covered with long stiff brownish hairs), length ♀ 11-12 mm, ♂ 8-9 mm, Formosa (typical race in Japan and Korea)

***Ectemnius (Iwataia) furuichii formosanus* Tsuneki, 1960**

- Mesonotum finely punctured (♂ with pygidial area) ... (subgen ***Cameronitus* Leclercq**) ... 39
- 39 Punctures on mesonotum very close, dense, partly rugoso-punctate, abdominal segment 1 longer than wide at apex 40
- Punctures on mesonotum medio-anteriorly finer and closer, on remaining area distinctly separated from each other, never rugoso-punctate, abdominal segment 1 nearly as long as wide at apex, with yellow or white maculae 41
- 40 Abdominal segment 1 subpetiolate, nearly twice as long as wide at apex, apical portion somewhat nodose, tergite 2 flattened on disc (ref. Pl. I, Figs. 6-9; scape, pronotum, humeral angles, a spot on mesopleura, scutellum, axillae, postscutellum, lateral marks on tergite 2 (large) and a macula on 5 orange yellow, legs yellow maculated), length 8 mm, Formosa

***Ectemnius (Cameronitus) alishanus* Tsuneki, 1968**

- Abdominal segment 1 only slightly longer than wide at apex (orange yellow: ♀, pronotum, humeral angles, a patch on mesopleura, scutellum, axillae, postscutellum, a pair of maculae on area dorsalis (with a very rare exception), on tergites 2-4, sometimes a touch on epimeral area, one or two spots on antero-lateral corners of mesonotum, and frequently a pair of spots on tergite 5; ♂, similar, but epimeral touch almost always absent, spot on antero-lateral corners of mesonotum rarely present, while area dorsalis always black and tergite 5 always with maculae), length ♀ 8-10 mm, ♂ 7-8 mm, Formosa

***Ectemnius (Cameronitus) orius cetonicus* Leclercq, 1958**

- 41 Maculae yellow (yellow: Mandibles except apical half, clypeus except apex, antennal joint 1 wholly and 2 except above, pronotum (medianly finely interrupted), humeral angles, anterior mesopleura, a spot behind it, axillae, anterior third of scutellum, anterior half of postscutellum, medianly fused large maculae on area dorsalis, a narrow transverse mark on each side of tergite 1, similar but large macula on 2-4, medianly touched large maculae on 5, fore and mid legs except coxae and pale brown apical 3 joints, and hind legs except

greater part of coxa, trochanter above, roughly apical half of femur, brownish maculae at base externally of tibia and pale brown apical 3 joints of tarsus), length ♀ 8-9 mm, ♂ 7-8 mm, Japan and Formosa

Ectemnius (Cameronitus) flavohirtus Tsuneki, 1954

- Maculae white (pronotum, humeral angles, anterior mesopleura, scutellum, postscutellum, abdominal tergites 1-5 white maculated, clypeus: Pl. IX, Fig. 15, others ref. Pl. IX, Figs. 16 and 17), length ♀ 13.3 mm, ♂ unknown, the Ryukyus (Is. Amami-Oshima)

Ectemnius (Cameronitus) albomaculatus Tsuneki, 1966

- 42 Mesonotum very finely closely punctured, abdominal tergites practically impunctate (Clypeus: Pl. I, ♀, Fig. 5, ♂, Fig. 1, antenna, ♂, Figs. 2, 3, 4, abdomen with 5 (♀) or 6 (♂) pairs of lateral maculae), length ♀ ♂ 8-10 mm, Formosa

Ectemnius (Clytochrysus) nigrifrons taiwanus, Tsuneki, 1968

- Mesonotum closely, more grossly punctured, in part rugoso-punctate or rugoso-striate (♂), abdomen finely, rather sparsely punctured (scape, pronotum, tubercles, anterior mesopleura axillae, scutellum, postscutellum, 2 large maculae on tergite 2, band or maculae on 4 and 5, rarely 2 spots on 3 yellow) 43
- 43 Maculae cream yellow, tergite 3 usually without maculae (clypeus broader than in the following subspecies: Pl. IX, Fig. 9; pygidial area in lateral view less strongly curved on upper side: Pl. IX, Fig. 11), length 8-10 mm, eastern Palaearctic region

Ectemnius (Hypocrabro) schlettereri schlettereri (Kohl, 1888)

- Maculae at least on abdomen orange yellow, tergite 3 usually with two lateral spots (clypeus narrower: Pl. IX, Fig. 8, pygidial area in lateral view more strongly curved on upper side: Pl. IX, Fig. 10), length 8-10 mm, S. Ryukyus and Formosa

Ectemnius (Hypocrabro) schlettereri sakaguchii (Matumura et Uchida, 1926)

EXPLANATTON OF PLATE I.

Figs. 1-5. *Ectemnius (Clytochrysus) nigrifrons taiwanus* subsp. nov.

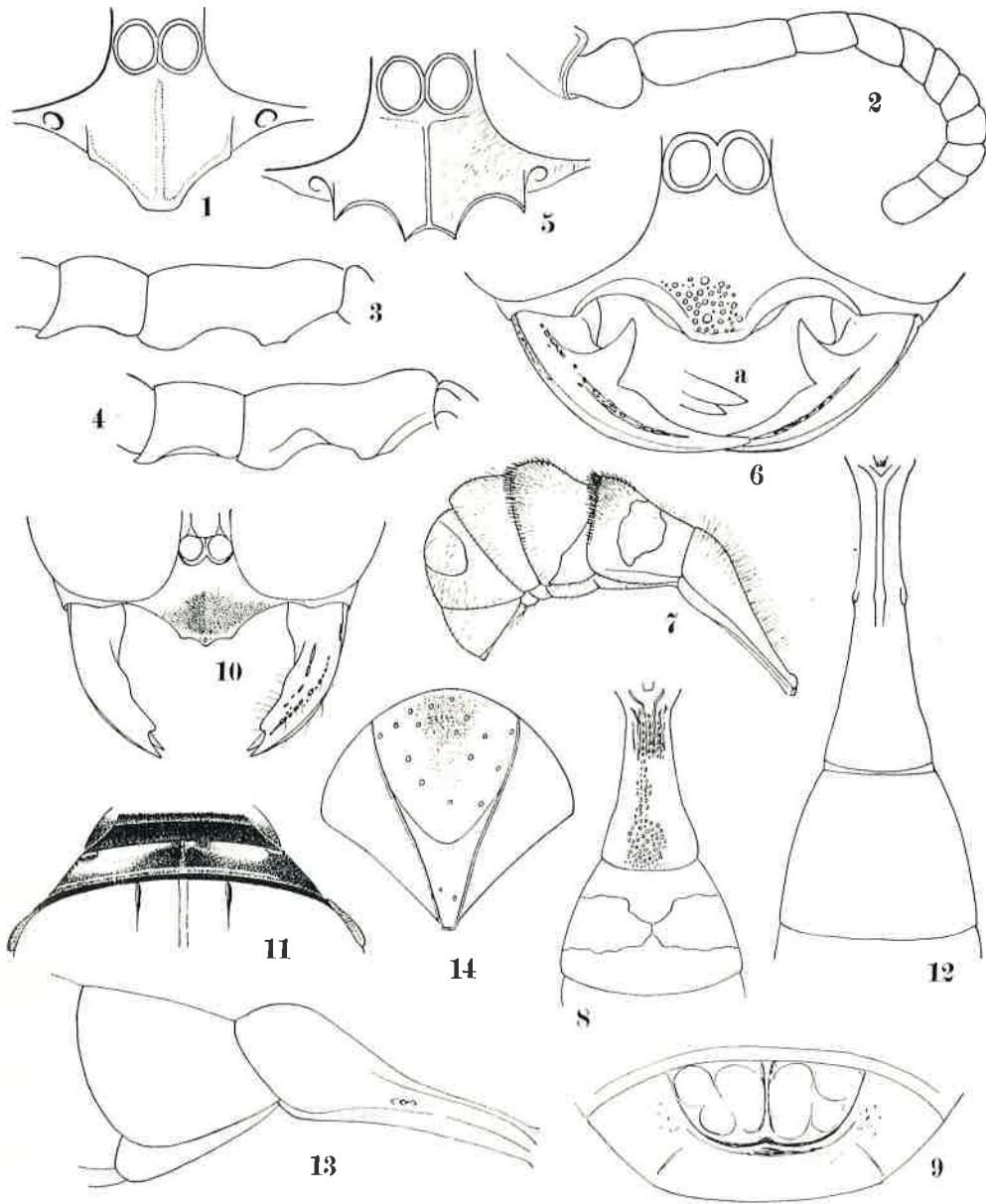
1. Clypeus (♂).
2. Antenna (♂) seen from above.
3. Ditto, joints 3 and 4 (from outside).
4. Ditto (from inside).
5. Clypeus (♀).

Figs. 6-9. *Ectemnius (Cameronitus) alishanus* sp. nov., ♂.

6. Clypeus and mandibles (a, apex of mandible).
7. Abdomen (lateral view).
8. Ditto (basal two segments).
9. Pygidial area (seen from apex).

Figs. 10-14. *Crossocerus (Apoides, subgen. nov.) alticola* sp. nov., ♀.

10. Clypeus and mandibles.
11. Pronotum.
12. Abdominal segments 1-2 (dorsal view).
13. Ditto (lateral view).
14. Pygidial area.



Tsuneki, K. *Formosan Sphecidae (V). Crabroninae*

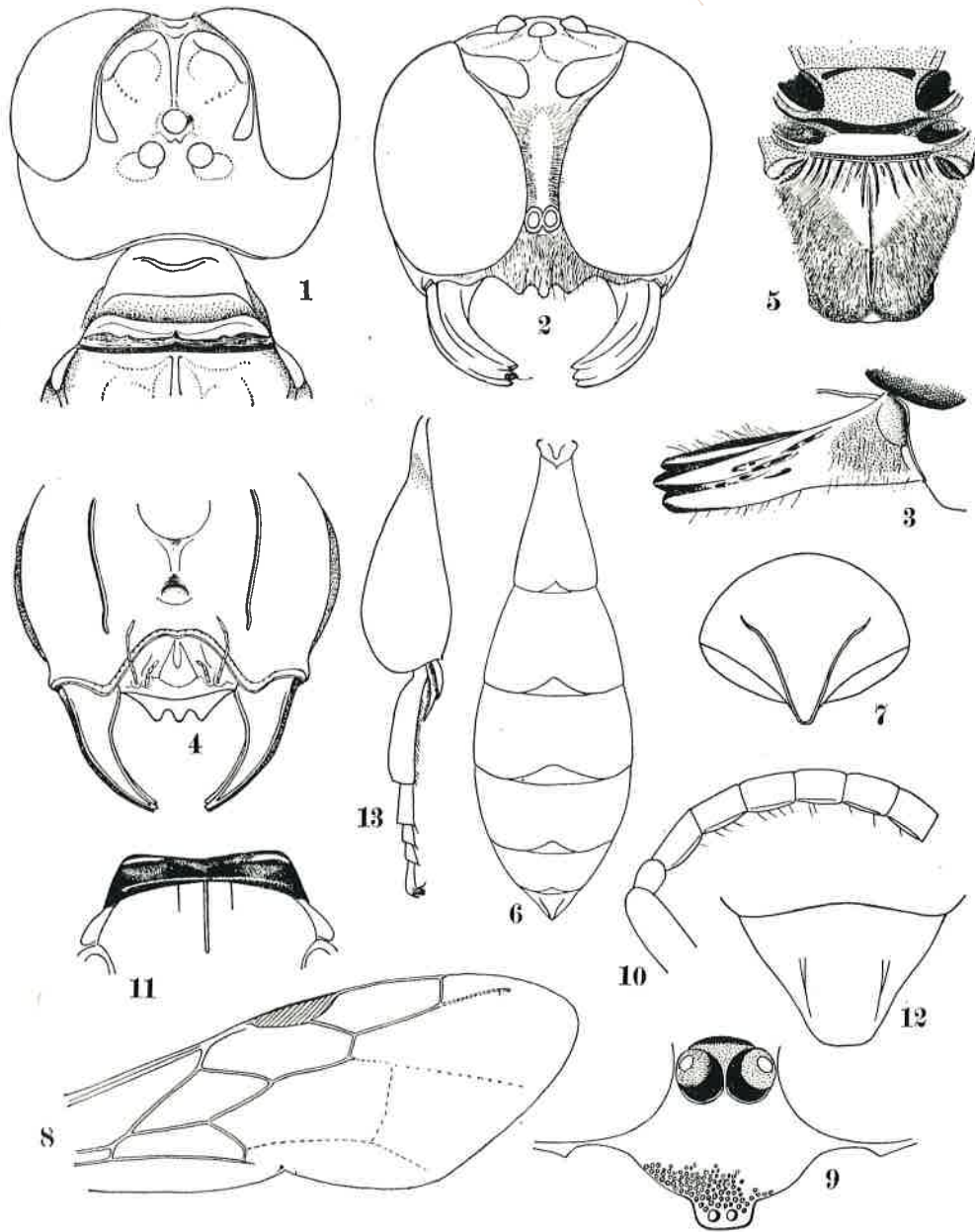
EXPLANATION OF PLATE II.

Figs. 1- 8. *Crossocerus* (*Alicrabro*, subgen. nov.) *rufiventris* sp. nov., ♀.

1. Head and pronotum.
2. Head seen in front.
3. Mandible.
4. Head seen from beneath.
5. Propodeum with scutellum and postscutellum.
6. Abdomen.
7. Pygidial area.
8. Wing venation.

Figs. 9-13. *Crossocerus* (*Ablepharipus*) *tsuifengensis* sp. nov., ♂.

9. Clypeus.
10. Antenna.
11. Pronotum.
12. Caudal tergite.
13. Hind tibia and tarsus.



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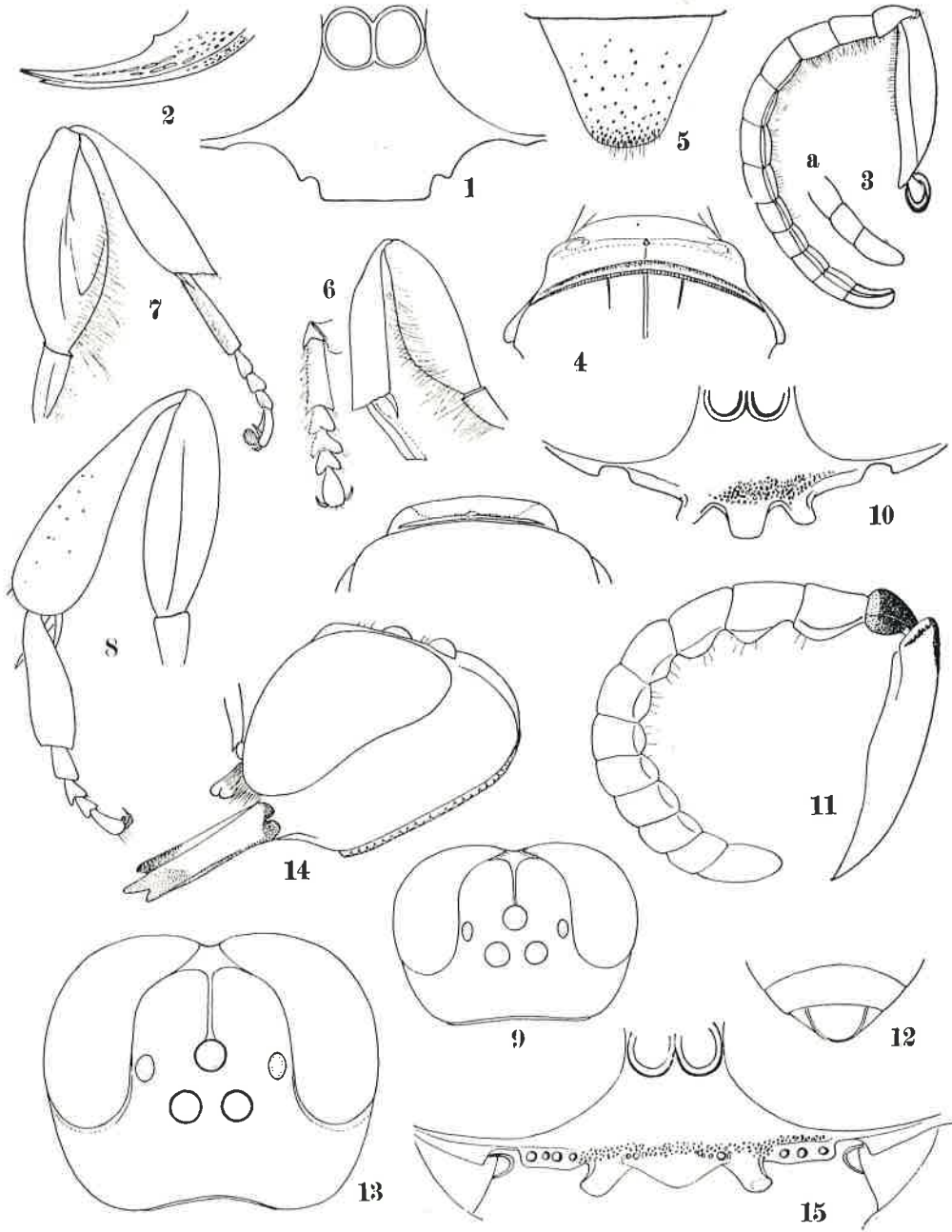
EXPLANATION OF PLATE III.

Figs. 1-8, *Crossocerus (Ablepharipus) taiwanus* sp. nov., ♂.

1. Clypeus.
2. Mandible.
3. Antenna (a, dorsal view of apical three joints).
4. Pronotum.
5. End tergite of abdomen.
6. Fore leg.
7. Mid leg.
8. Hind leg.

Figs. 9-16, *Crossocerus (Coelocrabro) nitidicorpus* sp. nov.

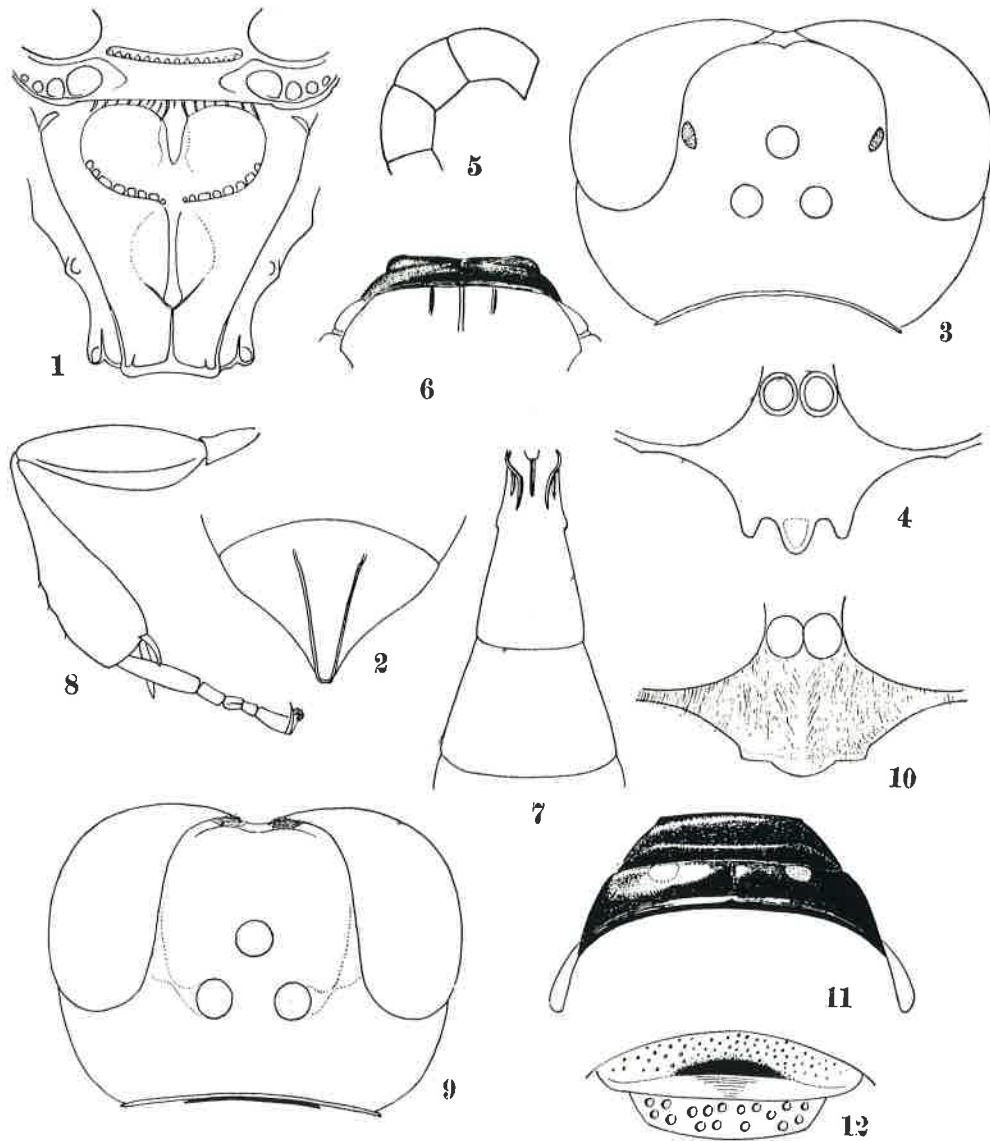
9. Head (♂).
10. Clypeus (♂).
11. Antenna (♂).
12. Pygidial area (♂).
13. Head (♀) seen from above.
14. Ditto seen in profile.
15. Clypeus (♀).
16. Pronotum (♀).



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EXPLANATION OF PLATE IV.

- Figs. 1-2. *Crossocerus (Coelocrabro) nitidicarpus* sp. nov., ♀.
1. Propodeum, with postscutellum.
2. Pygidial area.
- Figs. 3-8. *Crossocerus (Coelocrabro) tanoi* sp. nov., ♂.
3. Head seen from above.
4. Clypeus.
5. Apical three joints of antenna.
6. Pronotum.
7. Basal two segments of abdomen.
8. Hind leg.
- Figs. 9-12. *Crossocerus (Crossocerus) takasago* Tsuneki, ♂.
9. Head seen from above.
10. Clypeus.
11. Pronotum.
12. End tergite of abdomen.

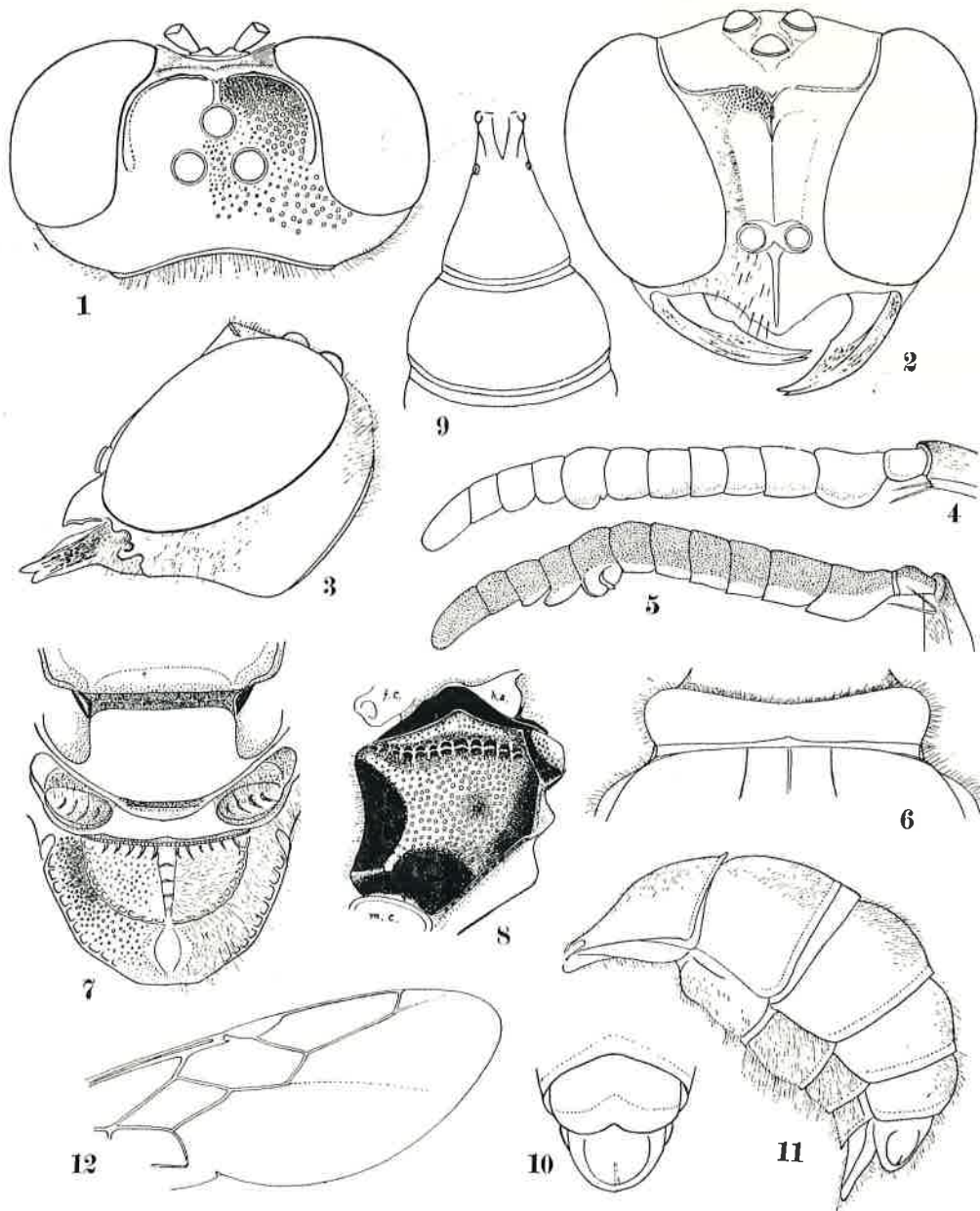


Tsuneki, K. *Formosan Sphecidae (V). Crabroninae*

EXPLANATION OF PLATE V.

Figs. 1-12. *Leclercqia* (gen. nov.) *formosana* sp. nov., ♂.

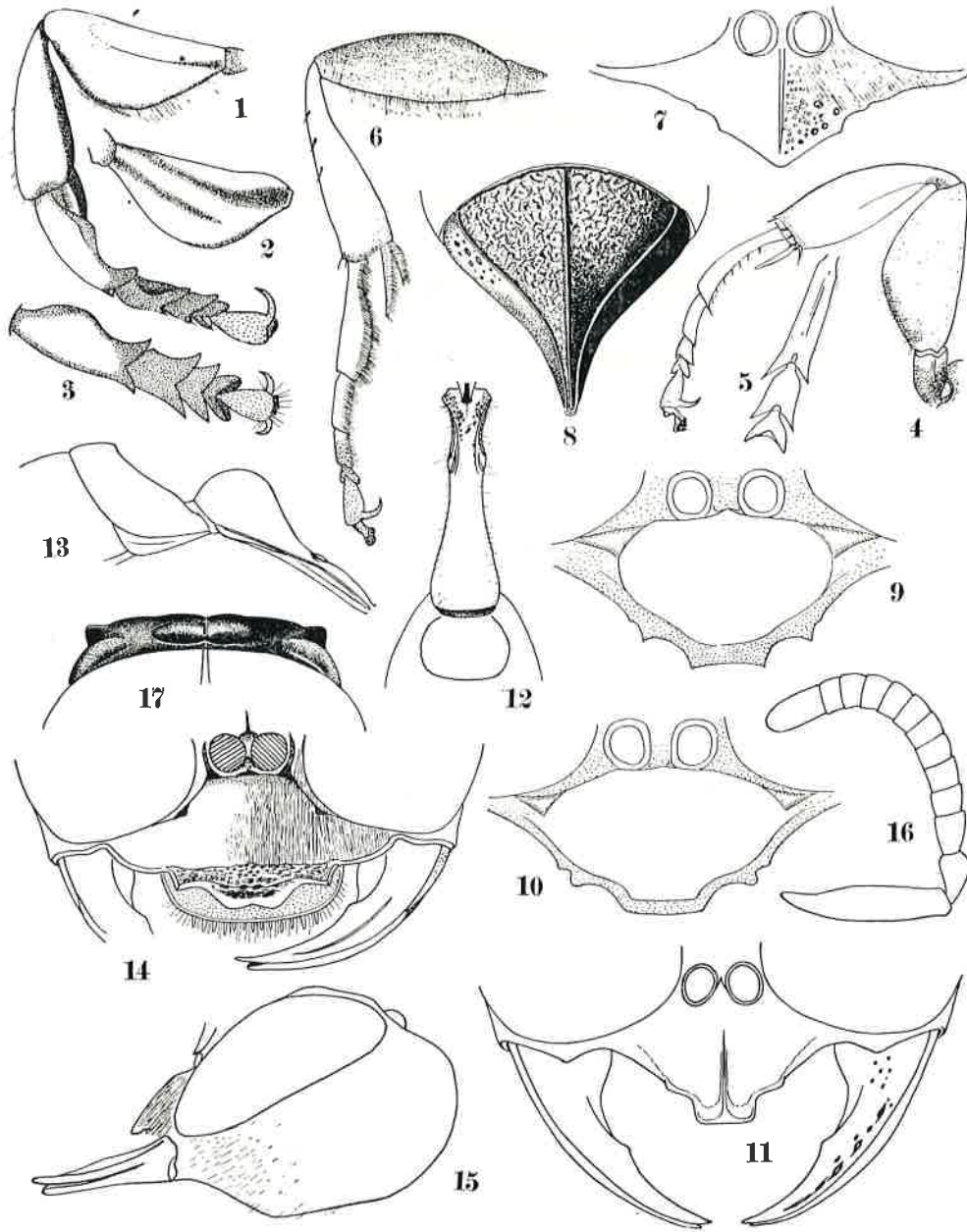
1. Head seen from above.
2. Head seen in front.
3. Head seen in profile.
4. Antenna (dorsal view).
5. Ditto (lateral view).
6. Pronotum.
7. Propodeum with scutellum and postscutellum.
8. Mesopleuron (f.c., fore coxa; m.c., mid coxa; h.a., humeral angle).
9. Basal two segments of abdomen.
10. Abdominal tergites 6 and 7.
11. Abdomen (lateral view).
12. Wing venation.



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EXPLANATION OF PLATE VI.

- Figs. 1-8. *Leclercqia* (gen. nov.) *formosana* sp. nov.
(1-6, ♂; 7-8. ♀)
1. Fore leg (from outside).
 2. Fore femur (from inside).
 3. Fore tarsus (seen in front).
 4. Mid leg (from outside).
 5. Mid tarsus (vertical view).
 6. Hind leg (posterior view).
 7. Clypeus.
 8. Pygidial area.
- Figs. 9-10. *Entomognathus* (*Koxinga*) *siraiya* Pate, 1944.
9. Clypeus (♂).
 10. Ditto (♀).
- Figs. 11-13. *Dasyproctus formosanus* sp. nov., ♂.
11. Clypeus.
 12. Basal two segments of abdomen.
 13. Ditto (lateral view).
- Figs. 14-17. *Rhopalum* (*Latrorhopalum*) *shirozui* Tsuneki, ♀.
14. Clypeus, mandibles and labrum.
 15. Head seen in profile.
 16. Antenna.
 17. Pronotum.



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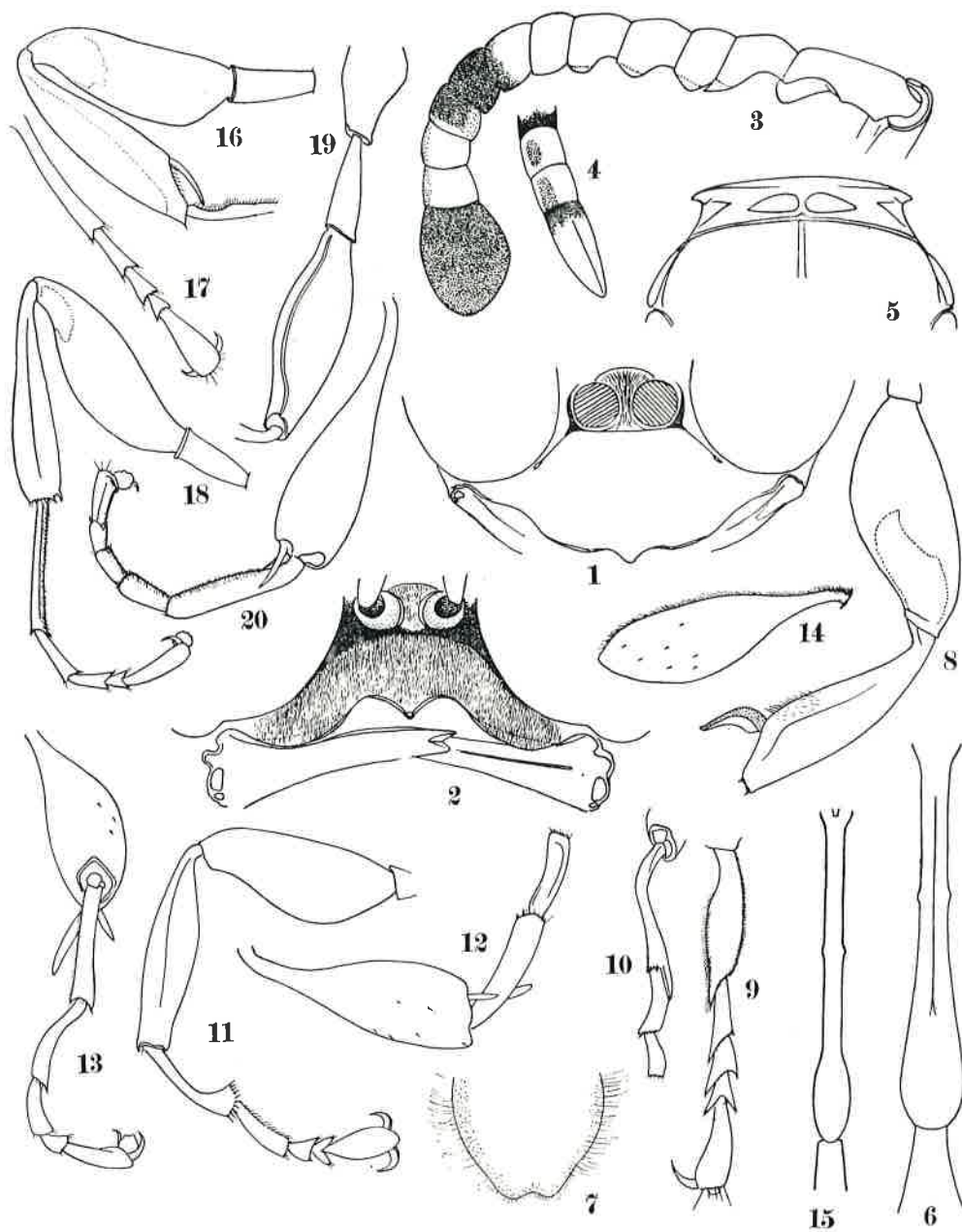
EXPLANATION OF PLATE VII.

Figs. 1-14. *Rhopalum (Latrorhopalum) changi* sp. nov., ♂.

1. Clypeus.
2. Ditto, seen from apex.
3. Antenna.
4. Ditto, apical three joints in lateral view.
5. Pronotum.
6. Petiole of abdomen.
7. Sternite 8 of abdomen.
8. Fore femur and tibia from outside.
9. Fore tarsus.
10. Ditto in lateral view.
11. Mid leg.
12. Hind tibia and basal two joints of tarsus.
13. Ditto, ful set in lateral view.
14. Right hind tibia in dorsal view.

Figs. 15-20. *Rhopalum (Latrorhopalum) taipingshanum* sp. nov., ♂.

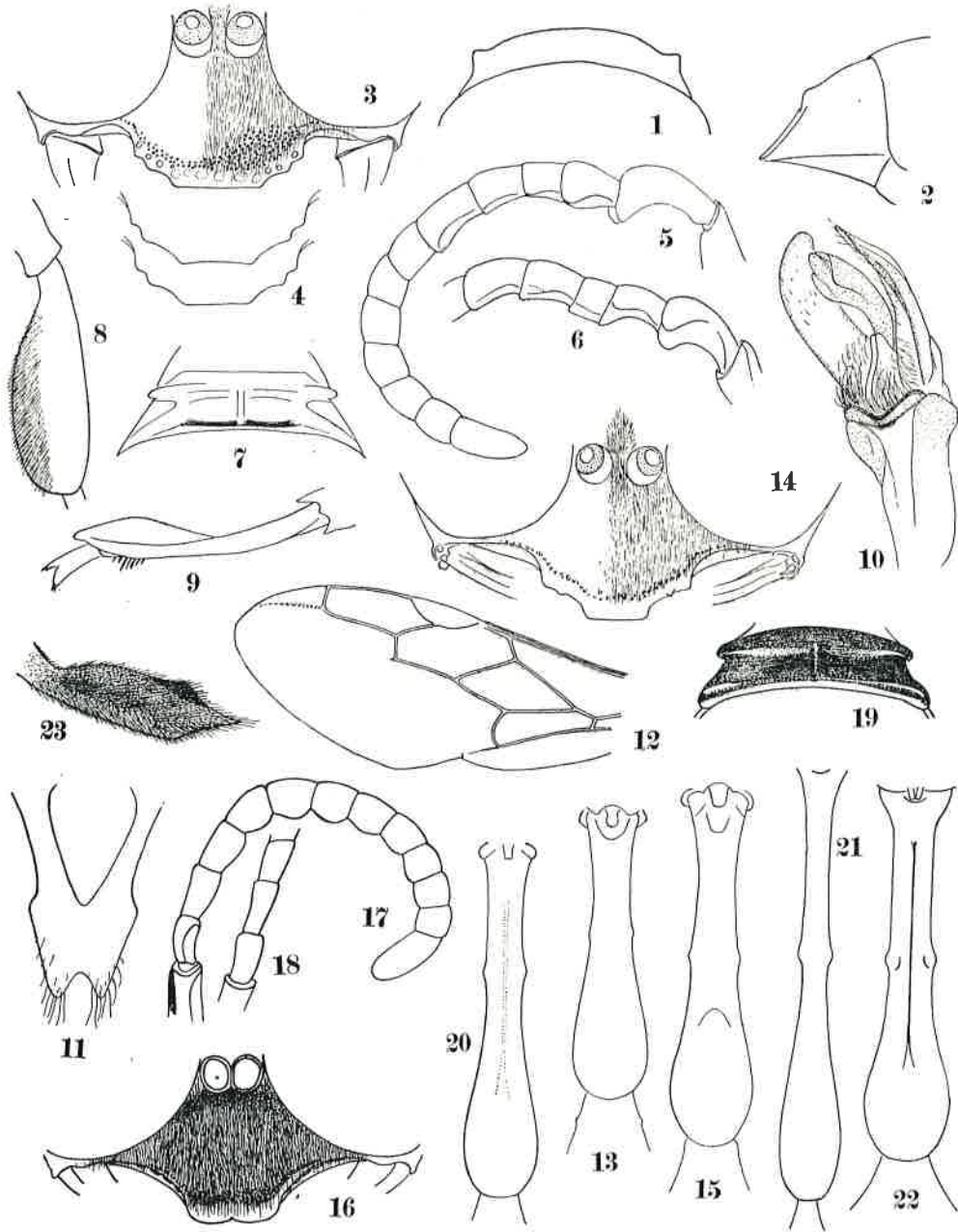
15. Petiole of abdomen.
- 16, 17. Fore leg.
18. Mid leg.
19. Hind leg.
20. Hind tibia and tarsus.



Tsuneki, K. *Formosan Sphecidae (V). Crabroninae*

EXPLANATION OF PLATE VIII.

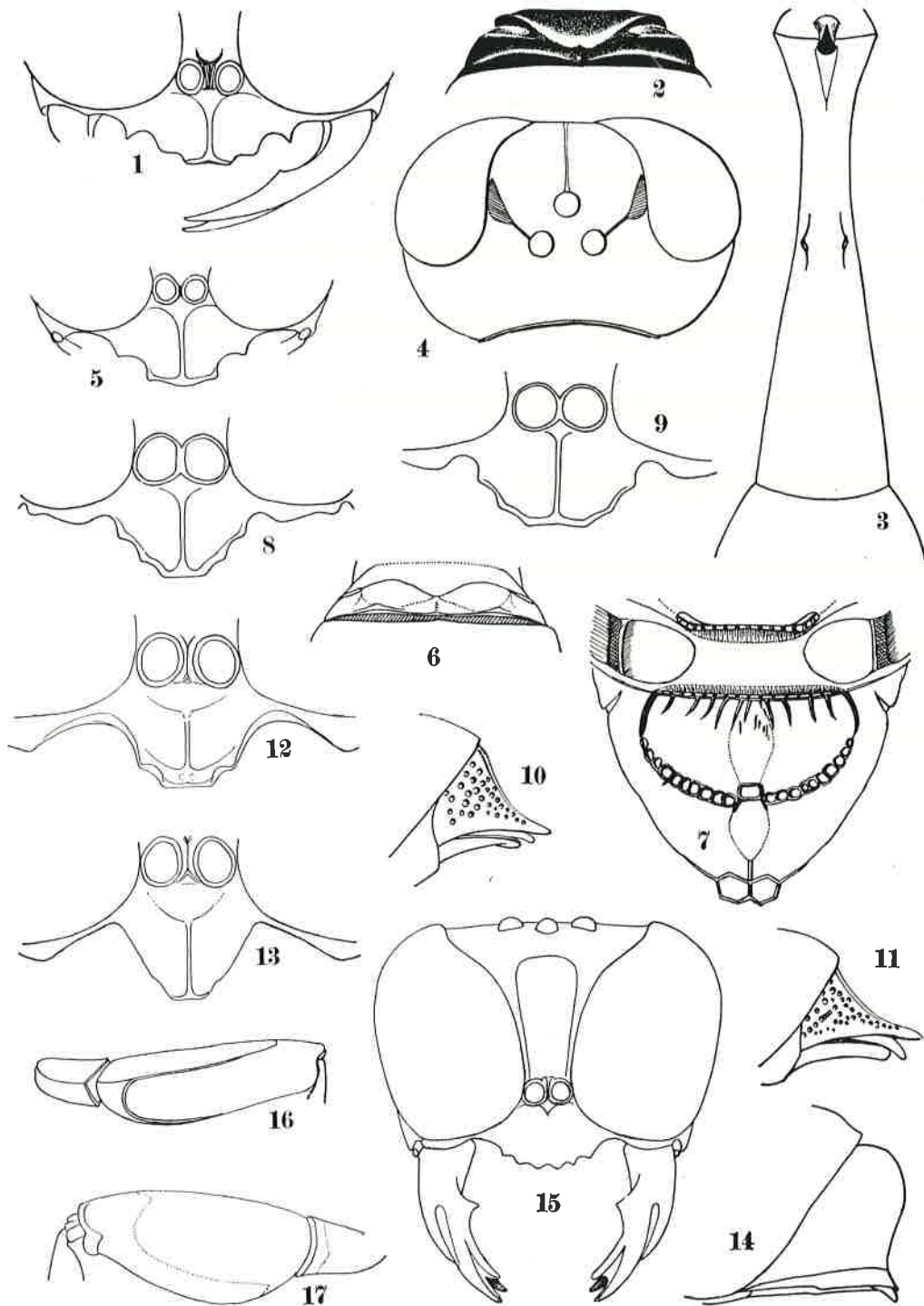
- Figs. 1, 2 and 20. *Rhopalum (Latrorhopalum) erraticum* sp. nov., ♀.
1. Pronotum seen obliquely from behind.
 2. Caudal segment of abdomen in lateral view.
 20. Petiole of abdomen.
- Figs. 3-15. *Rhopalum (Calceorhopalum) spinicollum* sp. nov.
(3-13, ♂; 14-15, ♀)
3. Clypeus.
 4. Ditto, variation.
 5. Antenna.
 6. Ditto, posterior view, somewhat from beneath.
 7. Pronotum.
 8. Fore metatarsus.
 9. Ditto, lateral view.
 10. Genitalia.
 11. Abdominal sternite 8.
 12. Fore wing.
 13. Petiole of abdomen.
 14. Clypeus.
 15. Petiole of abdomen.
- Figs. 16-19. *Rhopalum (Latrorhopalum) taipingshanum* sp. nov., ♂.
16. Clypeus.
 17. Antenna.
 18. Ditto, dorsal view.
 19. Pronotum.
- Figs. 21-22. *Rhopalum (Latrorhopalum) shirozui* Tsuneki.
21. Petiole of abdomen (♂).
 22. Ditto (♀).
- Figs. 23. *Rhopalum (Calceorhopalum) formosanum* Tsuneki, ♂.
23. Fore metatarsus, frontal view.



Tsuneki, K. *Formosan Sphecidae (V). Crabroninae*

EXPLANATION OF PLATE IX.

- Figs. 1-3. *Crossocerus (Apocrabro) aëta loa* Pate, ♂.
1. Clypeus.
 2. Pronotum.
 3. Abdominal petiole.
- Figs. 4-7. *Crossocerus (Coelocrabro) hirashimai* Tsuneki, ♂.
4. Head from above.
 5. Clypeus.
 6. Pronotum.
 7. Propodeum with postscutellum.
- Figs. 8 and 10. *Ectemnius (Hypocrabro) schlettereri sakaguchii* Mats. et Uch., ♀.
8. Clypeus.
 10. Pygidial area in lateral view.
- Figs. 9 and 11. *Ectemnius (Hypocrabro) schlettereri schlettereri* Kohl, ♀.
9. Clypeus.
 11. Pygidial area in lateral view.
- Figs. 12-14. *Ectemnius (Cameronitus) orius cetonicus* Leclercq.
12. Clypeus (♀).
 13. Clypeus (♂).
 14. Caudal segment of abdomen (♂).
- Figs. 15-17. *Ectemnius (Cameronitus) albomaculatus* Tsuneki (♀).
15. Head seen in front.
 16. Fore femur.
 17. Mid femur.



Tsuneki, K. *Formosan Sphecidae (V). Crabroninae*

EXPLANATION OF PLATE X.

Figs. 1- 4. *Rhopalum (Latrorhopalum) erraticum* sp. nov., ♀.

1. Head seen from above.
2. Clypeus.
3. Pronotum seen from above.
4. Hind leg.

Figs. 5-13. *Rhopalum (Latrorhopalum) shirozui* Tsuneki, ♂.

5. Head seen from above.
6. Head seen in front.
7. Apical margin of clypeus.
8. Antenna.
9. Pronotum and mesonotum.
10. Fore metatarsus.
11. Mid metatarsus.
12. Genitalia from beneath.
13. Eighth sternite.

Figs. 14-18. *Rhopalum (Calceorhopalum) formosanum* Tsuneki.

14. Clypeus (♀).
15. Abdominal petiole.
16. Clypeus (♂).
17. Antenna (♂).
18. Fore metatarsus.

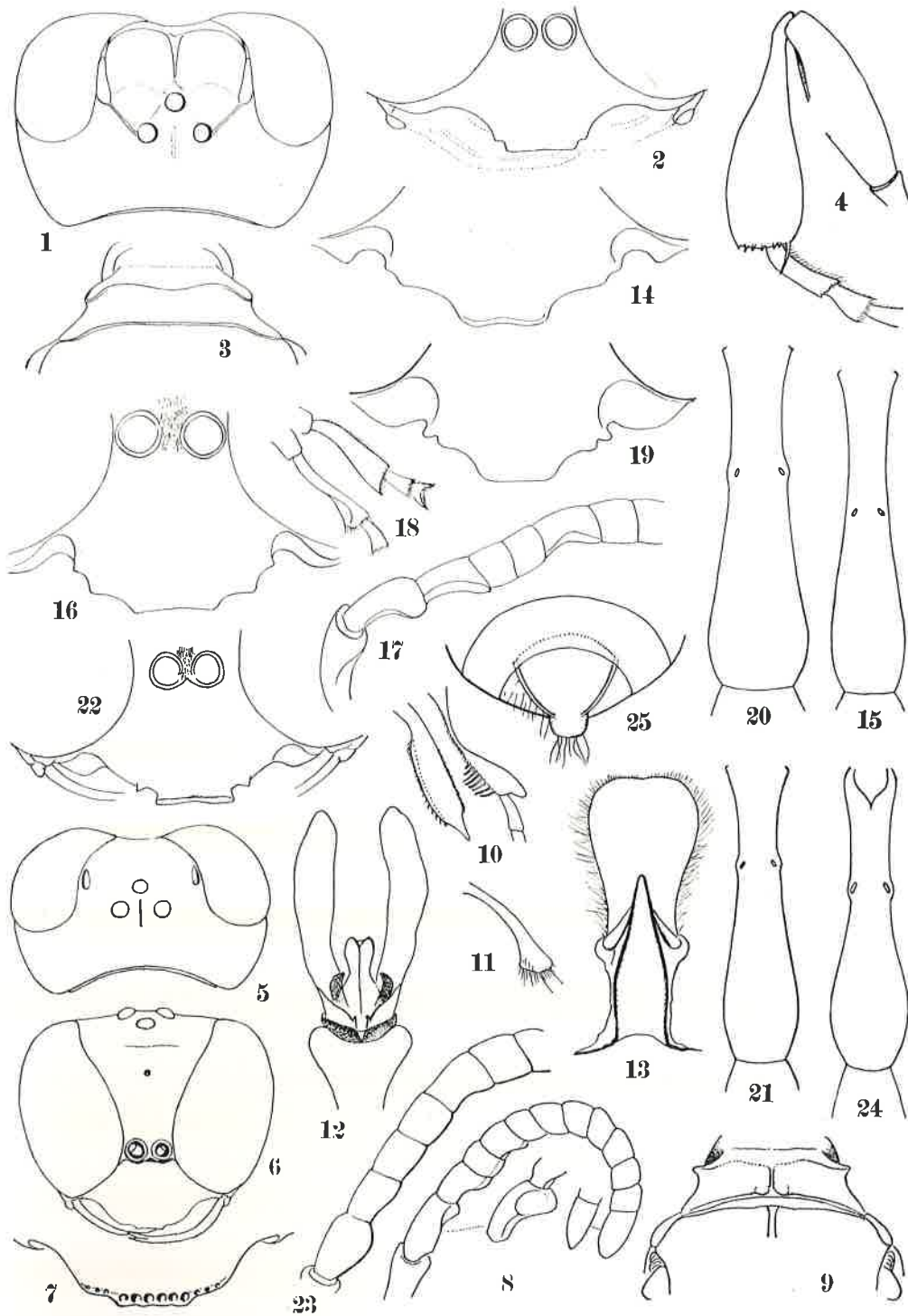
Fig. 19. Clypeus of *Rh. (Calceorh.) calceatum* and *bohartorum* (♀).

Fig. 20. Petiole of *Rhopalum calceatum* Tsuneki (♀).

Fig. 21. Petiole of *Rhopalum bohartorum* Tsuneki (♀).

Figs. 22-25. *Rhopalum (Rhopalum ?) tyarum* Tsuneki, ♂.

22. Clypeus.
23. Antenna.
24. Petiole of abdomen
25. Apical two segments of abdomen.



Tsuneki, K. Formosan Sphecidae (V). Crabroninae