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CONTRIBUTION TO THE KNOWLEDGE OF CRABRONINAE FAUNA OF FORMOSA AND THE RYUKYUS (HYMENOPTERA, SPHECIDAE)

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CONTRIBUTION TO THE KNOWLEDGE OF CRABRONINAE FAUNA OF FORMOSA AND THE RYUKYUS (HYMENOPTERA, SPHECIDAE)*

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Little has been known concerning the Crabroninae fauna of Formosa and the Ryukyus. So far as I am aware, only 12 species have been recorded from Formosa and 3 species from the Ryukyus. During the present investigation 9 species of Crabroninae were examined in the collection of the Formosan wasps and 5 species from that of the Ryukyus, of which 6 species are new to the fauna of Formosa and 4 species to that of the Ryukyus. The specimens of Formosa[1] belong to the Entomological Laboratory of the Kyushu University and were mainly collected by Professor T. Shirozu, a well known Lepidopterist, during his recent journey to Formosa. The Ryukyu specimens derive from the collection[2] of the Bernice P. Bishop Museum, Honolulu, as well as from that[1] of the Kyushu University.

The author wishes to express his thanks to the curators of the collections and to the collectors of the specimens to enable him to study these interesting specimens.

The species of Crabroninae described or recorded heretofore from Formosa and the related references are as follows:

(1) *Piyuma prosopoides* (Turner, 1908)
Crabro (*Crossocerus*) *iwatai* Yasumatsu, Mushi, 14 (2) : 88, 1942; *Piyuma koxinga* Pate, Amer. Midl. Nat., 31 (2) : 357, 1942; *Piyuma iwatai* : Leclercq, Bull. Ann. Soc. R. Ent. Belg., 87 (1-2) : 51, 1951; *Piyuma marklingi* : Leclercq, Ibid., 99 (1) : 59, 1963. (See also Leclercq, 1956, p. 1-4; Tsuneki, 1963a, p. 39-40.)

(2) *Crossocerus* (*Microcrabro*) *melanochilos* Pate. 1943
Crossocerus (*Yuchiha*) *melanochilos* Pate, Lloydia, 6 (4) : 277, 1943.

(3) *Crossocerus* (*Apocrabro*) *aeta* Pate, 1943
Crossocerus (*Apocrabro*) *loa* Pate, Lloydia, 6 (4) : 287, 1943.

(4) *Dasyproctus ceylonicus* Saussure, 1867
Dasyproctus ceylonicus : Leclercq, Bull. Ann. Soc. R. Ent. Belg., 92 (9-10) : 614, 1956; *Dasyproctus ceyonicus* : Tsuneki, Ins. Mats., 22 (3-4) : 96, 1959.

(5) *Dasyproctus buddha* (Cameron, 1889)
Dalsyproctus buddha : Tsuneki, Ins. Mats., 22 (3-4) : 97, 1959.

(6) *Lestica* (*Solenius*) *constricta* Krombein, 1949
Crabro (*Ceratocolus*) *quadriceps* : Yasumatsu (nec Bingham, 1897), Mushi, 14 (2) : 90, 1942; *Lestica* (*Solenius*) *constricta* Krombein, Proc. Hawaii. Ent. Soc., 13 (3) : 389, 1949.

(7) *Ectemnius* (*Iwataia*) *furuichii* (Iwata, 1934)
Ectemnius (*Iwataia*) *furuichii* : Tsuneki, Kontyu, 28 : 240, 1960.

(8) *Ectemnius* (*Metacrabro*) *chrysites* (Kohl, 1892)
Crabro (*Crabro*) *chrysites* : Kohl, Ann. k. k. naturhist. Hofmus., Wien, 24 : 46, 1915.

(9) *Ectemnius* (*Hypocrabro*) *schlettereri sakaguchii* (Matsumura et Uchida, 1926)
Ectemnius (*Hypocrabro*) *schlettereri sakaguchii* : Tsuneki, Ins. Mats., 22 (3-4) : 98, 1959; ? *Ectemnius* (*Hypocrabro*) *schlettereri* : Leclercq, Bull. Ann. Soc. R. Ent. Belg., 99 (1) : 32, 1963.

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1) Japan-U. S. Co-operative Science Program.

2) Japan-U. S. Co-operative Science Program (in part).

(10) *Ectemnius* (*Cameronitus*) *palitans* (Bingham, 1896)
Ectemnius (*Cameronitus*) *palitans* : Tsuneki, Ins. Mats., 22 (3-4) : 98, 1959.

(11) *Entomognathus* (*Koxinga*) *siraiya* Pate, 1944
Entomognathus (*Koxinga*) *siraiya* Pate, Amer. Midl. Nat., 31 (2) : 341, 1944.

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

The species of Crabroninae described or recorded from the Ryukyus heretofore and the related references are as follows:

(1) *Ectemnius* (*Metacrabro*) *chrysites* (Kohl, 1892)
Crabro (*Crabro*) *chrysites* : Yasumatsu, Mushi, 14 (2) : 87, 1942 : *Ectemnius* (*Metacrabro*) *chrysites* : Tsuneki, Life Study, 6 (1) : 7, 1962.

(2) ? *Ectemnius* (*Hypocrabro*) *laevigatus* Destefani, 1884
Crabro (*Solenius*) *laevigatus* : Yasumatsu, Mushi, 14 (2) : 88, 1942. (This may be *Ectemnius rubicola*, see Tsuneki, Life Study, 2 (3) : 18, 1958)

(3) *Ectemnius* (*Hypocrabro*) *schlettereri sakaguchii* (Matsumura et Uchida, 1926)
Crabro sakaguchii Mats. et Uch., Ins. Mats., 1 (1) : 38, 1926; *Ectemnius* (*Hypocrabro*) *schlettereri sakaguchii* : Tsuneki, Akitsu, 8 (1) : 8, 1959.

The species examined in the present investigation are as follows:

(1) *Crossocerus* (*Apocrabro*) *aeta* Pate, 1943 ..... Formosa
(2) *Crossocerus* (*Crossocerus*) *takasago* sp. nov. ..... Formosa
(3) *Crossocerus* (*Coelocrabro*) *hirashimai* sp. nov. ..... Is. Amami-Ohshima
(4) *Crossocerus* (*Cuphopterus*) *hakusanus* Tsunaki, 1954 ..... Is. Amami-Ohshima
(5) *Ectemnius* (*Hypocrabro*) *schlettereri* (Kohl, 1888) ..... Is. Amami-Ohshima
(6) *Ectemnius* (*Hypocrabro*) *schlettereri sakaguchii* (Matsumura et Uchida) ..... Is. Okinawa
(7) *Ectemnius* (*Clytochrysus*) *nigrifrons* (Cresson, 1865) ..... Formosa
(8) *Ectemnius* (*Cameronitus*) *orius cetonicus* Leclercq, 1958 ..... Formosa
(9) *Ectemnius* (*Cameronitus*) *flavohirtus* Tsuneki, 1954 ..... Formosa
(10) *Ectemnius* (*Cameronitus*) *albomaculatus* sp. nov. ..... Is. Amami-Ohshima
(11) *Dasyproctus ceylonicus* Saussure, 1867 ..... Formosa
(12) *Rhopalum* (*Latrorhopalum*) *shirozui* Tsuneki. 1965 ..... Formosa
(13) *Rhopalum* (*Calceorhopalum*) *formosanus* sp. nov. ..... Formosa
(14) *Rhopalum* (*Calceorhopalnm*) *bohartum* sp. nov. ..... Is. Ishigaki
(15) *Rhopalum* (*Rhopalum*) *tayarum* sp. nov. ..... Formosa

DESCRIPTIONS AND RECORDS OF THE SPECIES

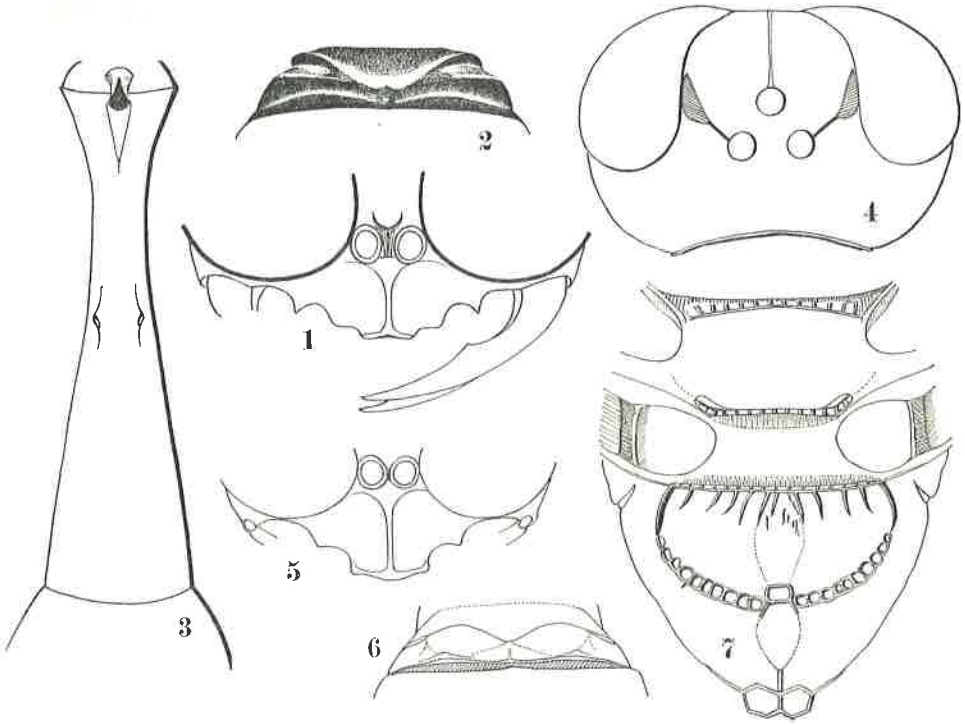
(1) *Crossocerus* (*Apocrabro*) *aeta* Pate, 1943

Crossocerus (*Apocrabro*) *aeta* Pate, Lloydia, 6 (4) : 285, 1943 (Philippines).
Crossocerus (*Apocrabro*) loa Pate, Ibid., p. 287. 1943 (Formosa).
Crossocerus (*Apocradro*) *aeta* : Leclercq, Bull. Ann. Soc. R. Ent. Belg., 99 (1) : 4, 1963

Specimen examined : 1 ♂, Nantou Hsien (Nanshanchi), Formosa, 20. VI. 1965, T. Shirozu leg.

Remarks. Crossocerus aeta and *loa* were originally described as distinct species, but recently Leclercq considered the latter as a synonym of the former basing upon the specimens from Borneo, Malaya, Philippines and India. A single specimen as it is the Formosan specimen at hand seems to support his opinion. Of course, it agrees better in characters with the description of *C. loa* than that of *aeta*, but is not completely so in some details:

The size is slightly larger (about 7.5 mm), fulvous colour much more restricted (palpi and front tibial spurs only); mandibles black, with a reddish brown fleck near apex. Legs black with flavescent hairs on tarsi, mid and hind calcaria yellowish brown. Antennal joint 1 black with extreme base and apex brownish. Wing tegulae slightly yellowish black. Supra-clypeal prominence



Figs. 1–7. 1–3, *Crossocerus* (*Apocrabro*) *aeta* Pate, ♂. 1, lower part of face. 2, pronotum. 3, abdominal petiole. 4–7, *Crossocerus* (*Coelocrabro*) *hirashimai* sp. nov. 4, head. 5, clypeus. 6, pronotum. 7, scutellum-propodeum.

low, above deeply roundly excavated; mandibles with a broad triangular tooth toward middle (Fig. 1), end of occipital carina produced (but not raised) into an acute tooth. Clypeus (agrees in general) : Fig. 1. Pronotum : Fig. 2. Area dorsalis on propodeum distinctly defined by the general elevation, but the marginal furrow weak and incomplete, sculpture generally as in *loa*; lateral carinae separating dorsal and posterior aspects from the sides of the segment very strong and distinct. petiole of abdomen : Fig. 3. punctures on upper front and vertex very fine and sparse, on mesonotum, scutellum slightly larger but similarly sparse.

(2) *Crossocerus* (*Crossocerus*) *takasago* sp. nov.

The male of this species is very closely allied to *Crossocerus* (*Crossocerus*) *elongatulus* Van der Linden, the relation seems similar to that born by *Crossocerus* (*Crossocerus*) *ardens* Cameron of India to *Cr.* (*Cr.*) *wesmaeli* Van der Linden (Leclercq, 1956, p. 220). According to the distinguishing key of Kohl (1915) it runs straight to *C. elongatulus* (and *distinguendus*), with some inconsistency on the colour and punctuation. In the direct comparison of the specimens both the male and female differ from this species from some structural characters and the female also differs from the allied Indian *ardens* (female only is known) at least in the structure of the propodeum, just as in *elongatulus* from *wesmaeli*.

♂. Length about 5.8 mm. Black. Yellow are : Antennal joint 1 in front, two spots on pronotum, a fleck on wing base, front tibiae in front except apex, a streak not reaching apex of mid and hind tibiae. Mandibles apically reddish brown, palpi and tarsal spurs ferruginous; tarsi dark brown. The general structure resembles either of the two palaearctic species compared. The differences:

Vertex and upper front not so convex as in *wesmaeli*, in this respect rather similar to *elong.*, but ocellar region not so raised as in this, generally flattened, the state of frontal marks (frontal impressions) as in the two species, OOD : POD=3 : 2, punctuation very much finer and sparser than in these, rather similar to that of *C. ardens* Cam., only on the inclining area of upper front to lower front somewhat large and close; clypeus as in *wesm.*, but the apical tridentate structure (the teeth rather obtuse) much more distinct and the vestiture not so abundant and long, hence the apical margin comes out of the vestiture and well visible. Antennal joints not roundly swollen as in *elong.* and the covering pubescence much shorter than in *wesm.*, lower fringe of hairs on basal portion rather indistinct, in addition basal several joints slightly longer, joint 3 about 1.7 times as long as wide at apex (in *wesm.* 1.3 times or less, in *elong.* about 1.5 times). Collar of pronotum slightly more developed than in *wesm.*, lateral angles roundly, somewhat more broadly stretched anteriorly, but not so as in *elong.* and not reflected. Mesonotum with punctures larger than in *wesm.* but finer as compared with *elong.*, with density similar to that of *elong.*, interspace very minutely (60×) coriaceous, not shining; posterior margin broadly crenate, crenules uniform, equidistant on the median region, closer on the side, not concentrated on the medial region, not medianly longer nor foveolate. On propodeum area dorsalis completely marginated, antero-laterally by the longitudinal carina and on the remaining area by the fine crenate furrow, the furrow is finer and the crenae shorter than in the compared two and not foveolate; the area at base crenate and in middle broadly furrowed, the furrow somewhat egg-shaped, with a longitudinal carina in middle and narrowed into a fine groove apically, and sparsely crenate, then it extended to posterior aspect. The surface of the area dorsalis smooth and shining, only a few fine striae on lateral portions, not so closely striate as in the two compared; posterior aspect also smooth (very weakly transversely striate antero-laterally and in the median furrow), but with a few strong transverse striae on the apical portion; lateral carinae separating the dorsal and posterior aspects from the sides of the segment distinct, on both sides shortly costate, but not accompanied with the furrow; sides of the segment longitudinally somewhat obliquely, finely closely striate. Structure and punctuation of caudal tergite as in *elong.*, in form transverse, with markedly coarse punctures sparsesly scattered.

♀. Also similar to the two species above mentioned. In the colour of thorax and legs it rather similar to *wesm.*, in the punctuation of head and thorax it closely resembles *C. ardens* Cam. occurring in India. But from both of them it differs in the structure of the propodeum as in ♂. Lenth 5.7 mm. Black with the following portions suffused yellow : Antennal joint 1 in front and at extreme apex, pronotum except discoloured posterior margin and median notch cut in from behind, humeral angles, a large macula on scutellum occupying anterior 2/3, a part on wing base (not tegulae), apex of femora and anterior side of tibiae of front legs, and mid and hind tibiae externally except narrow apical portions. Mandibles ferruginous on apical half, much reddish at apex, palpi and all tibial spurs pale ferruginous. Tegulae, veins and stigma of wings, and front and mid tarsi dark brown.

Vertex much more shining than in *wesm.*, owing to finer and sparser punctures, oblique smoothed frontal marks (frontal impressions) on oculocellar line less distinct accordingly, anterior portion of upper frons slightly more grossly and densely punctured, OOD : POD=4 : 3 (as in *elong.*, in *wesm.* subequal), groove between postocelli shallower and less distinct than in the two species

compared; clypeus as in *wesm.* (medial protuberance narrower than in *elong.*); antennal joint 3 about 2.1 times as long as broad at apex, structure of thorax as in *wesm.* Area dorsalis on propodeum well marginated by crenate furrow, but the furrow cut off soon behind antero-lateral corners by the area of oblique fine close striae, other structure as in ♂, structure of posterior aspect also as in ♂. Mesopleuron very finely and sparsely punctured, shining, suture between meso- and metapleuron crenulate, metapleuron smooth and polished with a few longitudinal striae on lower portion, sides of propodeum polished. Abdomen including the structure and punctuation of pygidial area as in *wesm.*, but the colour of anal segment as in *elon.* Legs and wing venation as in *wesm.*

Holotype : ♂, Chiayi Hsien (Arishan, 2300 m), Formosa, 9.IV.1965, Y. Hirashima leg. (left antenna from joint 2 apically lost) (Coll. Kyushu Univ.).

Paratype : ♀, Tainan Hsien (Kuantzuling), Formosa, 7.IV.1965, T. Shirozu leg. (Coll. Kyushu Univ.).

3. *Crossocerus* (*Coelocrabro*) *hirashimai* sp. nov.

♂. Abdomen immaculated, legs all normal, clypeus on anterior margin in middle, roughly say, tridentate, antennae and abdomen normal, area dorsalis marginated by furrow, without precoxal process on mesopleuron, front tibiae, mid femora and tibiae with ferruginous semitransparent streak, all tarsi extensively whitish.

By the combination of above characters this species can be separated from other known species of the subgenus.

Length 6.5 mm (paratype 5.3 mm). Black with aeneous shimmer on vertex and mesonotum. Antennal scape in front (medially narrowed by dark brown), humeral angles, a fleck on wing base, all tibiae at base externally whitish yellow; front and mid tarsi except apical joint, basal half of hind metatarsi semitransparent yellowish white; mandibles apically reddish brown; front tibiaee xcept above and beneath, mid femora and tibiae except above and beneath, tibial spurs and apex of end tergite pale brown; remaining joints of tarsi, tegulae, veins and stigma of wings dark brown. Wings hyaline, strongly iridescent, apically slightly darkened. especially strongly so on anterior half of radial cell.

Head from above : Fig. 4, OOD : POD : OCD=7 : 4 : 9, frontal medial furrow distinct from anterior ocellus, narrow and deep, frontal marks not impressed, glittering pitchy black, a fine similarly glittering line connecting the mark with postocellus. Head in front with ratio of width to length approximately 5 : 4, oculo-antennal space null, clypeus (Fig. 5) medianly carinated, with a blunt tooth on lateral margin, medio-apical margin broadly rounded with the sides slightly roundly produced. Antennal flagella beneath somewhat flattened, glabrous, fringed with comparatively long curved pubescence, each joint subcylindric, joint 3 about twice as long as broad at apex, succeeding joints progressively reducing in length apically, joint 10 approximately as long as wide, ultimate joint 1.5 times as long as penultimate joint or the width at its base. Collar of pronotum characteristic in form (Fig. 6), anteriorly not distinctly bordered, especilly on the median region broadly so, but to speak from the reflection of the light, anterior margin rounded and medianly broadly roundly emarginate, posterior margin nearly straight and carinated, accompanying a narrow groove in front, the carina incrassate on both sides of medial feeble incision and attenuating towards the sides, the surface medially roundly raised and on both sides of the elevation slightly depressed, flattened and broadened, and again narrowed laterally, with the antero-lateral angles bluntly carinated. Mesonotum raised high above the level of pronotum, markedly convex, slightly impressed along median scutal line which reaches approximately a third of the scutum,

parapsidal sutures indistinct, carinae at the lateral margins and axillae strong and high, posterior portion markedly roundly inclined posteriorly, but without crenulae; scutellum raised to the level of axillal carinae, about twice as wide as long, postscutellum with a deep lunate impression in front; mesopleuron without precoxal process. Propodeum with area dorsalis well marked off by the feebly crenulate furrow, having broad shallow median impression, the area very large, more than as large as scutellum (Fig. 7) and the posterior portion incorporated within the range of posterior inclination of the segment, median furrow posteriorly narrowed and excavated by a large fovea, then it continued to the median deep broad furrow of the posterior inclination and runs for 2/3 of the aspect, on apical third the furrow replaced by the median carina; lateral carinae absent, only on apical portion weakly defined. Abdomen with segment 1 longer than wide, each tergite weakly constricted before apex, caudal tergite triangular, with apex rounded, without pygidial area. Legs normal, hind tibiae in form as in *C. pubescens*, base of a few spines shortly produced into a tubercle. Radial cell of fore wing with accessory cell, fairly distinctly marked off.

Punctures on vertex very fine and sparse, nearly impunctate, on frons slightly larger, closer, but interspaces far larger than points, punctuation on mesonotum as on frons, on scutellum, postscutellum and mesopleuron finer and sparser. Area dorsalis smooth and polished, at base coarsely obliquely striate, on median furrow sometimes a few longitudinal striae observable, never with transverse costulae, marginal furrow posteriorly crenate or foveolate, anteriorly accompanying strong carina and not foveolate; posterior inclination polished upwards, with very fine sparse punctures, laterally on the bordering area to the sides of the segment finely weakly wrinkled, in holotype downwards transversely finely closely rugose, in paratype rugae very sparse; sides smooth and polished, on postero-ventral region obliquely rugoso-striate. Abdominal tergites with sparse very fine punctures. Vestiture normal, on clypeus silvery, abdominal sternites with apical fringe of hairs.

Holotype : ♂, Amami-Ohshima Is. (Yuwan-dake), 29. VII. 1963, Y. Hirashima leg. (Kyushu Univ. Coll.)

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

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

Crossocerus (*Blepharipus*) *hakusanus* Tsuneki, Mem. Fac. Lib. Arts, Fukui Univ., II, 3 (3) : 74, 1954 (♂).
Crossocerus (*Cuphopterus*) *hakusanus* : Tsuneki, Life Study, 3 (4) : 67 (♂), 73 (♀), 1959.

Specimen examined : 1 ♂, Amami-Ohshima Is. (Yuwan), 31. VII. 1963, Y. Hirashima leg. (Coll. Kyushu Univ.)

Remarks. The specimen is more brightly coloured than those captured in Honshu. Besides the usual white maculae it is adorned on the pronotum with a medianly interrupted band, on the postscutellum with a large macula occupying nearly whole the area and on each side of tergite 3 with a spot and on tergite 6 with two transverse large maculae. The first segment of the abdomen is more extensively maculated with white (rather to say that ground colour white with a blackish macula in the middle and on apical margin).

On this occasion I reexamined the 24 male specimens of *C. hakusanus* in my cabinet which were collected in central and northern Honshu and could confirm the following variation in maculation of the body in this species (annexed Table) :

The maculae on the pronotum are mainly two short transverse spots and those of the postscutellum a series of small rather indistinct spots. On none of the specimens could I find the macula on tergites 5 and 6. On the other hand, in one of the specimens a macula was found on tergite

2, and in two on tergite 4.

At any rate, it seems interesting that maculation is more extensively developed in the Ryukyu specimen.

Table 1. White maculae on the body of *Crossocerus hakusanus*.

Portion	Pronotum	Postscutullum	Tergite 2	Terg. 3	Terg. 4	Terg. 5	Terg. 6
Presence	7	5	1	14	2	–	–
Absence	17	19	23	10	22	24	24
Ex. Amami Is.	*	*	–	*	–	–	*

5. *Ectemnius* (*Hypocrabro*) *schlettereri* (Kohl, 1888)

Crabro (*Solenius*) *schlettereri* Kohl, Verh. zool.-bot. Ges. Wien, 38 : 135, 1888 (♀).
Crabro (*Solenius*) *chinensis* Sickmann, Zool. Jahrb., Syst., 8 : 199, 1895 (♀♂).
Crabro (*Crabro-Solenius*) *schlettereri* : Kohl, Ann. k. k. naturhist. Hofmus. Wien, 29 : 72, 1915 (♀♂).
Ectemnius (*Hypocrabro*) *schlettereri* : Leclercq, Monogr. Crabro., p. 270, 1954.
Ectemnius (*Hypocrabro*) *schlettereri* : Tsuneki, Life Study, 2 (3) : 17, 1958.

Specimen examined : 1 ♂, Amami-Ohshima Is. (Yuwan), 31. VII. 1963, Y. Hirashima leg.

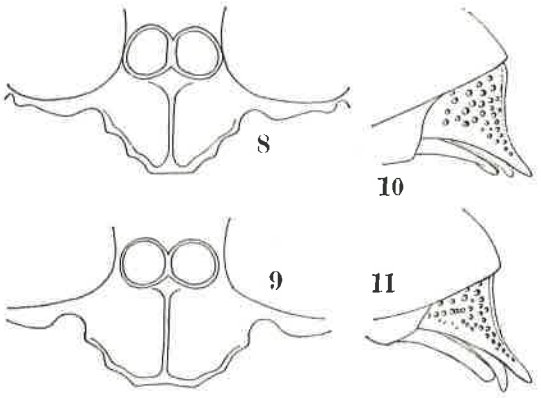
Remarks. The specimen shows an interesting inclination toward subsp. *sakaguchii* Mats. et Uch. occurring on the Island of Okinawa. The clypeus is slightly narrower in the median produced area, the interocular distance at the clypeus also comparatively slightly narrower and the sculpture generally very much feebler. The last mentioned tendency is most marked and it is best observed on the propodeum. Punctures on the abdomen are generally finer (in this respect there are marked variation among the Honshu specimens). In maculation it has the postscutellum carrying two transverse maculae. This is quite exceptional, because among 147 male specimens in my collection I could not find even a single specimen maculated as such. (Sickmann recorded the specimen having the postscutellum yellow maculated.) Maculae on the abdomen are as in the typical specimens. Further, it must particularly be mentioned that the yellow is suffused one, not deep orange yellow as in the type of *sakaguchii*.

6. *Ectemnius* (*Hypocrabro*) *schlettereri sakaguchii* (Matsumura et Uchida, 1926)

Crabro sakaguchii Matsnmura et Uchida, Ins. Mats., 1 (1) : 36, 1926 (♀).
Ectemnius (*Hypocrabro*) *sagakuchii* (!) : Leclercq, Monogr. Crabr., p. 270, 1954.
Ectemnius (*Hypocrabro*) *schlettereri sakaguchii*: Tsuneki, Akitsu, 8 : 8, 1959 (♀, type).
Ectemnius (*Hypocrabro*) *schlettereri sakaguchii*: Tsuneki, Ins. Mats., 22 (3–4) : 98, 1959 (♂, Formosa).
? *Ectemnius* (*Hypocrabro*) *schlettereri* : Leclercq, Bull. Ann. Soc. R. Ent. Belg., 99 (1) : 32, 1963 (incl. Formosa).

Specimen : 1 ♀, Okinawa Is., 6. VI. 1945, G. E. Bohart leg. (Coll. Bischop Mus.).

Remarks. As previously described by me (1959a) the clypeus of this subspecies is much more narrowly produced anteriorly (Fig. 8, cf Fig. 9, *schlettereri* s.str.) and the interantennal space comparatively shorter. Oculo-antennal



Figs. 8–11. 8, 10, *Ectemnius* (*Hypocrabro*) *schlettereri sakaguchii* Mats. et Uch. ♀.
9, 11, *Ect.* (*Hypocr.*) *schlettereri schlettereri* Kohl. ♀.
8, 9, clypeus. 10, 11, pygidial area in the lateral view.

space completely lacking (in the typical species slightly present). The yellow is much broadly extended. In the specimen (body) : Medianly interrupted band on pronotum, a large macula on scutellum, medianly interrupted broad band on postscutellum and, besides maculae on tergites 2, 4 and 5, tergite 3 also carrying lateral spots. Further, the following differences should be added :

(1) Sculpture generally finer and the striae closer.

(2) Punctures generally finer and on abdominal tergite 1 much sparser in addition.

(3) Curvature of area pygidialis in the lateral view much stronger (Fig. 10, cf Fig. 11, typical race).

7. *Ectemnius* (*Clytochrysus*) *nigrifrons* (Cresson, 1865)

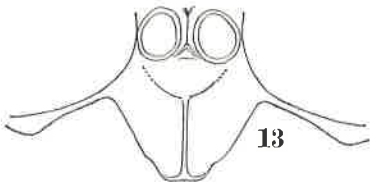
Crabro nigrifrons Cresson, Proc. Ent. Soc. Philad., 4 : 482, 1865 (♂).
Crabro planifrons Thomson, Opus. Ent., p. 2 : 173, 1870 (♀♂).
Crabro (*Crabro Clytochrysus*) *planifrons* : Kohl, Ann. k. k. naturhist. Hofmus. Wien, 29 : 62, 1915.
Ectemnius (*Clytochrysus*) *nigrifrons* : Leclercq, Monogr. Crabro., p. 286, 1954.
Ectemnius (*Clytochrysus*) *nigrifrons* : Tsuneki, Life Study, 2 (3) : 13, 1958.

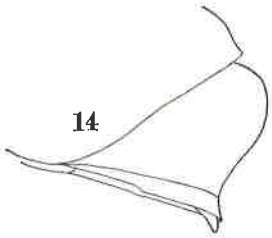
Specimen examined : 1 ♀, Nantou Hsien (Sungkang), 31. V. 1965, T. Shirozu leg.

Remarks. This is the first record of the species not only from Formosa, but also from the Oriental Zoological Region.

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

Ectemnius (*Cameronitus*) *orius cetonicus* Leclercq, Bull. Ann. Soc. R. Ent. Belg., 94 (5-6) : 145, 154, 1958 (Formosa).





Figs. 12–14. *Ectemnius* (*Cameronitur*) *orius cetonicus* Leclercq
12, clypeus, ♀. 13, ditto, ♂. 14, pygidial area in the lateral view.

Ectemnius (*Cameronitus*) *orius* : Leclercq, Ibid., 99 (1) : 31, 1961 (Formosa, Java, Sarawak).

Specimens examined : 2 ♀♀ 2 ♂♂, Nantou Hsien (Penpuchi, Nanshanchi), Formosa, 29. IV. 1965, 20. VI. 1965, T. Shirozu leg.; 1 ♂, Chiayi Hsien (Chihsinliao), Formosa, 15. IV. 1965, T. Shirozu leg.

Remarks. This species is characteristic in having the rich orange-yellow maculae on thorax, abdomen and legs, abdominal tergites 2 and 3 markedly constricted at the base and tergite 6 of the male strongly incrassate (most conspicuous in the lateral view). The brightest colour pattern (♀) : Mandibles at base externally pure yellow; antennal joint 1 wholly, collar and humeral angles of pronotum, a spot* near each antero-lateral corner of mesonotum, axillae, scutellum and postscutellum wholly, a spot* on subalar area and a large macula on post-epicnemial area of episternum of mesopleuron, two large transverse maculae* on dorsal aspect of propodeum, a large macula on each side of abdominal tergites 2–5 (posteriorly progressively diminishing in size), front and mid femora from beneath to external apex and two flecks on tarsi. Maculae marked with an asterisk in the above description sometimes lacking and abdominal tergite 5 sometimes without maculae. In males

mandibles always wholly black.

Notes on some characters : Clypeus in ♀ : Fig. 12, in ♂ : Fig. 13, frontal impressions as the glabrous glittering areas well marked off, in ♀ antennal joint 3 thrice as long as wide at apex, joint 4 in length 4/7 of joint 3, joint 10 as long as wide, in ♂ joints 3–6 slightly roundly swollen beneath, joint 3 thrice (in the narrowest view) or 2.7 times (in the widest view) as long as wide at apex, relative length of the succeeding joints as in ♀. Area cordata not marked off by the furrow in ♀, obliquely finely closely rugoso-striate, posterior aspect without lateral carinae, also obliquely closely rugoso-striate; in ♂ area cordata sometimes distinctly sometimes rather vaguely outlined by a series of foveae, in the distinct case the area roundly raised inside of the line of foveae, obliquely more coarsely striate than in ♀, posterior aspect on both sides of median excavation coarsely rugoso-reticulate, lateral carinae distinct for much the longer distance from apex; mesopleuron sparsely punctured, hypo-epimeral area rugoso-punctate, precoxal suture strongly carinate, metapleuron somewhat coarsely, sides of propodeum finely closely, both longitudinally striate. In ♂ the striae on these areas much coarser. Vertex and mesonotum finely closely punctured, subgranulate; abdomen sparsely punctured, punctures posteriorly progressively finer and somewhat closer. Caudal tergite of ♂ in the lateral view : Fig. 14. Pilosity on clypeus brassy to golden in ♀, silvery in ♂.

9. *Ectemnius* (*Cameronitus*) *flavohirtus* Tsuneki, 1954

Ectemnius (*Clytochrysus*) *flavohirtus* Tsuneki, Mem. Fac. Lib. Arts, Fukui Univ., II, 4 (5) : 43, 1954.
Ectemnius (*Cameronitus*) *flavohirtus* : Tsuneki, Life Study, 2 (3) : 14, 1958.

Specimen examined : 1 ♀, Tainan Hsien (Kuantzuling), Formosa, 7. IV. 1965, T. Shirozu leg.

Remarks. This species has been known only from a restricted area of Central Japan (Ichinose, at the foot pf Mt. Haku). Therefore it was a surprise to me to find a specimen of this species among the Formosan specimens. Further, it seemed rather curious that no difference whatever could be found between the specimens from both the regions, in regard not only to the structure, sculpture, but also even to the coloration. According to the fact this species is doubtless a delivative from the Oriental Region. However, in the keys of Leclercq of this subgenus (1958, 63) we can not meet with this species.

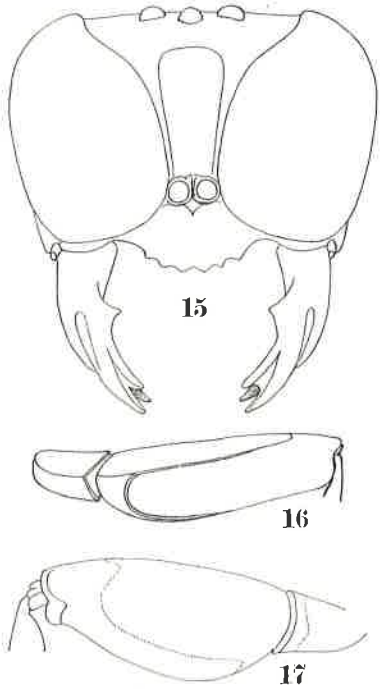
10, *Ectemnius* (*Cameronitus*) *albomaculatus* sp. nov.

♀. Length about 13.3 mm, with rich white maculation, mesonotum and mesopleuron sparsely punctured, glossy, the former crenate on posterior margin, antennal joint 3 about 2.3 times as long as broad at apex, area cordata marked off by a series of foveae and striae, with the disc simply punctured, abdomen normal.

Black, with weak aeneous shine on mesonotum and with the following portions ivory white (in some places faintly yellowish) : Mandibles on basal half externally, antennal joint 1 except an elongate brownish fleck on dorsal side, medially interrupted broad band on collar of pronotum, humeral angles, axillae of mesonotum, two lateral spots on scutellum, postscutellum wholly, a large macula on post-epicnemial area of episternum of mesopleuron, a large transverse macula on each side of abdominal tergites 1–5 (on 1 narrow, from 2 posteriorly progressively slightly smaller), front femora above at apex, front tibiae in front, mid femora beneath and at apex above, mid and hind tibiae externally and mid and hind metatarsi except apex. Palpi, remaining part of front tibiae, front tarsi wholly, mid and hind tarsi from end of metatarsi to apex and wing veins and stigma brown to dark brown; tegulae semitransparent pale brown, antennae

slightly brownish. Wings hyaline slightly fuscous and yellowish. Inner orbits and clypeus covered with appressed slivery hairs, hairs on other portions of head, thorax and abdomen comparatively long but sparse, greyish white, apically pale brownish, those on apical portions of abdominal tergite 5 dense, slightly stiff, pale brownish yellow and on the sides of pygidial area longer, thicker and similarly close and slightly darker in colour.

Head from above with ratio of width to length in middle approximately 2 : 1 (101 : 56), the surface flattened and ocellar region slightly depressed, ocelli in a curve, posterior margin of median ocellus situated on the supposed line connecting anterior margins of paired ocelli, OOD : POD : OCD relatively 17 : 10 : 25, ocelli uniform, with relative width 7.5, frontal median furrow shallow and feeble, frontal marks in the large elongate smooth areas along upper inner orbits, with a few punctures within. Head in front: Fig. 15, interocular space on lower frons very narrow (eyes very large accordingly), upper frons rather abruptly turning into lower frons, the anlge (in profile) narrowly rounded, forming approximately right angle, antennal sockets situated slightly below the minimum interocular line, occupying whole the space, median produced lobe of clypeus bluntly quadridentate at apex, median two more advanced, a short distance from the lateral tooth, a similar short tooth on the lateral margin toward middli; mandibles tridentate at apex, with a robust triangular tooth on inner margin; head in profile with eye slightly wider than temple, occipital carina gradually ending a short distance behind hypostomial carina. Collar of pronotum well developed, raised, with sides rounded and without carina, medially divided by a deep furrow, posterior margin markedly depressed, forming a deep transverse furrow, accompanying a much deeper intersegmental furrow posteriorly; mesonotum with median scutal line in a feeble carina, not reaching half of scutum, prescutal sutures in shorter impressed lines, parapsidal sutures in short impressed lines, pitchy black; scutellnm evenly connected with mesonotum, subelliptic in form, longer in middle than at sides, thus the anterior and posterior margins roundly produced (posterior margin medianly straight), while postscutellum transverse; on mesopleuron epicnemial carina high and distinct, anterior oblique suture narrow, distinctly foveolate, precoxal carina slightly obliquely transverse, gently bent and high. On propodeum area dorsalis transverse, with lateral margins roundly convergent apically and apical margin gently rounded, apical border and the apical half of lateral borders marked off by weak furrows feebly foveolated, anterior half of lateral borders defined by the difference of sculpture, the area medianly divided by a deep narrow groove which is marginated on both edges by fine carinae and narrower posteriorly, passing over the apical border and connecting with the medial furrow of the posterior inclination; in lateral view the posterior aspect roundly hollowed out, with upper portion nearly perpendicular and gradually gently inclined posteriorly; viewed obliquely backward, the posterior inclination bordered on upper edge by a transverse carina, located just behind the apical furrow of area dorsalis, without the formal lateral carinae separating the posterior aspect from the sides of the segment, but with a series of short rugae arranged



Figs. 15-17. *Ectemnius* (*Cameronitus*) *albomaculatus* sp. nov. ♀. 15, head. 16, front femur. 17, mid femur.

in nearly a form of carina, accompanying just outside a shallow groove (the structure is weak, definable under a certain light condition). Abdominal segment 1 as long as wide at apex, each tergite longitudinally gently rounded, thus intersegmental areas appear somewhat constricted, pygidial area narrow, deeply furrowed, slightly divergent toward base and rounded at apex, in the lateral view deeply roundly excavated. Front femur above flattened, outer side also nearly flattened with the surface somewhat twisted and on basal 2/3 distinctly marginated by a carina (Fig. 16), the following tibia without spines on outer side, with only a few spines apically; mid femur very broad, nearly half as wide as long (Fig. 17), mid tibia with 3 short thick spines on outer margin and a few similar spines apically, hind tibia with two rows of short robust spines on external surface, longer spur of the two half as long as the following metatarsus. In fore wing 2nd abscissa of cubital vein subequal to 1st transverse cubital vein or transverse radial vein.

Vertex finely very sparsely punctured, frons more grossly and more closely punctured, on the anterior verge punctures much larger, subreticulate, lower frons except sides smooth and polished; mesonotum more grossly sparsely punctured, punctures anteriorly finer and closer, intervals nearly as large as punctures, posteriorly larger and sparser, not subrugosely confluent, posterior margin longitudinally closely striate, striae divergent anteriorly; scutellum sparsely, postscutellum slightly more closely punctured, mesopleuron glittering, sparsely punctured, punctures as large as those on mesonotum, episternum between epicnemial carina and anterior oblique suture punctures very feeble, metapleuron longitudinally striate. Area dorsalis at base obliquely striate, disc rather closely (intervals as large as punctures) punctured, outside the area obliquely coarsely rugoso-striate, posterior aspect and sides of the segment transversely finely closely striate. Abdominal tergite 1 finely but distinctly and sparsely punctured, punctures on following tergites progressively finer and on tergite 2, somewhat close, tergite 5 apically grossly and closely punctured, pygidial area coarsely punctured, sides very coarsely punctured, sternites finely sparsely punctured, opaque areas on sternite 2 finely closely punctured, each tergite with a line of hair-bearing punctures before apical margin.

Holotype : ♀, Amami-Ohshima Is. (Yuwan-dake, 550 m.), 17. VII. 1963, C. M. Yoshimoto leg. (Malaise trap) (Coll. Bishop Mus.)

Remarks. Despite the marked difference in the colorific characters, this species has a close relationship to *Ectemnius* (*Cameronitus*) *flavohirtus* in many structural distinctions. Differs from it, however, in having the antennal joints relatively much longer, the lower frons narrower and in the structure of the scutellum, the posterior aspect of the propodeum and the front femora. Further, the form of the clypeus is also somewhat different.

11. *Dasyproctus ceylonicus* de Saussure, 1867

Dasyproctus ceylonicus de Saussure, Reise der Fregatte Novara. Zool. Hymen., Wien., p. 58, 1867.

Dasyproctus ceylonicus : Leclercq, Monogr. Crabro. etc., p. 262, 1954; —Bull. Ann. Soc. R. Ent. Belg., 92 : 162, 1956; —Bull. Soc. R. Sci. Liège, 26 (1) : 55, 1957; —Expl. Parc Nat. Upemba, Hymen. Sphec., II, Crabr., p, 46, 60, 1958; —Bull. Ann. Soc. R. Ent. Belg., 99 (1) : 17, 1963.

(As for synomyms of *orientalis* Cameron, 1890, *revelatus* Cameron, 1898, *infantulus* Kohl, 1898, *philippinensis* Ashmead, 1904, *funestus* Turner, 1917, see Leclercq, 1956, loc. cit. p. 162)

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

Specimens examined : 3 ♀♀, Nantou Hsien (Penpuchi and Baikei), 29. IV., 13. V. 1965, T. Shirozu leg.; 1 ♂, Taipei Hsien (Yangmingshan), 1. VII. 1965, T. Shirozu leg.; 1 ♂, Pingtung Hsien (Kenting), 4. IV. 1963, S. Miyamoto leg (Coll. Kyushu Univ.).

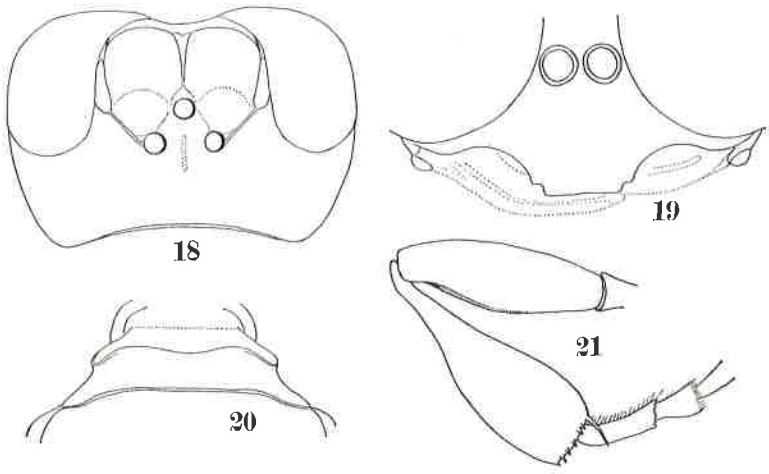
Remarks. The sculpture of the propodeum including that of the area dorsalis is markedly

varied in both sexes. So marked that at first sight we are likely to take them as belonging to different species. Though the pattern of striation, rugosity or reticulation is certainly constant, their density and size are conspicuously changed from one individual to another. This is especially marked in the case of the two males. In one of them the dorsal and posterior aspects are coarsely reticulate, while in the other finely rugoso-reticulate, the main direction of the rugae on posterior aspect being transverse and the meshes being transversely elongate, thus giving appearance that the area is transversely rugose. Further, in the former the punctures on the vertex fine (in this respect inconsistent with the key of Leclercq's 1958 paper) and the postscutellum longitudinally coarsely rugose, while in the latter punctures on the vertex much larger and the postscutellum finely rugoso-reticulate. (As for colorific variation see Leclercq, 1956, loc, cit.)

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

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

♀ (hitherto unknown). Length about 7 mm. Black, half mat. Antennal joint 1 in front slightly brownish yellow; humeral angles, front tibiae in front narrowly except base and apex yellow;



Figs. 18–21. *Rhopalum* (*Latrorhopalum*) *shirozui* Tsuneki, ♀.
18, head. 19, clypeus. 20, pronotum. 21, hind leg.

apical portion of caudal segment of abdomen, antennal joints 2–11 beneath, apex of front femora, front tibiae inside broadly, apex of mid tibiae, tibial spurs of anterior four legs, tarsi of all legs except mid and hind basitarsi ferruginous to castaneous brown; palpi slightly brownish, wing tegulae fuscous, semitransparent, veins and stigma nearly black. Pubescence of clypeus silver white, on other portions very short, greyish white, on apex of caudal segment somewhat long, thick and brownish.

Head from above : Fig. 18, ratio of width to length in middle approximately 3 : 2 (43 : 27), OOD : POD : OCD about 3 : 2 : 4 (14 : 10 : 22, ocellar diameter 6), ocelli in an isosceles triangle slightly lower than equilateral one), ocellar region not raised, but each ocellus slightly inclined externally and the area just outside impressed, frontal marks lengthened along upper inner-orbits, not distinctly outlined, represented by smooth pitchy black and glittering areas, an feebly impressed oblique line from postocellus runs to posterior end of the marks, frontal median furrow distinct, with areas on both sides gently roundly raised; clypeus (Fig. 19) medianly produced

and truncate at apex, on the oblique sides, a short distance from latero-anterior corners a short obtuse tooth (or an angle) defined, disc not medianly raised nor carinated, head in profile with eye as wide as temple. Antennae short, thick, slightly clavate, joint 3 about 1.5 times as long as wide at apex, subsequent joints progressively slightly thicker and shorter apically till penultimate joint, joint 10 approximately half as wide as long. Pronotum : Fig. 20, comparatively thick, with lateral angles somewhat obliquely flattened and shortly transversely carinated on their posterior margins, seen from above slightly produced in teeth, median furrow absent, posterior margin finely carinate with a transverse furrow just in front; mesonotum medio-anteriorly with a short impressed line, parapsidal suture shortly impressed, scutellum with a rounded impression on antero-lateral corners just inside the axillae; postscutellum anteriorly, posteriorly and laterally roundly inclined; on propodeum medianly a narrow well outlined groove runs from base to near apex of posterior inclination, without marginated area dorsalis. Petiole of abdomen similar in form to that of *R. latronum*, slightly longer than hind tibia (ratio 47 : 40), from toward middle posteriorly gradually incrassate, with maximum width approximately twice as great as minimum width, and then again narrowed toward apex, the surface medianly bluntly carinate from base to about middle, spiracles situated about a third from base; pygidial area elongate triangular, with apex rounded, the surface longitudinally gently excavated, smooth and polished and lateral margins weakly carinate, in front of the polished area and beyond the range of the lateral carinae a very distinct short medial carina present. Hind tibiae strongly clavate (Fig. 21), with a few short spinules externally, more than as long as the following tarsus, its metatarsus and the following joint also incrassate, metatarsus slightly curved, about thrice as long as wide at apex (in *latronum* tibia much less strongly clavate and as long as tarsus, metatarsus 4 times as long as broad). In fore wing venation generally as in ♂, but 1st transverse cubital vein slightly less than as long as transverse radial vein, and about half as long as 1st abscissa of radial vein.

Body microscopically (60×) minutely coriaceous, half mat. Vertex finely closely, frons slightly more grossly and more closely punctured (interspace narrower than points), mesonotum anteriorly very finely densely, posteriorly slightly largely punctured. Propodeum at base crenate, disc slightly grossly coriaceous, without puncture; abdomen practically impunctate, but half mat, only caudal segment slightly grossly punctured, pygidial area polished; sternites smooth and glossy.

Specimen : 1 ♀, Nantou Hsien (Sungkang), Formosa, 31. V. 1965, T. Shirozu leg.

13. *Rhopalum* (*Calceorhopalum*) *formosanum* sp. nov.

The present species is very closely related to *Rhopalum simalurense* (Maidl, 1925) from Sumatra, and Philippines, *R. ammatticum* Leclercq, 1963, from India and *R. calceatum* Tsuneki, 1954, from Japan. From the first species, however, it (♀) differs at least in having the abdominal petiole as long as the hind tibia and the legs more extensively adorned with yellow. From the second and third species it is more difficult to find important differences unless dealing with much more detailed characters, which will be touched on in the following description. Superficially the present species is much richer in yellow maculation.

♀. Length 6.0 mm. Black and shining. Yellow : Mandibles (semitransparent, somewhat whitish) except brownish apex, palpi (semitransparent, also whitish), antennal joint 1 wholly, joint 2 beneath, humeral angles, tegulae (semitransparent) and bases of wings, front legs wholly (base of coxae black and arolium brown), mid legs on greater part (base of coxae black, femora above narrowly brown, spines of tibiae reddish, tarsal joints 2–4 slightly darkened, 5 dark brown), and coxae and basal ring of tibiae of hind legs. Ferruginous to reddish ferruginous : Antennal joints 3–10 beneath, hind femora except above and beneath, three bands of abdominal tergites

(apex of tergite 1 and base of 2, apex of 2 and base of 3, apex of 3 and base of 4), abdominal sternites wholly and apical half of caudal segment. Wings with stigma black, veins dark brown. Antennae and dark parts of hind legs slightly brownish. Wings hyaline, strongly iridescent.

Head from above with relative width to length 38 : 22 (in *calceatum* similar, 40 : 23, in *ammatticum* more cubic), frontal median furrow slightly deeper than in *calc.*, concavity on lower frons as in *calc.* (in *ammat.* deeper), interantennal tubercle higher than in *calc.*, relative length of antennal joint : 2=3 > 4=5 (in *calc.* 2 > 5≧4≧3*, in ammat. 3 > 2=4=5), anterior margin of clypeus with lateral double teeth slightly further apart from the corner of medial protuberance (Fig. 22, cf. Fig. 23, *calc.*). Head above and mesonotum more finely punctured than in *calc.* and more shining (as in *ammat.*), the form and structure of pronotum as in *calc.*, but the lateral angles slightly more rounded (with medial incision, and the surface posteriorly inclined with apex carinated); propodeum at extreme base crenulate as in *calc.*, disc polished and medianly distinctly but finely furrowed (as in both species), the segment viewed from obliquely backward longer, with lateral margins less roundly convergent (as in *ammat.*) than in *calc.*, but the convexity of dorso-posterior aspects stronger than in *calc.* (more than *ammat.* accordingly); *the short carina running between lower margin of stigmata and upper end of metapleuron completely lacking.* Petiole as long as hind tibia (in *calc.* usually slightly shorter than hind tibia, rarely subeqnal), markedly slenderer than in *calc.* (Fig. 24, cf. Fig. 25, *calc.*), ratio between total length and minimum and maximum widths of the segment 10 : 1.3 : 2.3 (in *calc.* fairly varied, measurement of 6 specimens including 2 large, 2 medium and 2 small, 10 : 1.6 : 3.0, that is to say, relatively shorter or stumpy); further, the minimum width located comparatively

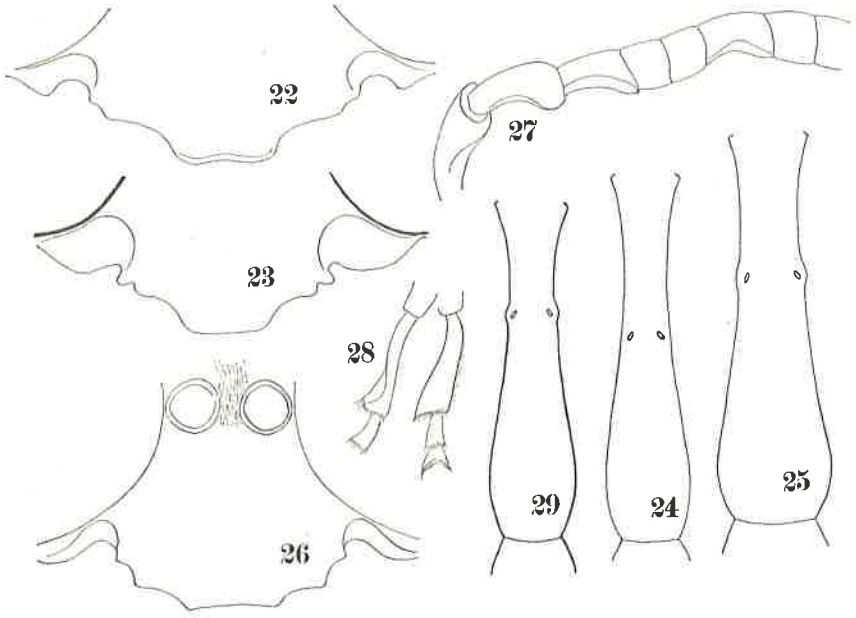


Fig. 22–29. 22, 24, 26, 27, *Rhopalum* (*Calceorhopalum*) *formosanum* sp. nov.
23, 25, *Rhopalum* (*Calceorhopalum*) *calceatum* (Tsuneki).
22, 23, clypeus (♀). 24, 25, abdominal petiole (♀). 26, clypeus (♂).
27, antennae(♂). 28, front metatarsus. 29, *Rhopalum* (*Calceorhopalum*) *bohartum* sp. nov., abdominal petiole.

*Difference between joints slight, appears varied depending upon the state of the antenna. Therefore, the value is inreliable except very distinct case.

more posteriorly and the maximum width located more anteriorly than in *calc.* and the stigmata also located more posteriorly, about 4/9 from base (in *calc.* about 4/10 from base). In pygidial area lateral carinae reach upwards about middle of the medial carina (as in *calc.*). Hind tarsi clavate, with a few spinules on outer margin. Wing venation similar to that of *calc.*

♂. Length about 4.7 mm. Similar in general characters to ♀. Antennal joint 2 except a brown fleck above apically yellow, joint 3–6 beneath also yellowish, abdomen with 4 yellowish red bands (apex of tergite 1 and base of 2, apex of 2 and base of 3, apical margins of 4 and 5); clypeus similar to that of ♀, but anterior margin of medial lobe slightly broader (Fig. 26), antennae very similar to that of *calc.*, ♂, joint 2, 3 and 6 long and excavated beneath, 4 and 5 short and not excavated, (Fig. 27), petiole of abdomen slightly slenderer than in ♀, ratio of total length, minimum and maximum widths 10 : 1.3 : 2.3; no enclosed pygidial area on caudal tergite. Front metatarsus deformed as given in Fig. 28, mid metatarsus normal, hind tibia clavate with a few spinules on outer margin, following metatarsus somewhat incrassate, not so conspicuous. In fore wing venation similar to ♀, or to that of *calc.*

Holotype : ♂, Nantou Hsien (Sungkang), Formosa, 29. VI. 1965, T. Shirozu leg. (Coll. Kyushu Univ.).

Paratype : 1 ♀, Chiayi Hsien (Fenchihu), Formosa, 16. IV. 1965, T. Saigusa leg. (Ditto).

14. *Rhopalum* (*Calceorhopalum*) *bohartum* sp. nov.

This species (♀) is also closely allied to *Rhopalum calceatum* Tsuneki, therefore to the related species, *ammatticum*, *hillorum*, *canlaoni* and *formosanum* accordingly. According to the literature, it differs from *ammatticum* Leclercq, 1963, at least in that the colour of the legs much brighter, the punctuation of mesonotum more distinct, and the dorsal aspect of the propodeum without distinct medial furrow; from *hillorum* Leclercq, 1963, in that the colour of legs brighter, the epicnemial furrow distinctly foveolate, the petiole of the abdomen not longer than hind trochanter and femur united; from *canlaoni* Leclercq, 1963, in that the colour of legs brighter, the lateral carinae of the propodeum much shorter. From *formosanum* and *calceatum* it is separable by the difference in the following points : (1) Colour of legs, (2) medial furrow of propodeum, (3) structure of abdominal petiole, (4) structure of antenna, (5) punctuation on mesonotum.

♀. Length about 5.5 mm. Black and shining, with a slight aeneous shimmer on vertex and mesonotum. Suffused yellow : Antennal joint 1 and 2 wholly, humeral angles, tegulae and base of wings, front and mid legs from apex of coxae wholly (except mid tarsi apically pale brownish), greater part of hind coxae, apex of trochanters and basal ring of tibiae of hind legs. Mandibles and palpi semitransparent whitish yellow, the former apically reddish brown. Antennae slightly brownish, above basally more strongly so, beneath basally ferruginous. Reddish ferruginous : Abdominal tergites 3 and 4 at base broadly (both accompanying a narrow apical band of the same colour of the preceding tergite), caudal segment except base and sternites from apical portion of petiole to apex. Pubescence of clypeus silvery, hairs of hind tibiae and tarsi slightly brownish yellow. Wings hyaline, strongly iridescent, stigma and veins dark brown.

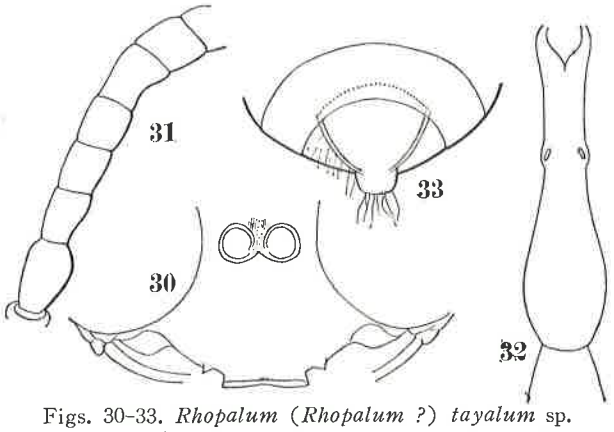
Head from above more cubic than in *formosanum* and *calceatum*, with ratio of width to length 36 : 23 (approximately 3 : 2, in *formosanum* 38 : 22, in *calceatum* 40 : 23), frons more roundly inclined anteriorly than in *calc.*, with medial furrow deeper, ocelli in an equilateral triangle, OOD : POD : OCD=12 : 7 : 13 (relative width of postocellus 5). Punctures on vertex and upper frons slightly larger and somewhat more distinct than in *formosanum*, but much finer and less distinct as compared with those of *calceatum*. Clypeus similar in the form of anterior

margin to that of *calc.* (Fig. 23), with double teeth on lateral margin. Antennal joints from 5 to 11 wider than long, (in the two species compared greater part longer than, or as long as, wide) relative length : 2 (pedicel)〉 3≧ 4 〉5. Pronotum fairly closely covered with silver pubescence (different from the two species), medially furrowed as in both species, but the transverse furrow across middle weaker, with rounded lateral angles more broadly expanded anteriorly. Mesonotum medio-anteriorly deeply impressed, the impression longer than in the two species compared, reaching posteriorly near middle of scutum. Scutellum nearly cubic. Propodeum at base minutely crenulate, median furrow very shallow and feeble on dorsal aspect, rather indistinct, lateral carinae defined only on apical portion of the posterior inclination, very short; the carina connecting the base of stigmata with upper portion of metapleuron, as in *calceatum*, well-defined and straight. Petiole of abdomen as long as hind tibia, slenderer than in *calc.* (Fig, 29, cf. Fig. 25), but relatively shorter than in *formosanum* (cf. Fig. 24); location of stigmata approximately 1/3 from base (in *calc.* 4/10 and in *formos.* 4/9, in the latter not swollen out laterally). In pygidial area the lateral carinae reaches the level of upper end of medial carina (this character fairly varied in *calc.*, probably not important). Legs and wing venation normal.

Holotype : Ishigaki Is., the Ryukyus, 25-30. XI. 1952 (?), G. E. Bohart leg. (Coll. Bishop Mus.)

15. *Rhopalum* (*Rhopalum ?*) *tayalum* sp. nov.

This species (♂) is similar to (*Rhopalum* (*Rhopalum ?*) *parcimonium* Leclercq, 1963, known from the Philippines (Luzon) in having the pygidial area on the caudal tergite of the abdomen. Differing from it, however, in that antennal joint 6 distinctly excavated beneath, mandibles normal, oculo-antennal space distincly present, median lobe of clypeus with a short but distinct tooth on each lateral margin, dorsal aspect of propodeum longitudinally finely closely striate, abdominal petiole wholly black and coloration of other parts of body somewhat otherwise.



Figs. 30-33. *Rhopalum* (*Rhopalum ?*) *tayalum* sp. nov. ♂.
30, clypeus. 31, antenna. 32, abdominal petiole. 33, pygidial area.

♂. Length about 5.3 mm. Black with the following portions cream yellow : Mandibles except the reddish brown apex, palpi, antennal joint 1, humeral angles, front legs except base of coxae and a streak above femora, mid legs except base of coxae, a vague fleck on trochanter, femora above widely, an elongate macula on the side of tibiae and terminal tarsal segment, hind legs at apex of coxae and of trochanters and base of tibiae. Wing tegulae transparent yellow, with an opaque yellow spot, base of fore wings semitransparent yellow, with a brownish macula at the centre; apex of antennal joint 2, maculae on femora and tibiae and apical tarsal joint of mid legs and trochanters except dark brown macula in middle and extreme base of tibiae of hind legs brown. Wings hyaline, iridescent, veins and stigma black to dark brown. Apical portion of abdominal sternites 1 and 2, from sternits 3 to apex of abdomen yellowish red.

Head from above with ratio of width to length in middle 7 : 4, OOD : POD : OCD≒2 : 1 :

4, median frontal furrow distinct but not deep; head seen in front oculo-antennal space distinctly present (quite exceptional in this genus), slightly more than half as wide as antennal socket, relative interantennal distance at vertex and at clypeus 17 : 9.5, clypeus : Fig. 28, mandibles bidentate at apex, not particularly enlarged toward apex. Antennal joint 2 distinctly shorter than joints 3 and 4 taken together (Fig. 29), relative length between joints : 2 > 3 > 4=5, joint 6 at base beneath excavated and widened toward apex, slightly longer than joint 3, joints 9–12 wider than long, ultimate joint 1.7 times as long as wide at base. Collar of pronotum with anterior margin straight, medial region raised on anterior half and depressed posteriorly, with lateral angles broadly rounded, mesonotum with medio-anterior longitudinal impression very feeble, almost unobservable on the disc, scutellum slightly wider than long, propleural tubercle semispherical, mesopleuron with transverse precoxal carina distinct, with upper end slightly raised into a small cone, apex nearly pointed. On propodeum median furrow very weak on dorsal aspect, broadened into lenticular impression on upper half of posterior aspect, with bottom medially distinctly furrowed, lateral carinae defined only on apical portion. Abdominal petiole slightly less than as long as hind trochanter and femur combined (30 : 33), rather as long as hind tibia (30 : 31), in form generally similar to that of *bohartum*, but much slenderer at apex (Fig. 32), ratio of minimum and maximum widths approximately 2 : 1, stigmata situated about 2/5 from base, caudal tergite with a broad pygidial area (Fig. 33), on both sides marginated by weak carinae, the carinae not meeting with each other at the apical margin, thus the area widely opened at apex, the surface not flattened but transversely gently convex as in other tergites. Legs without particular deformation, hind tibia clavate with a few spinules on outer margin, following two joints somewhat incrassate. Wing venation normal. Frons distinctly, moderately closely (interspace as large as punctures) punctured, vertex slightly more finely and morely sparsely punctured, well shining; punctures on mesonotum slightly larger, much closer and the surface somewhat less glossy, but posteriorly progressively sparser, on scutellum as on mesonotum; on mesopleuren epicnemial area granulate and densely haired, episternum very minutely weakly and sparsely punctured, highly shining on upper posterior region; propodeum on dorsal aspect at base crenulate, on the disc longitudinally finely and closely striate, only on lateral portions the striae somewhat oblique, on posterior aspect on both sides of medial impression sparsely, somewhat grossly punctured, on lateral portions similarly punctured, mixed with close fine oblique but weak striae, on apical portion on both sides of medial carina transversely closely striate, sides of the segment obliquely closely but weakly striate, the striae weaker and obsolete anteriorly. Abdomen only on posterior swelling of tergite 1 glossy, other portions half mat, due to very minute puncturings and covering hairs, posteriorly the surface very minutely coriaceous, pygidial area similarly coriaceous (60×).

Holotype : ♂, Nantou Hsien (Sungkang), 29. VI. 1965, T. Shirozu leg. (Coll. Kyushu Univ.)

Remarks. This species is characteristic in that the inner orbits do not touch the antennal sockets, leaving a considerable space between them and that the anal tergite provided with the pygidial area. As for *Rhopalum parcimonium* no mention was given relating the oculo-antennal space. If the species does not possess a similar character it seems not to bear a close affinity with the present species, despite that the two species bear the similar structure regarding the caudal tergite, since the former structure is considered to have a more important significance in taxonomy than the latter.

I agree with Dr. J. Leclercq in opinion that the subgeneric status of the species can not be determined until the female specimen is discovered.

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