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STUDIES ON THE NEW MATERIAL OF
SPHECIDAE, CHRYSIDIDAE AND MUTILLIDAE OF
FORMOSA AND THE SOUTHERN RYUKYUS
(HYMENOPTERA)

By K. TSUNEKI

Recently Mr. T. Nambu, Saitama Prefecture, made the Hymenoptera collecting excursions to the Yayeyama Group of the Ryukyus and to Formosa and sent to me a part of his collections of the Aculeate Hymenoptera that are within my study range for identification. He added also to the material a considerable number of the wasp specimens that were collected of late by Mr. M. Terayama, a myrmecologist of Tochigi Prefecture. This is the report of the result of my study of these specimens.

The present paper includes the descriptions of 2 new subgenera, 11 new species, 2 new subspecies and the unrecorded sex of one species. Further, noteworthy is that the genus Mellinus found in the material is new to the fauna of Formosa.

New subgenera: Liris (Pitaliris) and Crossocerus (Thao).

New species: Ampulex tridentata, Ampulex albo barbata, Psen foveicornis, Psen terayamai, Psenulus yingfeng, Crossocerus rubromaculatus, Crossocerus nambui, Rhopalum ataiyal, Chrysis bishamon, Chrysis arishana and Smicromyrme hombuzeiana.

New subspecies: Nitela yasumatsui taiwana, Liris rohweri formosana (new status).

I. SPHECIDAE

© Taxonomical Problem on Ampulex dentata Matsumura et Uchida, 1926

In 1926 Matsumura and Uchida described a species of Ampulex based upon two female specimens from Is. of Okinawa, naming it dentatus. On the other hand, Yasumatsu in his revisional study of "Ampulicidae of the Japanese Empire" in 1936 described in detail a species of Ampulex under the name, dentata Matsumura et Uchida, based upon 2 ♀ and 1 ♂ specimens from Is. Ishigaki and 1 ♂ specimen from Is. Amami-Oshima. Since then Ampulex dentata sens. Yasumatsu (1936) has prevailed among the Japanese entomologists as dentata Matsumura et Uchida (1926).

Strange to say, however, Ampulex dentata: Yasumatsu is different from A. dentata Matsumura et Uchida. The fact is clear if one tries to compare the descriptions of both the authors. According to the original description A. dentata Matsumura et Uchida has the clypeus bidentate at the apex: "Clypeus mit kräftigem Mittellängskiel, der zwischen den Fühlern anfängt, nach unten zu aber stark an der höhe und Breite zunimmt und durch einen dreieckigen Eindruck am Ende des Clypeus in zwei nach vorn divergierend Kiele gespalten wird, der jede auf dem Vorderrande wie ein kleiner Zahnförmiger Fortsatz endigend". While, in dentata sens. Yasumatsu the clypeus is tridentate at the apex: "apex with three small teeth", Pl. XIII, Fig. A of his paper.

The difference between the two descriptions of Ampulex dentata was already pointed out by me in 1968 when I examined 1 ♀ 1 ♂ specimens of A. dentata sens. Yasumatsu collected on the island of Amami-Oshima (Trans. Shikoku Ent. Soc., 9 (4): 110, 1968). But I postponed the solution of the problem until I can examine the holotype specimen of A. dentata Mats. et Uchi.

Now, I have 3 specimens of so-called dentata that were collected in the Yayeyama Group of the Ryukyus and sent to me from Mr. Nambu. Hereupon I have become to be compelled to solve the problem.

Through the courtesy of Dr. S. Takagi, curator of the Entomological Collection, Entomological Institute, Hokkaido University, I could have a chance to examine the so-called holotype specimen of Ampulex dentata Matsumura et Uchida.

To my surprise, the specimen was not dentata Matsumura et Uchida, 1926, but was identical with dentata s. Yasumatsu, 1936. Surely it was not the holotype that was used by the authors at the moment of their description, although it was accompanied with the red type label and the name label of Ampulex dentata, because the structure of the clypeus was distinctly different from that described by the authors. Moreover, there were two other facts that indicated that the specimen was not the holotype nor paratype: One is that the locality of the specimen was not Okinawa as was given in the original description, but yayeyama. The other fact was that the name label attach-

ed to the specimen was not "dentatus" as was given in the original description, but was Ampules "dentata" sp. nov. The second fact seems to indicate that some one else attached the name label after the Yasumatsu's monograph had appeared, following his treatment of the gender alternation of the specific trivial name. But it was not the lectotype also, because it was different from the description!

The three facts mentioned above are sufficient enough to show that the specimen is not the true holotype.

According to the kind communication of Dr. Takagi, the other specimen of Ampulex dentata kept as paratype at the Institute is also the delivative from the Yayeyama Group and has the clypeus similar in structure to that of the so-called holotype.

Ampulex dentata Matsumura et Uchida is a species that is very close to Ampulex difficilis Strand, 1913, known from Formosa, especially in the structure of the clypeus they are completely identical (compare the descriptions of both the species that are given both in German!). But, as presumed from the account given above the types are considered to have lost, and as the original description is very simple without illustration, the details of the characters of the species are unknown. However, judging from the description presumably it has the characters, except the clypeus, similar to those of dentata s. Yasumatsu.

However, among the specimens of Ampulex that have been treated by the experts of Sphecidae as dentata none was captured in Okinawa-Group, all having been collected either in the Yayeyama-Group (Is. Ishigaki or Is. Iriomote), or in the Amami-Group, and all these specimens are not dentata Mats. et Uch., but dentata s. Yasumatsu.

However, it is very strange that Yasumatsu did not take notice of the difference of his species from that of Matsumura et Uchida at the time of his first investigation of the related specimens from Is. Ishigaki in 1935 and especially at the time of his revisional study of the family of East Asia.

At any rate, as it has become clear that Ampulex dentata: Yasumatsu is not the same species as A. dentata Matsumura et Uchida it can not be called with this specific name and the new species name becomes necessary in order to avoid the confusion.

1. Ampulex tridentata sp. nov.

Ampulex dentata: Yasumatsu, Ann. Zool. Jap., 15 (1): 34, 1935 (2 ♀, Is. Ishigaki).

Ampulex dentata: Yasumatsu (nec Matsumura et Uchida, 1926), Tenthredo, 1 (2): 187-195, Pl. XIII, Figs. A-M, 1936 (2 ♀ 1 ♂, Is. Ishigaki; 1 ♂, Is. Amami-Oshshima).

Ampulex dentata: Tsuneki, Trans. Shikoku Ent. Soc., 9 (9): 110, 1968 (1 ♀ 1 ♂, Amami-Oshshima).

The description of this species is already made in detail by Yasumatsu in his 1936 monograph under the name of dentata Matsumura et Uchida and there is no need of redescription.

Holotype: ♀, Yayeyama Group of the Ryukyus, 1901 (? 1909)(Coll. Ent. Inst. Hokkaido Univ., Sapporo, preserved as the type of so-called A. dentata Mats. et Uchi.).

Paratypes: 1 ♀, Yayeyama-Group, date unknown (Coll. Ent. Inst. Hokkaido Univ.); 1 ♀, Is. Ishigaki, Mt. Omoto, 30. VIII. 1978, T. Nambu; 2 ♀, Is. Iriomote, Kanbiretaki, 25. VIII. 1978, T. Nambu (2 ♀, Coll. Nambu; 1 ♀, Coll. Tsuneki).

Remarks. The holotype is the specimen that had been preserved in the Entomological Institute of Hokkaido University erroneously as the type of Ampulex dentata Matsumura et Uchida. The specimen is pinned, but from it the head, both wings and left fore leg are dropped off, of which the head, one of the antennae, left fore leg and one each of fore and hind wings are glued on to a slit of celluloid plate and attached to the pin. Four labels are put, from above (1) surface: Japan, Matsumura, 579, in 3 lines (Handwritten), back side: Yayeyama (in Japanese) 1901 (or 1909?) in two lines, also handwritten, (2) Ampulex dentata sp. nov. in 3 lines (handwritten), (3) red long label with Type Matsumura in 2 lines (also handwritten) and (4) identified label: Ampulex dentata Matsumura et Uchida 1926 det Sh. Sakagami, 1946 (handwritten in 4 lines). But the letters of the upper two labels are different from those of the lowermost label, showing that the upper labels are not put by S. Sakagami.

2. Ampulex takeuchii Yasumatsu, 1936

Ampulex takeuchii Yasumatsu, Tenthredo (Kyoto), 1 (2): 195, 1936 (1 ♀, holotype, 1 ♀

paratype, Nantou Pref., Puli, 5. V. 1922, leg. K. Takeuchi).

Specimens examined: 2 ♀, Taipei Pref., Ulai, 23. VIII. 1980, T. Nambu.

Remarks. The specimens are much larger in body size, measuring 19 and 20 mm respectively (when the head is stretched forwards they reach about 22 mm; in the type females the length is 16 mm) and considerably different in the measured values of some bodily parts and if the differences are strictly taken the present specimens must be dealt with as distinct. But, taking into consideration the fact that the measurement is sometimes difficult and considerable errors are inevitable, the present specimens are identified with takeuchii. Differences in measured values, for instances:

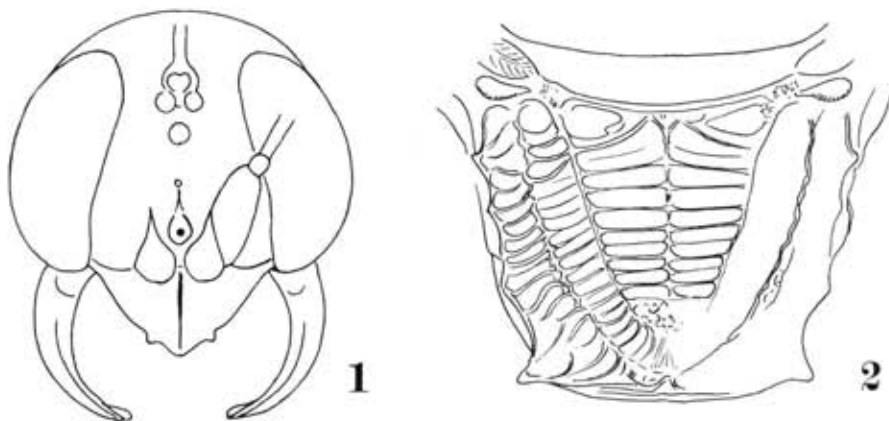
Minimum IOD : IOD at anterior margin of front: in Y's specimen (♀) 12:30, while in mine 12: 19 (judging by the general knowledge the ratio of 12:30 can not be exist, this may be the printer's error of 12:20).

L:W of the eye seen in front: in Y's specimen 40:25, while in mine 40:17.

Dorsal area of pronotum : Length of mesonotum in Y's 2:3, in mine 3:5.

Relative lengths of antennal joints agree fairly well: in Y's A1-6=15,4,29,20,20,19; in mine 16,5,30,20,20,19, but in his A3=AW×4, while in mine A3=AW×5. This is very remarkable.

Some supplements: Head in frontal view: Fig. 1. Postocellar area triangularly surrounded with indistinctly outlined furrows originating from the outside impression of each hind ocellus, the furrows after united further extended posteriorly as a wider furrow till occipital margin, bottom line of the furrow distinct; vertex on both sides of the furrow gently roundly elevated. Pronotum wider than long, W:L4:3, medio-anterior area broadly depressed and inclined forwards, hence antero-lateral corners appearing roundly swollen, while medio-posterior half gently roundly raised. On meso-scutum notauli complete and deep, slightly sinuate and medial lobe gently rounded out



Figs. 1 and 2. Ampulex takeuchii Yasumatsu, ♀. 1, head. 2, propodeum.

at posterior margin in dorsal view, admedian lines anteriorly for short distance elevated into carinae, parapsidal sutures also in raised lines anteriorly, but posteriorly soon impressed and ended in a large deep hollow respectively at postero-lateral corner of the scutum. Sculpture of propodeum: Fig. 2.

As to structure of legs detailed accounts and measurements are given in the original description.

3. Ampulex kurarensis Yasumatsu, 1936

Ampulex kurarensis Yasumatsu, Tenthredo, 1 (2): 208-214, 1936 (1 ♂, holotype, 1 ♀, paratype, Pingtung Pref., Kuraru = Kenting Park).

Specimen examined: 1 ♀, Taitung Pref., Chiepen Spa, 8. VIII. 1988, M. Terayama leg.

Remarks. The present specimen tolerably well agrees in characters with the original description of A. kurarensis except following:

Frontal carinae are more similar to those of his male figure than to the female ones. The carinae are strong and high at base, gradually lowering and at upper curved part very weak but distinct.

Dorsal surface of pronotum not completely without transverse striae, but anteriorly with a few weak striae and the medial impressed line distinctly crenate.

Of the longitudinal carinae of dorsum of propodeum the next outer one consists of two that margin both sides of a series of foveae which are by degrees smaller forwards.

As to ocellar disposition in the present specimen OOD,Od,POD=20,9,10 and distance between fore and hind ocelli relatively 10. The values are considerably different from those of the Yasumatsu's.

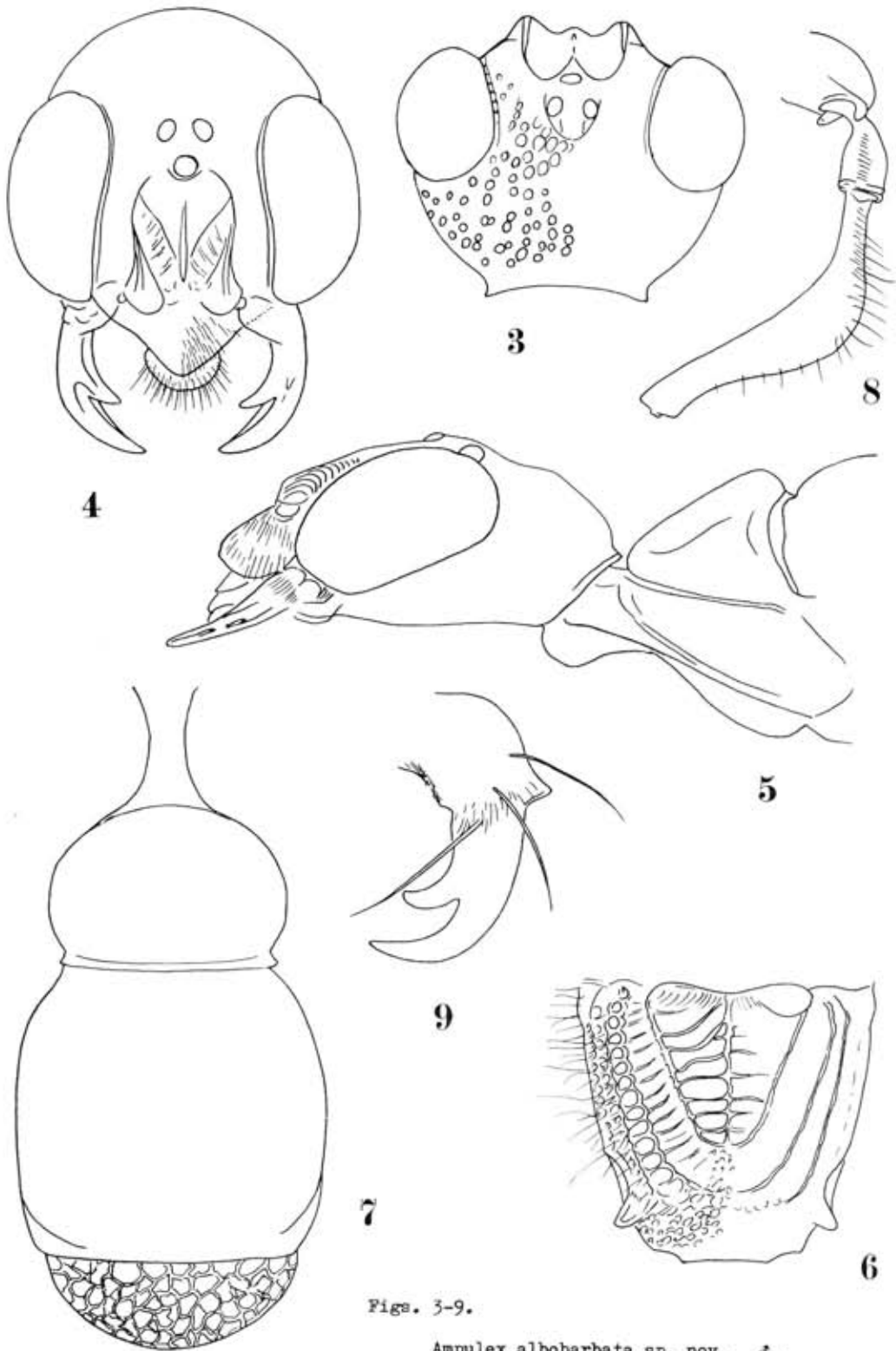
4. Ampulex albobarbata sp. nov.

Belonging to the group of A. kurarensis, differing from this species at least in ♂ in many characters of the structure of head, gaster, antenna and legs, in the sculpture of thorax and gaster and especially in the characteristic vestiture of the clypeus.

♂. Length 20 mm. Brilliant metallic blue, in some light parts of head, thorax and propodeum appearing purple, while dorsal part of G1 and 2 always largely purple; antennae, mandibles, palpi and tibial spurs and tarsi of legs black, mandible on apical teeth partly pale brown. Hairs on head and thorax above fairly long, soft and sparse, at base dark brown, but apically whitish, in some light appearing wholly whitish, those on postscutellum, sides of head and thorax, sides and posterior aspect of propodeum and on legs till femora silky white, but those on tibiae and tarsi somewhat brownish, especially on hind tibia and tarsus much darker; besides the above, mesopleuron, posterior part of propodeum, underside of thorax-complex and gaster wholly and coxae beneath densely covered with short, appressed, whitish velvety pubescence. Clypeus densely covered with silky white hair, the hair regularly arranged in radiating directions, in some light letting see the brilliant blue of the ground colour amid the silky white lustre of the hair. The layer of the hair is mixed with some long, somewhat stiff and pale brownish hairs also shooting out radiately on the anterior side. Labrum also covered with short velvety pubescence and anteriorly mixed with long brownish hairs, but here the pubescence not so dense and the surface appears dark grey.

Head seen from above: Fig. 3, vertex without medial furrow, postocellar area also without transverse impressed line, ocellar area gently roundly raised in an oval outline, each ocellus inclined outwards, each accompanied with a depression just outside. Head seen in front: Fig. 4, with inner orbits almost parallel to each other, frontal medial line distinctly carinated, carina subtuberculate at a short distance behind clypeus, antennal tubercle roundly elevated and thence a stout carina running up till $\frac{3}{4}$ of the distance to fore ocellus, each gently outcurved and gradually narrowing and weakening and finally as the edge line of the round depression in front of the fore ocellus reaching close to it. Clypeus medianly highly raised into a roof-shaped keel, inclined at an angle of about 45° nearly flatly towards sides (top angle about 90° in cross section, but less steep laterally and near lower ends of inner orbits gently roundly reflected to connect with here), no particular tooth on apical margin, only the medio-apical top bluntly pointed, not produced, outer side of frontal carina above antennal tubercle deeply roundly excavated (Fig. 5, head and prothorax seen from left side). Antenna filiform, slender and long, relative length of A1-6 and A12-13 = (when HW=100) 28,6,58,40,34,28 and 14,14. A1 about 2.5 times as long as wide at middle and A3=AW×8, A6=AW×4. Mandible as in Fig. 2. Buccal carina and median longitudinal carina beneath head distinct, occipital carina gradually lowered and disappeared downward. Pronotum with top area slightly longer than wide, gently roundly elevated, with distinct median furrow on anterior half, with medio-posterior top not particularly raised and produced and thence for about posterior 4th roundly inclined (Fig. 5) and at the same time broadened laterally in dorsal view. Mesoscutum with deep notauli, but not reaching posterior margin (posterior 4th without impressed lines), postero-lateral hollows very deep, parapsidal sutures normal, scutellum wider than long, surface nearly flat. Propodeum: Fig. 6, gaster in dorsal view: Fig. 7, G1 beneath with a broad transverse band at posterior margin, G2 beneath markedly roundly swollen; fore femur: Fig. 8 (left one in posterior view), mid and hind femora widest respectively at $\frac{2}{5}$ and $\frac{1}{3}$ from base. T4 normal in this genus, claw: Fig. 9.

Vertex strongly grossly punctured, punctures partly close and partly sparse (Fig. 3), frons somewhat finely, fairly closely punctured on inner orbital area and between



Figs. 3-9.

Ampulex albobarbata sp. nov., ♂.

the pair of frontal carinae, but in front of fore ocellus punctures very sparse, pro- and mesonotum and scutellum grossly but sparsely punctured, all impressed lines including inner orbital grooves strongly foveolate, scuto-scutellar furrow coarsely crenate, mesopleuron also grossly, irregularly, somewhat sparsely punctured, sides of propodeum on dorsal half strongly and coarsely rugoso-striate and partly punctured, G1 and 2 finely, sparsely punctured and G3 grossly, coarsely and irregularly punctate-reticulate.

♀, unknown.

Holotype: ♂, Formosa, Pingtung Pref., Kenting Park (old name = Kuraru), 11. VIII. 1980, T. Nambu (Coll. Tsuneki).

Remarks. In *kurarensis* ♂ inner orbits divergent below, vertex with a median longitudinal furrow, ocellar disposition different, the pair of frontal carinae above antennal tubercles divergent above, curved and reaching fore ocellus, clypeus without remarkable pubescence layer, A3=A1 3, A4=A1 2, pronotum with median furrow at anterior and posterior third and at intermediate area transversely striate, claws of T5 different in form, gastral segments different in form and with punctures as large as those on thorax and G3 punctured as on other tegites (after Yasumatsu, 1936).

5. *Pemphredon shirozui* Tsuneki, 1966

Pemphredon shirozui Tsuneki, Etizenia, 14: 14, 1966 (♂, Formosa, Nantou Pref., Sungkang).

Specimen examined: 1 ♂, Nantou Pref., Sungkang, 11. IX. 1980; 1 ♂, Ditto, Nanshanchi, 4. IX. 1980, both M. Terayama leg.

Remarks. Both the specimens well agree in general with the original description, but epicnemial area margined on outer side with a carina which is accompanied just behind with a coarsely foveolate furrow. Antennal tyloidea seen from side roundly produced beneath on A4-11 (this may be a variation), medianly marked and weaker towards both ends, on A11 not reaching apex, seen vertically each located somewhat oblique and gently elevated in a spindle-shape, but without distinct outline. In fore wing in the Sungkang specimen recurrent vein 1 received by cubital cell 1 at about middle and recurrent vein 2 in right wing interstitial with transverse cubital vein 2, while in the left received by cubital cell 2 close to its base. In Nanshanchi specimen recurrent vein 1 similar, but 2 interstitial in both. Area dorsalis with posterior margin not triangular, but rounded. Punctuation and striae generally as in the holotype.

The differences observed are considered intraspecific variations.

These are a second and a third specimen respectively of this species.

6. *Psen (Psen) shirozui* Tsuneki, 1966

Psen (Psen) shirozui Tsuneki, Etizenia, 14:10, 1966 (♂, Chiai Pref., Fenchiu).

Psen (Psen) shirozui: Van Lith, Tijds. Ent., 111 (4): 105, 1968.

Psen (Psen) shirozui: Tsuneki, Etizenia, 57: 15, 1971 (♂, keyed).

Psen shirozui: Bohart and Menke, World Sphecid., p. 167, 1976 (listed).

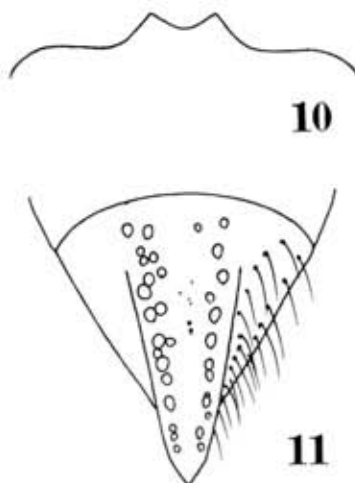
Specimen observed: 1 ♀, Formosa, Nantou Pref., Sungkang, Lo Chin-chi, 22. VIII. 1980.

♀ (Hitherto unknown). Length about 12 mm. Hairs on frons and clypeus golden, sculpture on outer parts of dorsal aspect and on posterior inclination of propodeum slightly different in pattern (but the sculpture may considerably vary within a species) and generally with sex characters of the female; otherwise similar in general to ♂, having broadly ferruginous legs.

Black, ferruginous are apical part of clydible, palpi, tegula (translucent), basal plate of wing (kite brownish), fore and mid femora in front broadly, hind trochanter except above, hind femur nearly wholly and all tibiae and tarsi; claws apically and all arolia dark brown. Wings yellowish fusco-hyaline, veins dark brown. Pubescence on vertex, mesoscutum silky white, hairs on outer sides of mandibles, temples, pronotum, sides of thorax-complex and on propodeum silvery, those on legs slightly yellowish.

Head from above with ratio of W : L (in middle till base of antennae) : L (till apex of interantennal carina) = 100:45:53, IOV at posterior margin of hind ocelli re-

lately 58 (across middle 54), OOD,Od,POD=7,4,6. Head seen in front with W : L (in middle) : IOD (at base of antennae = minimum) : IOD (at lateral ends of clypeus) = 76, 41,48. AOD,WAS,IAD,ACD=3,4,7,5. A3,4,5=10,8,7.5. A3=AWx3.5(dorsal) or AWx3.0(widest) Antenna not strongly incrassate towards apex. Postocellar bicurved and interocellar simple furrows distinct. Frontal median carina fine and distinct, at verge of upper frons surface on both sides of the carina roundly elevated and the carina sunk to bottom of median furrow. Interantennal carina in frontal view roundly upcurved, in dorsal view also roundly outcurved, without medial tooth, at each end jointed to the lower margin of antennal socket rim. Median lobe of clypeus roundly elevated, densely covered with golden hair and in order to observe the apical margin (Fig. 10) it must be removed. Mandible thick and broad as in ♂, apical third ferruginous. Collar of pronotum short, with anterior margin carinated, mesoscutum raised roundly, admedian lines and notauli equidistant at bases, the latter convergent posteriorly, but not united, all reaching about a third the length of scutum, parapsidal sutures normal, conspicuous by pure black in the plumbous lustre of surroundings. On mesopleuron epimeral area roundly raised, postspiracular carina distinct, epicnemial carina, episternal and scrobal furrows distinct as usual. Structure and sculpture of propodeum as in ♂, only differing from it in that outer sides of area dorsalis and dorsal part of posterior inclination are mainly longitudinally, somewhat rugosely striate, not simply irregularly reticulate (but this may be variable), side distinctly separated from dorsal and posterior aspects by a longitudinal rugosed carina. Gastral petiole about 9 times as long as broad at middle, dorsal surface roundly curved, smooth, only at its sides carinated. Pygidial area: Fig. 11, with surface microcoriaceous all over. Hind tibia with a longitudinal series of short spinules, about 16-17 in number. In fore wing recurrent veins 1 and 2 received by cubital cell 2, vein 1 at 3/5 from base and 2 almost interstitial with transverse cubital vein 2.



Figs. 10 and 11.

Psen shirozui Tsuneki, ♀.

Vertex and upper frons smooth and polished and sparsely scattered with fine weak punctures, mixed with a few medium-sized ones, on raised areas punctures sparser. Mesoscutum fairly closely covered with medium-sized punctures, PIS mostly nearly equal to PD, on posterior margin at lateral areas longitudinally punctate-striate, scutellum and postscutellum similarly, but more sparsely punctured, mesopleuron smooth and shining, on epimeral area punctures fine and very sparse and at posterior part punctate-striate with piliferous punctures, prepectus fairly closely covered with medium-sized piliferous punctures, lower part of episternum very sparsely scattered with very fine points, also piliferous. On propodeum area dorsalis margined with foveolated furrow, surface longitudinally and coarsely striate, on median furrow mixed with transverse striae. Gaster, except smooth petiole, finely, somewhat sparsely punctured, but G6 on sides (outer area of epipygium) strongly coarsely punctured, epipygium with surface opaque and punctured as given in Fig. 11.

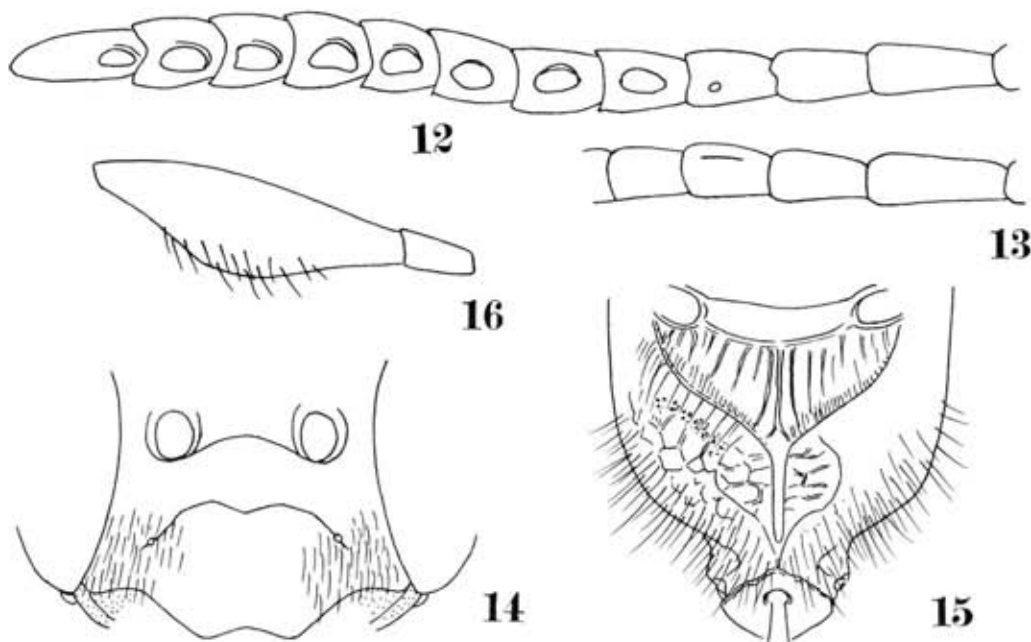
7. Psen (Psen) foveicornis sp. nov.

♂. 9 mm. Characteristic in that A5 with a minute tubercle and a fine raised line and A6-13 each with a smooth shining fovea and that GS3 and 4 each with a medio-apical tuft of long brown hairs. In colour fairly resembles Psen (Psen) rufoannulatus Cameron of North India.

Black; ferruginous are A1 at base and broadly beneath, A3-12 beneath (basally narrow and apically broad), labrum, mouth parts with palpi and tegra of wing (translucent). Mandible on outer side yellow, at extreme base black and at apical area reddish brown. Gaster except petiole, a large baso-medial black mark on tergite 1 and an obscure brownish black mark on tergite 3 reddish ferruginous; legs also reddish ferru-

ginous except black coxae. Hair long, silvery on clypeus, vertex, temples, sides of thorax-complex and legs, and shining brown on dorsal side of mesoscutum and posterior part of gaster. Wings slightly yellowish and apically somewhat clouded. Antennae dorsally brownish black, but on A8 apically slightly paler, A1 and 2 smooth and polished, from A 3 apically microgranulate and dull except the foveae. On A5 a minute tubercle is on front side and a raised line on dorso-posterior area, foveae in a line on frontal side when stretched laterally.

Head from above transverse, W:L in middle = 100:46, occipital margin moderately emarginate, IODv at posterior margins of hind ocelli relatively 55, OOD,Od,POD=10,6,8, hind ocellus obliquely elongate as it is inclined postero-laterally. Head seen in front minimum IOD at base of antennae and at lateral ends of clypeus relatively 44 and 54. AOD,WAS,IAD=3,4,8. Interantennal carina upcurved, without medial tooth, with both ends connected with lower margins of socket-rims of antennae. Lower part of head seen



Figs. 12-16. *Psen (Psen) foveicornis* sp. nov., ♂.

in front: Fig. 12, clypeus with median lobe roundly and comparatively highly elevated, mandibles normal, not strongly widened. Antennal flagellum in frontal view: Fig. 13, foveae not flat-bottomed, but longitudinally concave; A3-6 in dorso-posterior view: Fig. 14, the raised line on A5 is visible in certain light only and difficult to observe. Collar of pronotum short, transverse, with anterior margin strongly carinate, mesoscutum convex, with notauli fairly deep, reaching about mid point of length of scutum, parapsidal suture in a fine raised line; on mesopleuron epicnemial carina strong and at lower end turned posteriorly as a weak hyposternal carina, episternal and scrobal furrows distinct, both finely crenate, median sternal carina strong and marked. Sculpture of propodeum roughly as given in Fig. 15, area dorsalis at posterior marginal area distinctly depressed and margined with a carina, median furrow bordered on both sides with carinae and narrowly extended to posterior inclination and finally replaced with a short carina. Gastral socket markedly large as given in the figure, including in it a round socket rim of ligament of gaster-raising muscle. Gastral petiole long, L:W (in middle area) = 7:1, on basal third strongly upcurved and on sides longitudinally bluntly carinate, otherwise almost rounded in cross section. In fore wing first and second recurrent veins received respectively by second and third cubital cell, both near base of each cell. Legs slender and long, fore femur in posterior view: Fig. 16, tarsi normal, hind tibia with a series of short spinules (8-9 in number) on basal half of outer side and irregular rows of comparatively long silvery hairs.

Vertex smooth and polished, with a few fine punctures very sparsely scattered, upper frons at verge to anterior inclination finely, fairly closely punctured on median area and partly longitudinally rugoso-punctate, clypeus on median area closely, finely but not strongly punctured, punctures on mesoscutum medium-sized, deep, fairly close as a whole, but irregular in distribution, PIS:PD=1:1 - 1:5, generally on central area sparse, at posterior margin forming a transverse series of a few punctures longitudinally and closely arranged, apparently the area rugoso-punctate, punctures on scutellum as on central part of scutum, on mesopleuron prepectus finely, rather closely but weakly punctured, on other areas punctures weaker, much sparser, side of propodeum on anterior femoral sinus smooth and shining, but on postero-dorsal area closely covered with rugosed striae, the striae extended from there to dorsal and posterior aspects of the segment. Gaster smooth and shining above, but posteriorly sparsely covered with fine weak piliferous punctures, ventral side finely and closely punctured on lateral areas of GS2-4 and grossly and sparsely so on GS5 in front of posterior margin and irregularly so on GS6.

♀, unknown.

Holotype: ♂, Formosa, Chiai Pref., Mt. Ali, 18. VIII. 1980, M. Terayama leg. (Coll. Tsuneki).

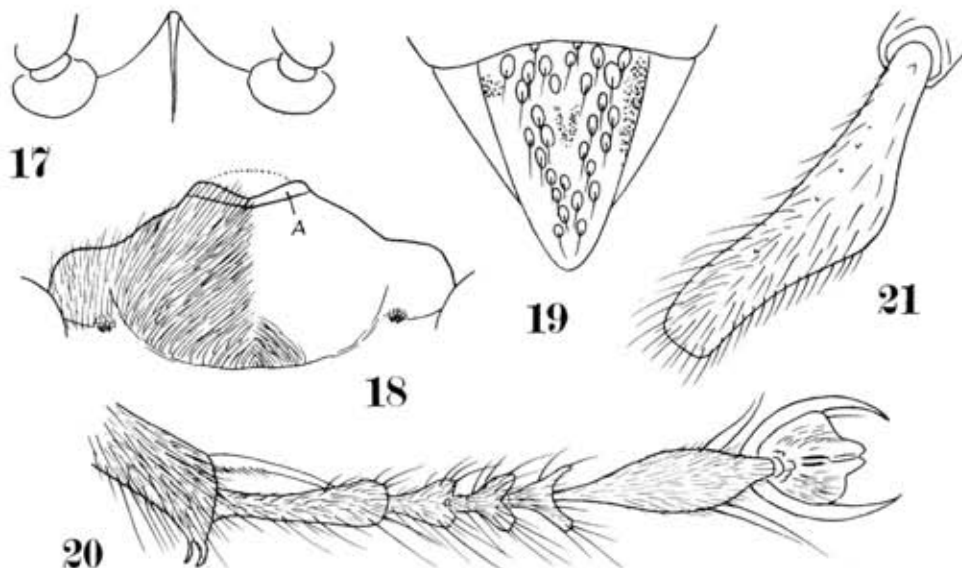
8. Paen Paen) terayamai sp. nov.

In having the fringe of long, soft, curved greyish hair at apical margin of gastral tergites 2-6 the present species resembles Paen (Paen) sauteri Lith, 1968 that was described from Taihorin (now Talin, Chiai Pref.), Formosa, but differs from this in the colour of mandible, legs and clypeal hairs, in the relative length of antennal segments, and strictly in the form of clypeus and epipygium and in the sculpture of mesoscutum and propodeum and in the venation of fore wing (but the slight differences in sculpture, punctuation and venation are not important, since they vary considerably as a rule).

♀. 10 mm. Black, without plumbeous shine, clypeus, mandible and legs without ferruginous area, antennae also black, but appearing somewhat brownish, due to covering short pubescence, mouth parts pale brown, but basal two joints of maxillary palpus dark brown, tibial spurs greyish white and tarsi of legs brownish, more strongly so apically. Hairs on clypeus silvery, strongly convergent towards medial line, on frons, temples, thorax beneath and femora and tibiae of legs also silvery, strong and appressed or half appressed; hairs on head above, dorsum and upper half of side of thorax-complex, gastral petiole and anterior part of tergite 1 long, soft and greyish white, in some light somewhat yellowish. Hairs of apical fringes of gaster not stiff, not highly stretched, but curved towards medial line, silky grey in colour, but in some light slightly yellowish; pubescence on G1 and 2 above very short, on 3-6 slightly long and longer posteriorly. Hairs on epipygium and its outer sides rather bristle-like. On ventral side each sternite with an ante-apical irregular row of long stiff hairs. Beside, sternite 1 with scattered long hairs at central area and shorter, closer, somewhat stronger and almost silvery ones at lateral areas.

Head from above with ratio of W:L (till base of antennae)=100:43, L till top of interantennal tooth 51. W:IOD at posterior margin and across middle of hind ocelli relatively 60 and 56; interantennal tooth: Fig. 17 (from above), OOD, Od, POD relatively 15, 8, 12, ocellar area gently concave, without inter- and post-ocellar groove, ocellular area and postocellar area not elevated, but the former just outside the ocelli narrowly impressed along margin, on sides of vertex, along inner orbit a gentle longitudinal elevation present till verge to anterior frons, frontal furrow absent, instead frontal carina runs from fore ocellus till interantennal tooth. Head seen in front with W:L=100:74, IOD at base of antennae (minimum) and at lateral ends of clypeus relatively 42 and 56, while length of clypeus 24; AOD, WAS, IAD, ACD=6, 8, 15, 12, interantennal carina with median tooth gently upcurved and connected with lower margins of antennal socket rims at both ends. Clypeus with medial lobe roundly, comparatively highly elevated, apical margin: Fig. 18, the marginal area of the incision (A in Fig. 18) minutely transversely rugulose and distinctly reflected. (In the natural state a gently rounded labrum produced from beneath clypeus, making it appear as if rounded at apex; in order to see the structure of the clypeus covering hair must be removed). Al thick, in widest view about twice as wide as A3 at apex, flagellum markedly widened towards apex, Al2=A1 in width, A3, 4, 5=10, 8, 7 in length. A3=AW×3.3 (widest view), or ×4 (narrowest view). Mesoscutum and mesopleuron as in preceding species, but remarkable is

that a short tooth present on sides of mesosternum, about mid point between fore and mid coxae. Area dorsalis on propodeum impressed as usual, lunate in form, polished and longitudinally carinate or foveate, mid fovea representing the medial furrow of the usual case, with surface rugulose, after once constricted, extended to posterior inclination to turn to its medial furrow, but not reaching apex, with its apical 4th replaced by a raised ridge, lateralmost carinae of area dorsalis located rather within the range of sides of propodeum. Gastral socket markedly large as usual, roughly pentagonal in outline. Gastral petiole long, L : W at base (minimum), in middle and at apex = 100, 12, 14, 18, but at extreme apex 20, nearly rounded in cross section, only bluntly edged on sides of dorsal surface. Pygidial area: Fig. 19. Fore tibia



Figs. 17-21. Psen (Psen) terayamai sp. nov. ♀

normal, mid tibia slightly deformed (Fig. 20, right one, dorsal view), with two short curved apical spines, outer surface somewhat closely scattered with pointed tubercles whence bristles shooting out, hind tibia provided with a longitudinal series of short thick curved spines on outer side and at basal area, further, with another short series consisting of 3 or 4 shorter spines; mid T1 slender and in dorsal view enlarged at apical area (as in Fig. 20), but in posterior view enlarged near middle as given in Fig. 21, mid T2-4 subtriangular and T5 spindle-shaped as shown in Fig. 20; fore T2-5 as in mid leg, but hind T1-4 much slenderer and longer, but T5 alone similar. In fore wing recurrent vein 1 received by cubital cell 2 at a third from base, recurrent vein 2 by cubital cell 3 close to its base, nearly interstitial.

Upper frons including roundly inclined anterior verge finely, fairly closely punctured, vertex more sparsely punctured, mesoscutum considerably closely covered with medium-sized strong punctures, PIS mostly as great as PD, but on central area punctures somewhat sparser, on mesopleuron prepectus finely, rather weakly, fairly closely punctured, epimeral area almost impunctate, episternal area sparsely punctured. Raised posterior limb of area dorsalis longitudinally, finely and closely rugoso-striate, rugae posteriorly sparse, turning to marginal carinae of reticulation which covers posterior aspect, reticulation moderate in size, irregular, but including a few strong oblique-longitudinal rugae covering whole the surface. Gastral petiole smooth and polished, GT 1-2 finely and sparsely, GT 3-5 finely and closely punctured, pygidial area microcoriaceous and grossly punctured with setiferous punctures, sides of GT6 similarly strongly and coarsely punctured.

♂, unknown.

Holotype: ♀. Formosa, Nantou Pref., Nanshanchi, 4. IX. 1960, M. Terayama leg. (Coll. Tsuneki).

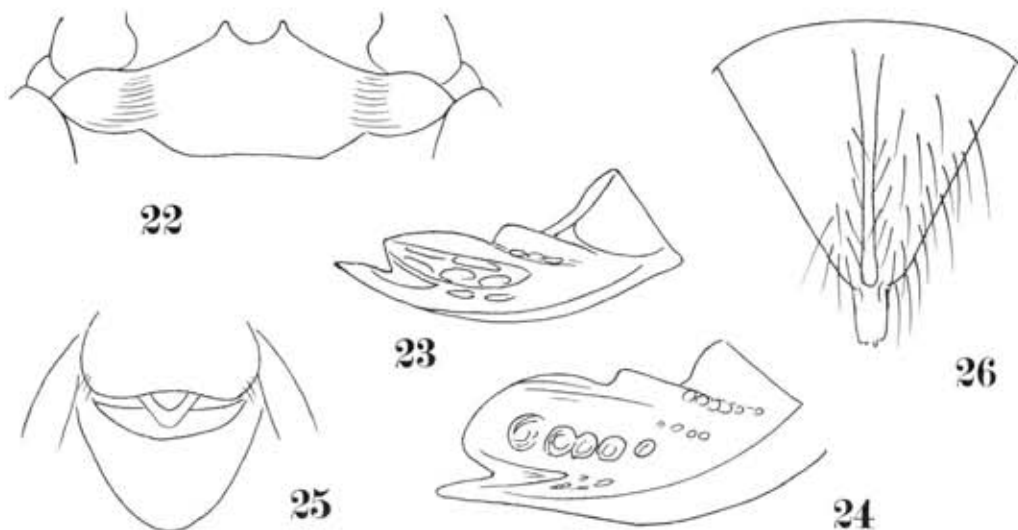
9. Psenulus yingfeng sp. nov.

Closely resembles Psenulus lubricus Pérez, occurring in Japan, delicately differs from this in some characters:

A3 relatively longer, flagellum not ferruginous beneath, median of the three teeth of mandible much narrower, anterior carina of pronotal collar slightly higher and more distinctly triangularly raised in frontal view, punctures on frons and mesoscutum somewhat larger and much stronger, mesoepimeral area more highly roundly elevated, on propodeum the smooth area extending from behind area dorsalis to posterior inclination is covered broadly with large but shallow punctures, and the outer side of which is covered with very coarse reticulation, gastral petiole and pygidial area relatively much narrower and longer and legs much less brownish and more broadly black.

♀. Length 6.0 mm. Black, tibial spurs pale brownish white, palpi and apical part of mandible slightly brownish, wings hyaline, apical area slightly darkened, veins and stigma black. Hairs on frons, clypeus, temples, collar, mesosternum, sides of propodeum, gastral petiole beneath and legs silvery, long; pubescence on dorsal side of head and thorax and on gaster soft, comparatively short, greyish white, in some light silky white in other dark grey.

Head transverse, $W:L=2:1$, $HW:10Dv$ (at posterior margin of fore ocellus)=100:64, interantennal tubercle expanded into broad lobiform plate, highly elevated, with lateral margins obliquely roundly raised and as a whole longitudinally strongly upcurved as in lubricus, occipital margin fairly markedly roundly emarginate, with carina considerably high, reaching close to, but not contiguous to, buccal carina, $OOD,Od,POD=10,3,6$, without postocellar and interocellar groove, but outer side of hind ocelli markedly depressed along outer margin, frontal furrow broad and shallow, rather indistinct. Head in frontal view with $HW:10D$ in middle (minimum) and at lateral ends of clypeus relatively 100:51,54, $AOD,WAS,IAD,ACD=6,5,8,11$, width of interantennal plate relatively 6, structure of interantennal transverse carina also similar to that of lubricus. Clypeus: Fig. 22, Mandible in frontal view: Fig. 23 (cf. Fig. 24, in lubricus). Antennal flagellum strongly incrassate towards apex as in compared species, $A3,4,5=10,7,7$, $A^*=AW \times 2.4$, $A4=AW \times 1.8$, $A5=AW \times 1.5$, $A4-11$ equal in length, but $A10-11$ as long as wide. On mesoscutum admedian lines more distinct than in lubricus, notauli similarly extended till near posterior margin, while impressed parapsidal suture lines completely reaching there (as in lubricus), mesopleuron and propodeum as above mentioned. Gastral petiole as long as hind trochanter and femur united, gradually slightly widened posteriorly and strongly widened at apical area, ratio of relative length, minimum width behind base, width at end of gradual enlargement and at extreme apex = 100,13,20,30, dorsal surface medianly gently furrowed, the furrow at base and at apex broader and deeper and margined with



Figs. 22-26. Psenulus yingfeng sp. nov., ♀

carinae on both side, carinae on basal half acute, besides these the petiole at dorsal sides, ventral sides and ventral middle longitudinally carinate, the last mentioned one blunt (similar to lubricus). Structure at base of sternite 2: Fig. 25 (do.), pygidial area: Fig. 26.

Upper frons fairly closely (PIS=1-1.5 times PD) covered with medium-sized punctures, vertex and its posterior part more sparsely and weakly so, punctures on mesoscutum similar, but somewhat sparser, PIS mostly 1.5-2 times PD, mesopleuron much more finely and more sparsely punctured, the impressed area dorsalis of propodeum covered with a transverse series of large elongate foveae, the foveae with bottom smooth and polished, medial fovea large, trapeziform, sectioned into several cells and extending posteriorly to turn to medial furrow of posterior aspect, here the furrow is at upper area transversely carinated, surface of posterior aspect coarsely irregularly reticulate and further minutely rugulose, not smooth; sides of propodeum finely, fairly closely, but not strongly punctured. Gaster smooth and polished and very sparsely covered with piliferous points, but on basal half tergite 3 completely without puncture, tergite 6 with sparse strong setiferous punctures.

♂, unknown.

Holotype: ♀, Formosa, Nantou Pref., Yingfeng, about 2500 m high, 3. VIII. 1980, T. Nambu.

10. Larra (Cratolarra) polita (Smith, 1857)

Larrada polita Smith, J. Proc. Linn. Soc. London, Zool., 2: 103, 1857 (♀, Borneo: Sarawaku).

Larra rufipes: Williams, Ann. Mag. Nat. Hist., Ser. 10, 18: 124, 1936 (Solomon Is.).

Larra polita: Tsuneki, Etizenia, 20: 24, 1967 (♀ ♂, Formosa)

Larra (Cratolarra) polita: Bohart & Menke, World Sphecid., p. 238, 1976 (placing rufipes Smith and luzonensis Rohwer under subspecies).

Larra polita: Tsuneki, SPJHA, 19: 5, 1982 (luzonensis is a good species).

Specimen examined: 1 ♂, Formosa, Yehyu, Is. Lan-hsu (= Botel Tobago Is.), 7. VIII. 1981, M. Kawana.

Liris (Pitaliris) subgenus nov.

Characters of mandible, T5 with claws and apical row of spinules of gastral tergite 6 as in Leptolarra Cameron sens. Bohart and Menke, 1976, but in the present subgenus pronotum considerably thick, with distinct dorsal surface and pygidium of ♀ bare and polished, without appressed hair.

Type: Liris pitamawa (Rohwer, 1919)

Remarks. Leptolarra Cameron is a problematical taxon and in a sense the present subgenus may be included within it, because Leptolarra, according to the definition of Cameron, has the highly raised pronotum and the bare pygidial area (♀) (different from the definition by Bohart and Menke and by no means identical with Nigliris m.), but it can not be included within the prevailing definition of Leptolarra: Bohart and Menke, so that a new subgenus is erected.

11. Liris (Pitaliris) pitamawa (Rohwer, 1919)

Cratolarra pitamawa Rohwer, Bull. Hawai. Sug. Plant. Ass., Ent. Ser., 14: 7, 1919.

Notogonidea (Cratolarra) pitamawa: Williams, Ibid., 19: 80, 1928 (♀ ♂, Philippines).

Cratolarra fuscinerva: Tsuneki (nec Cameron, 1905), Etizenia, 17: 8, 1966 (Formosa).

Liris (Cratolarra) pitamawa: Tsuneki, Ibid., 20: 41, 1967 (5 ♀ 4 ♂, Formosa); Ibid., 55: 2, 1971 (8 ♀ 7 ♂, Formosa).

Liris (Leptolarra) pitamawa: Bohart and Menke, World Sphecid., p. 247, 1976.

Specimen examined: 1 ♀, Formosa, Nantou Pref., Nanshanchi, 4. IX. 1980, M. Terayama leg.

12. Liris (Pitaliris) iriomotensis Tsuneki, 1972

Liris (Cratolarra) iriomotensis Tsuneki, Etizenia, 59: 17, 1972 (1 ♂, South Ryukyus: Is. Iriomote).

Specimens examined: 2 ♀, South Ryukyus: Is. Iriomote, Nakama River, 20. VIII. 1978 and Komi, 21. VIII. 1978, both T. Nambu leg.

Remarks. In the females observed the differences in the characters of antenna, IOD at vertex and sculpture of propodeum are much less marked than in the male, yet the sculpture of propodeum is weaker than in pitamawa, A3 slightly shorter and IODv slightly longer.

Judging by the slight differences iriomotensis may be a local race of pitamawa, but based on the difference in the structure of male genitalia, although not marked, it is still dealt with as distinct.

12. Liris (Leptolarra) rohweri formosana Tsuneki, 1973

Liris (Notogonidea) rohweri: Tsuneki, Etizenia, 17: 2, 1966 (1 ♀, Formosa; 4 ♀ 1 ♂, Is. Iriomote; 3 ♀ 1 ♂, Is. Ishigaki).

Liris (Dociliris) rohweri: Tsuneki, Ibid., 20: 31, 1967 (22 ♀ 40 ♂, Formosa); Ibid., 55: 4, 1971 (5 ♂, Formosa); Kontyu, 35 (4): 389, 1967.

Liris (Dociliris) formosana Tsuneki, Life Study, 17 (3-4): 113, 1973; Ann. Hist.-Nat. Mus. Natn. Hung., 69: 267, 1977 (21 ♀ 15 ♂, Formosa, leg. H. Sauter).

Specimens examined: 2 ♀, Is. Ishigaki, Yonehara, 28. VIII. 1978; Mt. Banna, 29. VIII. 1978, leg. T. Nambu; 1 ♀, Formosa, Nantou Pref., Pempuchi, 18. VIII. 1980, T. Nambu.

Remarks. As it was considered from the original description and from the explanation of the species by Williams (1928) that Liris rohweri had not lateral carinae on propodeum the Formosan specimens above listed was dealt with as distinct. But recently the examination of rich material of this species from the Philippines showed that the carinae were present in the Philippine specimens also, although they were much less marked than the Formosan and the Ryukyus, so that the latter was sunk to a local race of the Philippine species.

13. Liris (Leptolarra) laboriosa (Smith, 1856)

Liris (Dociliris) laboriosa: Tsuneki, Etizenia, 20: 30, 1967 (4 ♂, Formosa); Ibid., 55: 4, 1971 (1 ♀ 13 ♂, Formosa); SPJHA, 19: 17 (keyed).

Specimens examined: 1 ♀, Formosa, Pingtung Pref., Hengchun, 12. VIII. 1980, T. Nambu; 1 ♂, Formosa, Nantou Pref., Puli, 15. VIII. 1980, M. Terayama.

14. Liris (Leptolarra) deplanata binghami Tsuneki, 1967

Liris (Notogonidea) deplanata binghami Tsuneki, Etizenia, 18: 1-6, 1967 (27 ♀ 1 ♂, Ryukyus: Is. Amami-Oshima; 21 ♀ 28 ♂, Formosa).

Liris (Dociliris) deplanata binghami: Tsuneki, Ibid., 20: 27, 1967 (18 ♀ 28 ♂, Formosa); Ibid., 55: 2, 1971 (5 ♀ 12 ♂, Formosa)

Specimens examined: 1 ♂, Formosa, Nantou Pref., Nanshanchi, 4. IX. 1980, M. Terayama.

15. Liris (Leptolarra) festinans (Smith, 1859)

Liris (Nigliris) japonica: Tsuneki, Etizenia, 20: 34, 1967 (ref. variation, forms, distribution, 53 ♀ 55 ♂, Formosa); Kontyu, 35 (4): 388, 1967 (♀ ♂, Formosa and the Ryukyus: Is. Iriomote, Is. Yoron, Is. Tokunoshima); Etizenia, 55: 7, 1971.

Liris (Nigliris) japonica manilae: Tsuneki, Ann. Hist.-Nat. Mus. Natn. Hung., 69: 269, Liris (Leptolarra) festinans: Tsuneki, SPJHA, 19: 9, 1982 (19 ♀ 10 ♂, Bismarck Arch.).

Specimens examined: 1 ♀, Ryukyus: Is. Iriomote, Nakama River, 20. VIII. 1978,

T. Nambu; 1 ♂, Formosa, Lihyuehtan, 16. VIII. 1980, T. Nambu.

Remarks. The Iriomote specimen examined is medium-sized, similar to the smaller form of ssp. japonica and to the larger form of the Formosan and southern typical form, but with the sculpture on propodeum much finer and weaker, with punctures on mesopleuron somewhat finer, weaker and sparser and with lateral incisions of the apical produced part of clypeus stronger and more distinct than the usual form of the Formosan as well as the Japanese specimens. Rhinaria on antenna similar.

The Formosan male belongs to none of the types mentioned in my 1967 paper, namely, it has rhinaria on A6 and 7 only and the hair on ventral side of gaster consisting of long stiff ones and short abundant pubescence.

16. Tachysphex nigricolor yaeyamanus Tsuneki, 1971

Tachysphex bengalensis yaeyamanus Tsuneki, Etizenia, 55: 20, 1971 (7 ♀, Is. Iriomote; 2 ♀ 6 ♂, Is. Ishigaki).

Specimen examined: 1 ♀, Is. Iriomote, Mt. Omoto, 30. VIII. 1978, K. Hara.

17. Tachysphex mindorensis Williams, 1928

Tachysphex mindorensis Williams, Bull. Exp. St. Hawai. Sug. Pl. Ass., Ent. Ser., 19: 92, 1928 (♀ ♂, Philippines); Tsuneki, Etizenia, 55: 11, 14, 1955 (9 ♀ 3 ♂, Formosa).

Specimens examined: 1 ♂, Formosa, Pingtung Pref., Erhchungchi, 10. VIII. 1980, T. Nambu.

18. Nitela yasumatsui taiwana ssp. nov.

Nitela yasumatsui Tsuneki, Akitu (Kyoto), 5 (2): 34, 1935 (♀ ♂, figs.).

♀. Length 4 mm. (slightly larger than the average of the 70 typical specimens from Japan). Differs only in that surface sculpture on frons and mesoscutum is coarser, and on mesoscutum, further, stronger and somewhat irregular. In the form of apical margin of clypeus medial rounded prominence almost unobservable and seen vertically apical margin straight. However, in the Japanese specimens medial prominence in ♀ is always weak and sometimes nearly straight, and so as to the difference in this character further confirmation with more specimens seems necessary. In other characters, e. g., medial high elevation of clypeus seen in profile, relative length of antennal joints, structure of pronotum, series of striae at apical margin of mesoscutum, sculpture on dorsal, posterior and lateral aspects of propodeum, delicate striae and very sparse indistinct fine points on gaster, wing venation etc., the Taiwanese specimen agrees well with the Japanese.

♂, unknown.

Holotype: ♀, Formosa, Mt. Ali, 2. VIII. 1980, M. Terayam leg. (Coll. Tsuneki).

19. Ectemnius (Hypocraebro) schlettereri taiwanensis Tsuneki, 1977

Ectemnius schlettereri sakaguchii: Tsuneki, Etizenia, 30: 3, 1968 (5 ♀ 4 ♂, Formosa); Ibid., 51: 2, 1971 (9 ♀ 5 ♂, Formosa); Japanese authors, 1968-77; Leclercq, Bull. Ann. Soc. R. Ent., 109: 298, 1973 (6 ♀ 19 ♂, Formosa, Sauter leg.); Bohart and Menke, World Sphecid., p. 428 (listed).

Ectemnius (Hypocraebro) schlettereri taiwanensis Tsuneki, SPJHA, 4: 12, 1977.

Specimens newly examined: 2 ♀ 1 ♂, Nantou Pref., Puli, 16, 18. VIII. 1980; 2 ♀, same Pref., Nanshanchi, 15. VIII., 4. IX. 1980; 1 ♀, Lushan, 15. VIII. 1980, all leg. T. Nambu.

Remarks. This subspecies is rather common in Formosa.

20. Ectemnius (Cameronitus) orius cetonicus Leclercq, 1958

Ectemnius (Cameronitus) orius cetonicus Leclercq, Bull. Ann. Soc. R. Ent. Belg., 94 (5-6): 155, 1958; *Ibid.*, 109: 297, 1973 (62 ♀ 92 ♂, Formosa, H. Sauter leg.); Tsuneki, Etizenia, 30: 3, 1968 (84 ♀ 14 ♂, Formosa); *Ibid.*, 51: 5 (35 ♀ 15 ♂, Formosa); Japanese authors, 1971-77.

Ectemnius palitans: Tsuneki, Ins. Matsumurana, 22 (3-4): 98, 1959; Bohart and Menke, World Sphecid., p. 427 (listed).

Specimens examined: 3 ♂, Formosa, Nantou Pref., Nanshanchi, 15. VIII. 1980; 2 ♀, same Pref., Puli, 16, 18. VIII. 1980; 1 ♀, Shinrienchao, 10. IX. 1980, T. Nambu and M. Terayama leg.

Remarks. This species is common and abundant in Formosa.

Recently Bohart and Menke, in their "Sphecid Wasps of the World", synonymized orius, bornicus, cetonicus, palitoides, pauxinus Leclercq with palitans Bingham, 1896. I had the same opinion in 1968 (Tsuneki, 1968, p. 3, above cited). Certainly these appear so when the females are compared, but at least as far as palitans and orius are concerned they differ markedly in the structure of gastral tergite 5 in the male and possibly also of gastral segments 1 and 2, and it is doubtless that they belong to a separate species respectively.

Leclercq in his repeated treatments of these species compares mainly the females in relation to the colorific or sculptural characters, simply touching upon gastral tergite 6 of the male in some of the species.

When more detailed comparison is made with their males the taxonomic relationships among them will become clearer.

21. Crossocerus (Cuphopterus) kakusanus sungkangensis ssp. nov.

Crossocerus (Cuphopterus) kakusanus: Tsuneki, Etizenia, 15: 6, 1966 (♂, Ryukyus: Is. Amami-Oshima); Kontyu (Tokyo), 36 (1): 57, 1968; Leclercq, Bull. Ann. Soc. R. Ent. Belg., 109: 291, 1973 (2 ♀ 2 ♂, Formosa, leg. H. Sauter).

Specimen examined (holotype): 1 ♂, Formosa, Nantou Pref., Sungkang, about 2000 m high.

The Formosan specimen examined brightly maculated with brilliant lemon-yellow and different from the white maculated Japanese typical specimens. In the latter the maculae are considerably variable in form and size on the clypeus, collar and tubercles of pronotum, gastral segment 3 and sometimes completely lacking on these areas, while on antennal scape, gastral segment 1 and legs always present, though more or less varied in developmental degrees. In the Formosan specimens also possibly variable. In the specimen observed here the yellow maculae are as follows:

Clypeus except medio-basal spot, medio-apical area and apical margin, mandible except narrow apical brown (extreme apex black), antennal scape except a large black mark above, a medianly narrowly interrupted broad band on collar, humeral tubercles, a spot on tegula, postscutellum nearly completely (in the typical race always without mark), gastral segment 1 except apical 2/3 (posteriorly and beneath brown), coxae at apices, trochanters completely (hind one with a black mark above), fore and mid femora posteriorly and beneath, fore and mid tibiae except folded side, a large elongate mark on outer side of hind tibia and all tibial spurs.

In structure, punctuation and vestiture similar, only the genal process somewhat larger and more distinctly triangularly produced. Hind coxal process and mid tarsal excavation on outer side also similar.

Remarks. Leclercq recorded 2 ♀ 2 ♂ specimens collected at Taihorin (now Talin, Chiai Pref., about 14 km north of City Chiai) by H. Sauter, now mostly preserved in Zoological Museum of Humboldt University, Berlin, but he did not give any comment about the characters of the specimens. The specimen recorded by me from the island of Amami-Oshima, the Ryukyus, belonged to the typical form in the colour of the maculation.

22. Crossocerus (Cuphopterus) surusumi Tsuneki, 1971

Crossocerus (Cuphopterus) surusumi Tsuneki, Etizenia, 51: 10, 1971 (1 ♀, Formosa, Mt.

Ali, about 2400 m high).

Specimen examined: 1 ♂, Formosa, Nantou Pref., Mt. Yingfeng, about 2500 m, 19. VIII. 1980, T. Nambu leg.

♂ (hitherto unknown). Length 8.0 mm. Black; scape of antenna on posterior side yellow, mid femur on posterior side fairly broadly and tibial spurs ferruginous, basal condyle of antenna and apex of fore trochanter pale brown, fore tarsus slightly brownish. Dense appressed hair on anterior frons and clypeus and comparatively long pubescence on thorax silvery; antennal flagellum fringed with long whitish hair beneath.

Generally similar to the male of *Crossocerus hakusanus*, but easily be separable from this by the wholly black mandible, humeral tubercle, gastral segments 1 and 3 and legs except the narrow ferruginous areas above mentioned.

Modified mandible and legs also very similar to those of *hakusanus*, but hind coxal process triangularly acutely pointed (isosceles triangle and laterally compressed), hind tibial spurs as in *hakusanus* and in this respect distinctly different from *subulatus* (Kohl, 1892) (= *monstrosus* or *suzukii*). In the structure of fore T1, hind tibia and hind T1 also closer to *hakusanus* than to *subulatus* (hind tibia without a pair of hook-shaped spines), but the excavation on outer side of mid tibia is deeper than in both and generally similar-formed clypeus at apex truncate, not emarginate (as in *subulatus*) nor triangularly incised (as in *hakusanus*). Frontal structure generally similar to that in both, but frontal impressions or foveae much narrower and located along inner orbit, surface of upper frons and vertex with strong plumbeous shine as in both, but in the present species from hind ocellus to frontal fovea runs a curved pure black strip lunately. Structure of propodeum and fore wing venation also similar to those of *hakusanus*.

23. *Crossocerus* (*Apocrabro*) *aeta loa* Pate, 1943

Crossocerus (*Apocrabro*) *aeta* Pate, Lloydia, 6 (4): 285, 1943 (Philippines).

Crossocerus (*Apocrabro*) *loa* Pate, Ibid., 6 (4): 287, 1943 (Formosa).

Crossocerus (*Apocrabro*) *aeta*: Leclercq, Bull. Ann. Soc. R. Ent. Belg., 99 (1): 4, 1963 (Borneo, Java, S. India, Philippines).

Crossocerus (*Apocrabro*) *aeta*: Tsuneki, Etizenia, 15: 2, 1966 (1 ♂, Formosa), Kontyu, 36 (1): 56, 1968.

Crossocerus (*Apocrabro*) *aeta loa*: Tsuneki, Etizenia, 30: 31, 1968; Ibid., 51: 13, 1971 (3 ♀ 9 ♂, Formosa); Life Study (Fukui), 17 (3-4): 45, 1973 (1 ♂, Formosa); Ann. Hist.-Nat. Mus. Nat. Hung., 69: 285, 1977 (3 ♀ 1 ♂, Formosa, H. Sauter leg.).

Crossocerus (*Apocrabro*) *aeta loa*: Leclercq, Bull. Ann. Soc. R. Belg. Ent., 109: 288 (11 ♀ 7 ♂, Formosa, H. Sauter leg.).

Crossocerus (*Apocrabro*) *aeta loa*: Murota, Life Study (Fukui), 17 (3-4): 119, 1973 (1 ♂ Formosa); Hymts. Comm., 5: 21, 1977 (1 ♂, Formosa).

Specimen examined: 1 ♂, Formosa, Nantou Pref., Pempuchi, 18. VIII. 1980, T. Nambu.

Remarks. This species is rare in Formosa. The wasps live in deep wood.

24. *Crossocerus* (*Paroxyerabro*) *rubromaculatus* sp. nov.

Diagnosis. ♀ 6, ♂ 4.5 mm. Head thick, shining, frontal foveae not conspicuous, ocelli in a triangle slightly lower than equilateral one, occipital carina without terminal tooth, but not reaching buccal carina, clypeus very short, stoutly tridentate at apical margin in middle, mandible tridentate in both sexes, in ♀ median tooth slightly longer than others, in ♂ inner tooth short, somewhat retreated, in both inner margin unarmed, antennal flagellum in ♂ sparsely fringed with hair beneath, epicnemial carina distinct, episternal sulcus foveolate, without precoxal tooth, area dorsalis not enclosed with furrow, lateral carinae of posterior aspect of propodeum defined only on posterior part, gastral segment 1 slightly longer than wide, pygidial area in ♀ exceptional, comparatively broad triangular, with apex broadly rounded, surface flat, only gently curved up apically and comparatively highly carinated on lateral margins, not gutterwise excavated as usual and at base broadly, gently roundly raised, but in ♂ punctures on ultimate tergite typical in this subgenus, not coarser than those on penultimate tergite. Legs normal, hind tibia strongly spinose, only hind tibial spurs of ♂ exceptionally broad and somewhat lobiform. Antennal joint 1, mandible largely, col-

lar and tubercle of pronotum, a spot on tegula, postscutellum, fore and mid legs broadly and hind leg partly lemon-yellow; gaster broadly beneath and G1, 2 and 3 partly above ferruginous red.

Remarks. Strictly the present species is slightly deviated from the definition of the subgenus, *Paroxycrabro* Leclercq, 1963, in the characters of apical teeth of mandible, precoxal tooth of mesopleuron and lateral carinae of propodeum, but it well agrees with it in the more important characters of head, clypeus, mandible (inner margin) and ultimate tergite of gaster (♀ ♂), so it was included within the subgenus by slightly enlarging its category.

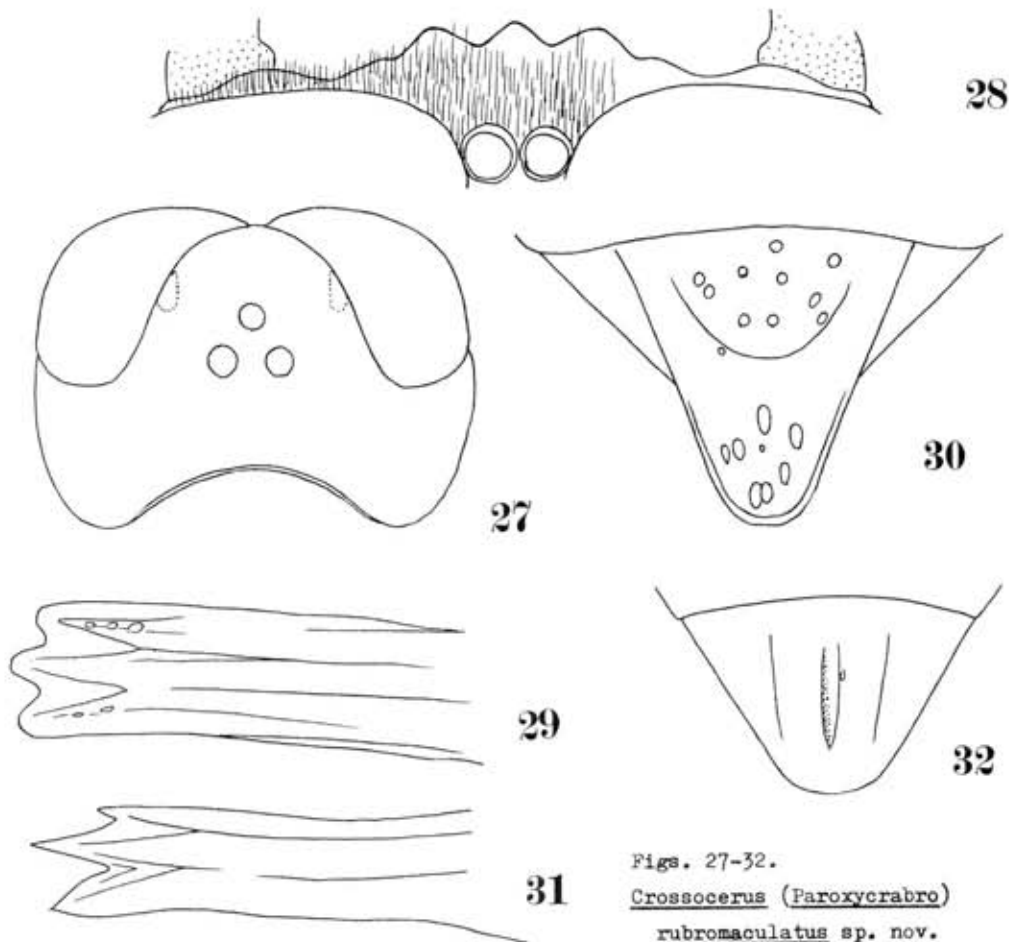
♀. Closely allied to the Philippine species, *C. (P.) sotirus* Leclercq, 1963, but differs from this at least in the structure of clypeus, precoxal tooth and somewhat in colouration.

Length 6.0 mm. Black, without plumbeous shine; A2 at base, apex and beneath ferruginous, mandible yellow and on inner and apical margins black and apically brownish, labrum (slightly brownish) and palpi yellow, clypeus at apical margin dark brown, its posterior area narrowly ferruginous, seen from beneath wholly ferruginous except apical margin, yellow on pronotal collar very finely incised with black in middle, posterior margin discoloured, tegula translucent, with a yellow fleck, basal plate of fore wing largely (rest kite brown) and hind one completely yellow, posterior margins of lateral foveae of scutellum and postscutellum pale yellow. Yellow on legs: apices of fore and mid coxae, hind coxa nearly completely, trochanters except fore one above (brown), fore and mid femora except an elongate mark above and ferruginous basal 2/3, hind femur at narrow apical ring, fore and mid tibiae except ferruginous spines at apical portions (with inner side slightly ferruginous), broad basal ring of hind tibia, extending narrowly till near apex on outer side (inner side broadly ferruginous), tibial spurs (hind ones in some light appear ferruginous), fore T1-5 except arolium, mid T1-4 (T5 brown with black arolium) and hind T1 at base (rest brown, but in some direction each base appears pale). Gaster from base till base of G4 ferruginous red beneath, the colour extended dorsally as obscurely outlined bands at posterior part of GT1 (intermittent) and across middle of GT2 and 3. Hairs on clypeus silvery. Wings hyaline, very faintly clouded apically.

Head seen from above (Fig. 27) very thick, subquadrate, temple well developed, W:L (both maximum, namely Wat temples and L at middle of an eye) = 100:74, occipital margin strongly emarginate, length in middle of head and width between lateral ends of occipital carina seen from above relatively 56 and 30, length of eye and temple relatively 42 and 32 (Fig. 27), each ocellus in a round depression, hind depressions large and fore one small and shallow, the latter connected with shallow frontal medial furrow anteriorly, OOD, Od, POD = 10, 5, 4.5, frontal foveae not well outlined, only in some light defined along eye, elongate oval in form, not impressed. Head seen in front very short, W:L (in middle) = 100:65, this is due to very short clypeus, without frontal transverse carina, scapal hollow very narrow, yet inner orbits convergent downwards, antennal sockets contiguous to each other and to eyes. Clypeus: Fig. 28, mandible with dorsal and ventral margins of inner side (from apex till 1/3 from base) and of outer side (from base till about middle) strongly carinate, dorsal margin of inner side always castaneous, while all the rest yellow, but in some light appearing brown, apical teeth: Fig. 29. Relative length of A3, 4, 5, 11, 12 = 10, 9, 8, 7, 12. A3 = AW × 1.7. Pronotum well developed, anterior margin nearly straight, with sides rounded, posterior margin broadly (in middle as long as yellow band) discoloured, pale brownish, mesoscutum roundly raised, with admedian impression fairly deep, on mesopleuron postspiracular and epicnemial carinae distinct, episternal sulcus coarsely foveate. Propodeum medianly fairly deeply furrowed, the furrow posteriorly connected with the median large deep elliptic hollow of posterior inclination, the hollow with median bottom line which is replaced posteriorly with median raised keel and the spaces between this and lateral carinae deeply roundly excavated. G1 in dorso-vertical view with apical width : median length = 2:3, at base triangularly deeply excavated, lateral margins of the excavation acutely carinate, carinae bifurcate on the way, inner carinae convergent apically, forming the edge of the triangular hollow, while outer carinae divergent posteriorly, with both sides deeply hollowed out. Pygidial area: Fig. 30. Each tibia of legs sparsely spinose on outer side, spines of mid tibia longer and more abundant than on others, on hind tibia stronger and at each base minutely tuberculate, besides these mid tibia with a longitudinal series of 7 short thick and strong spines (not pointed at apex) on posterior-outer edge, longer ones of fore and mid tibial spurs and shorter hind one with apices rounded, not spine-like as a whole, longer hind spur bluntly pointed at apex, relative length of this to hind T1 4:5.

Head above smooth and polished, mesoscutum and scutellum very finely, fairly close-

ly punctured, but surface considerably shining, mesoscutum on posterior margin not crenate, mesopleuron sparsely covered with fine piliferous punctures, shining, ante- and post-scutellar furrows minutely crenulate, propodeum at base strongly and coarsely foveolate, dorsal area corresponding to area dorsalis smooth and shining, posterior inclination dull and opaque and posteriorly in front of apical excavations transversely striate, side of propodeum as well as metapleuron longitudinally finely and closely striate, gaster smooth and shining except rugoso-striate basal sides of G1 and sparsely punctured ante-apical area of each sternite. In fore wing transverse radial vein nearly vertical to radial vein, appr. as long as transverse cubital vein, accessory cell widely open at apex.



Figs. 27-32.

Crossocerus (Paroxycabro)

rubromaculatus sp. nov.

27-30.. ♀; 31-32.. ♂.

♂. Generally similar to ♀, but head seen from above less thick, with temples less developed, with occipital margin not so strongly emarginate, $W:l(\text{at eye}):l(\text{at middle}) = 100:68:62$, width between lateral ends of occipital carina relatively 52 and relative length of eye and temple $=48:20$, depression around each ocellus and medial frontal furrow also shallow and weak, frontal foveae also less distinct, in some light hardly visible, slightly longer than in ♀, scapal hollow, relative position of antennal sockets and form of clypeus generally similar. Mandible: Fig. 31, $A_3, 4, 5, 12, 13 = 10, 8, 7, 4, 7$, $A_3 = AW \times 1.8$, $A1_3$ fairly markedly laterally compressed, with apex rounded. G1 similar in structure, G7 not transverse, but subtriangular (Fig. 32), without enclosed pygidial area, but the area flattened and medianly finely furrowed, the furrow not reaching base. Legs generally similar, tibiae similarly spinose, especially so the postero-lateral series of short strong spines of mid tibia, mid tibial spur point-

ed at apex, hind ones somewhat broader than in ♀, but both with apices bluntly pointed, relative length of longer one: hind T1=1:2, with L:W of the spur =5:1.

Al, mandible, pronotum, tegula and base of hind wing, postero-lateral ridges of scutellum and of postscutellum similar in colouration to ♀, but clypeus except narrow apical margin and baso-medial area completely yellow and seen from beneath also yellow. Gastral red colouration also similar. Fore leg extreme base of coxa and arolium completely lemon-yellow, mid leg also from near base till T3 yellow, but apices of T1, 2, 3 and whole of T4 and 5 ferruginous brown, hind coxa except extreme base, trochanter, apex of femur, base broadly of tibia which is extended apically till near end as a stripe on outer and base of T1 yellow, hind femur black above and beneath, intermediate areas reddish ferruginous, hind tibia on folded side pale reddish ferruginous, rest of the tibia on both sides of yellow stripe black and rest of tarsus dark brown, spurs yellow, but hind ones somewhat ferruginous.

Holotype: ♀, Formosa, Nantou Pref., Pempuchi, 18. VIII. 1980, T. Nambu (Coll. Tsuneki).

Paratype: 1 ♂, same valley, 21. VIII. 1980, T. Nambu (Coll. Nambu).

Crossocerus (Thao) subgen. nov.

Type: Crossocerus nitidicorpus Tsuneki, 1968.

Subgeneric characters: Pronotal collar complete, without median notch, second tergite of gaster with a large, deep, rounded hollow at base. Otherwise similar to subgenus Blepharipus Lepeletier et Brullé.

According to the generic key of Crabroninae by Bohart and Menke (1976) Crossocerus nitidicorpus runs to couplet 25 and runs out. If stress is placed on the structure of pronotum it is necessary to create a new genus to receive this species. However, this species, except the two characters mentioned above, belongs distinctly to Crossocerus (Blepharipus), so that it seems to me better to erect a new subgenus within Crossocerus, instead of creating a new genus of Crabroninae.

In the key mentioned above an additional branch should be made to couplet 25 to receive this exceptional subgenus of Crossocerus.

Thao is the name of one of the aboriginals of Formosa, living in high montanic district and at present with the smallest population.

25. Crossocerus (Thao) nitidicorpus Tsuneki, 1968

Crossocerus (Coelocrabro) nitidicorpus Tsuneki, Etizenia, 30: 11, 1968 (♀ ♂, Formosa);

Ibid., 51: 15, 1971; Haneda, Life Study, 16 (1-2): 6, 1972.

Crossocerus (Blepharipus) nitidicorpus: Leclercq, Bull. Ann. Soc. R. Belg. Ent., 109: 288, 1973 (1 ♂, Formosa); Tsuneki, Life Study, 17 (3-4): 45, 1973; Murota, Ibid. p. 119, 1973; Hymts. Comm., 5: 21, 1977. Bohart and Menke, World Sphecid., p. 402, 1976 (listed).

Specimen examined: 1 ♀, Formosa, Nantou Pref., Pempuchi, 17. VIII. 1980, T. Nambu.

26. Crossocerus (Crossocerus) nambui sp. nov.

Belongs to the group of C. wesmaeli-elongatulus and is closest to the Formosan C. takasago Tsuneki, 1956, differs from these in the structure of collar of pronotum, otherwise, however, it is difficult to separate it from others except slight difference in colouration which is not always reliable.

♀ ♂. Anterior inclination of medianly broadly hollowed (the hollow transverse and rounded in curvature), as a result median area of dorsal side of collar becomes very narrow and blunt transverse ridge curved out posteriorly seen from above. In all the compared species



transverse ridge is very blunt and rather indistinct and dorsal aspect transverse, without medio-anterior broad emargination and everywhere nearly rounded in cross section.

In other respect scutellum always (♀ ♂) immaculated (in takasago ♀ yellow maculated, but in ♂ immaculated).

Colouration:

♀. Black, yellow are antero-lateral side of A1, two spindle-shaped marks on collar, base of hind wing, fore tibia in front, not reaching apex, an obscure oblique mark near base on outer side of mid tibia and basal 2/5 of outer side of hind tibia; palpi and tibial spurs ferruginous; mandible black and on apical half dark red; pygidial area completely black.

♂. A1 and base of hind wing similarly yellow, maculae on collar smaller, only two small spots, marks on tibiae same in position, but longer and distinct, in fore tibia almost reaching apex, in mid and hind tibiae reaching 3/4 from base.

In structure similar to C. takasago, even in form of ante-coxal prominence of fore sternum. Apical margin of clypeus in ♀: Fig. 33, in ♂ similar. Mandible bidentate at apex in both sexes.

Length: ♀ 5.5 mm, ♂ 4.0 mm.

Holotype: ♀, Yingfeng, Nantou Pref., Formosa, 19. VIII. 1980, T. Nambu leg. (Coll. Tsuneki).

Paratype: ♂, Same place and time, leg. T. Nambu (Coll. Nambu).

Remarks. This species seems to be the highland inhabitant. Yingfeng lies on the Central Mountain Range of Formosa, at about 2500 m above sea level.

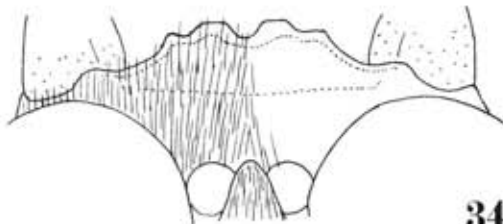
27. Rhopalum (Rhopalum) succineicollare taiwanum Tsuneki, 1977

Rhopalum (Rhopalum) succineicollare taiwanum Tsuneki, Etizenia, 51: 27, 1971 (♀, Formosa. Holotype, Kuanhua, Chiai Pref. about 1500 m, 1-2. VIII. 1968, K. Tsuneki).

Rhopalum (Rhopalum) succineicollare Tsuneki subsp. taiwanum: Leclercq, Bull. Ann. Soc. R. Belg. Ent., 109: 302, 1973 (1 ♂, Taihorin, leg. H. Sauter, VI. 1910).

Specimen examined: 1 ♂, Formosa, Nantou Pref., Pempuchi valley, 18. VIII. 1980, T. Nambu.

Remarks. Leclercq in his 1973 paper gives some comment on the male of this subspecies. The following is the observation of the present specimen:



♂. Markedly smaller than the typical race, 5.5 mm. Three incisions at apical margin of clypeus deeper as given with Fig. 34. A6 relatively slightly longer as against A5 and more strongly excavated beneath.

Clypeus on apical half yellow except extreme apical margin, pronotum completely yellow (in typical form usually posterior half black) as mentioned by Leclercq, but without yellow flack at axilla and scutellum, dark brown marks on fore and mid fe-

mora smaller and gastral red is much more broadly spread over (petiole amber-yellow on basal half as in typical race). Yellow red on gaster: G2-7 except a mark above on G4, 5,6, on G5 largest.

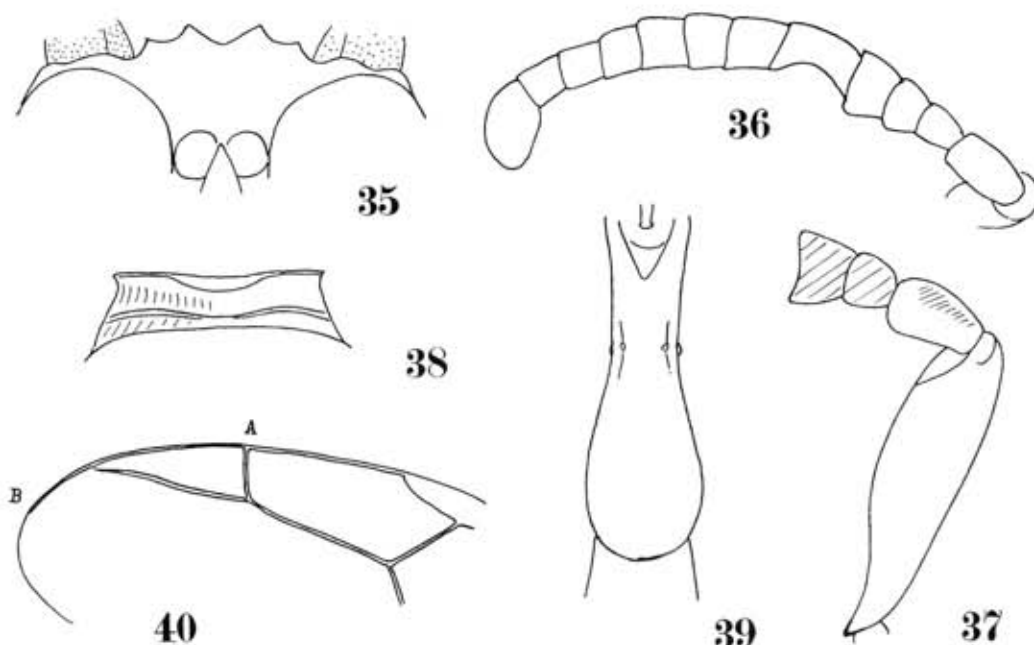
28. Rhopalum (Rhopalum Sect. Corynopus?) ataiyal sp. nov.

This species (♂) may belong to a new subgenus, because the antenna is remarkably modified and yet the transverse radial vein is oblique as against costal vein. But as the female remains unknown it is ascribed provisionally to subgenus Rhopalum, section Corynopus. The present species is also characterized by the structure of pronotal collar, distinctly punctured mesoscutum, posteriorly nodulated gastral petiole and wholly black gaster.

♂. About 4 mm. Black; yellow are A1 completely, A2 beneath, humeral tubercle,

a spot on brownish translucent tegula, marginal area of basal plate of fore wing, base of hind wing, articulations of coxa-trochanter-femur of all legs (slightly brownish), apices of femora narrowly, fore tibia and tarsus, mid tibia at base and apex, mid tarsus completely, hind tibia at base. Mandible black, apically brown; tibial spurs yellow, but hind ones distinctly brownish. Clypeus under magnification with the area near apices of inner pair of apical teeth narrowly, somewhat pale ferruginous.

Head from above somewhat thick, but with lateral margins rounded, $W:L(\text{at inner orbit}):L(\text{in middle})=100:67:52$, occipital margin rather gently emarginate, occipital carina comparatively broad, obliquely raised, length of eye and temple in dorsal view = 20:47, ocelli in a nearly equilateral triangle, fore ocellus slightly smaller, each with outer gentle excavation, central area flat. $OOD, Od, POD=8, 5, 5$, frontal furrow distinct, bearing shining bottom line, frontal foveae indistinct. Head seen in front with $W:L=100:76$, with lateral margins rounded and slightly convergent below, antennal sockets contiguous to each other and to eyes, interantennal prominence tongue-shaped, obliquely raised. Clypeus: Fig. 35, antenna: Fig. 36, A1-4 in lateral view: Fig. 37, A4-5 thick,



Figs. 35-40. *Rhopalum ataiyal* sp. nov., ♂

slightly excavated beneath, A6 long and markedly excavated beneath, from A9 gradually narrowed to A12, ultimate joint longer, thicker, suboval in form. Occipital carina by degrees lower below, not reaching buccal cavity. Collar of pronotum in dorsal view: Fig. 38, antero-lateral angles triangular, with apex triangularly produced and pointed, anterior margin distinctly edged, rather carinated, but on median area the edge blunt and the area lunately expanded posteriorly (Fig. 38), with surface transversely, very minutely rugoso-punctulate, posterior margin of the lunate area obtusely edged, surface behind this and lateral parts of anterior carina gently inclined posteriorly to transverse furrow running across middle of the segment, hence the collar is markedly constricted from before on median area; ante-coxal tubercle of prosternum stoutly triangularly produced; mesoscutum roundly elevated, without series of short striae on posterior margin, without impressed lines anteriorly, even the parapsidal sutures indistinct, lateral hollows of scutellum markedly deep, those of postscutellum not so deep, consisting of a series of strong foveae that are laterally smaller. On mesopleuron episternal sulcus broad and deep, turning posteriorly below into hyposternal sulcus, both strongly foveolate. Propodeum without enclosed area dorsalis, but with a median furrow, the furrow finer, weaker posteriorly and connected with a large deep median hollow of posterior inclination, the hollow wedge-shaped, reaching posteriorly near the broad raised

rim of gastral socket, lateral carinae of posterior inclination strong and distinct, accompanied inside with a crenate furrow which is turned transverse in front of the socket rim of gaster and connected that of the other side, only interrupted at junction with a short carina located at apex of median wedge-shaped hollow. Femoral sinus on sides of propodeum very deep. Gastral petiole: Fig. 39.

Legs are folded beneath thorax and glued on to the card paper and the structure of fore T1 can not be observed. In fore wing radial and accessory cells: Fig. 40, costa castaneous brown till shortly beyond junction (A) with transverse radial vein, thence apically till B narrowly pale brown, thence apically veinless, veins of accessory cell completely discoloured.

Upper frons before ocellar area finely, shallowly and sparsely punctured, PIS slightly larger than PD, punctures under high magnification are connected with each other by a fine impressed line, ocellar area smooth and shining, from ocello-ocular area posteriorly to occipital carina punctures finer and microstriae between them weaker and indistinct, and the surface more strongly shining than on upper frons. Pronotal collar except rugoso-striated lunate area finely, very sparsely punctured till transverse furrow, mesoscutum finely and sparsely punctured, punctures as large as those on upper frons, but deeper and somewhat sparser, PIS 1.5-2 times as large as PD and without microstriae and the surface smooth and polished, punctures on scutellum similar, on post-scutellum finer, but otherwise similar, bottom lines of transverse furrows before and behind scutellum smooth and shining, on mesopleuron prepectus finely, fairly closely, but weakly punctured, resp of the pleuron and metapleuron smooth and polished. Dorsal side of propodeum and raised areas on both sides of large wedge-shaped hollow of posterior inclination also smooth and shining, lateral furrows inside the lateral carinae of posterior inclination shallowly expanded inwards, forming an elongate triangular depression, broader downwards and deeper outwards, deeper area strongly obliquely striate and grossly punctured and shallower area covered with fine piliferous points; sides of propodeum smooth and polished except posterior area outside the lateral carina of posterior inclination where transversely, finely and closely striate. Gastral petiole smooth and polished, except medio-basal impressed area, from G2 apically transversely very finely closely microstriolate and posteriorly mixed with sparse fine piliferous points.

♀, unknown.

Holotype: ♂, Formosa, Nantou Pref., Pempuchi valley, 18. VIII. 1980, T. Nambu (Coll. Tsuneki).

Remarks. After the description the antennae from T2 and T5 apically accidentally lost.

29. Argogorytes fuliginosus Tsuneki, 1968

Argogorytes fuliginosus Tsuneki, Etizenia, 31: 2, 1968 (♀ ♂, Formosa, Pempuchi valley, figs. 1-8).

Specimen examined: 1 ♀, Formosa, Nantou Pref., (? Pempuchi), 14. VIII. 1980, M. Terayama).

Remarks. The specimen well agrees in characters with the original description.

30. Mellinus obscurus Handlirsch, 1888

Mellinus obscurus Handlirsch, Sitz. k. Akad. Wiss. Abt. 1, 1887 (10): 288, 1988 (♀ ♂, Palaearctica).

Mellinus tristis Pérez, Bull. Mus. Paris, 11: 156, 1905 (♀, Japan).

Mellinus obscurus tristis: Yasumatsu, Icon. Ins. Jap., Ed. 2: 1471, 1950.

Mellinus obscurus: Tsuneki, Life Study (Fukui), 9 (1-2): 26, 1965 (keyed); Etizenia, 41: 18, 1969 (biol.).

Specimen examined: 1 ♀, Formosa, Chiai Pref., Mt. Ali, about 2500 m, 2. VIII. 1980, M. Terayama.

Remarks. The genus is new to Formosa. In the specimen no geographic difference could be observed. Body length (12 mm) and colour tone are also similar to those of the Central Japan where it commonly occurs. The mandibles are shortened, possibly broken off.

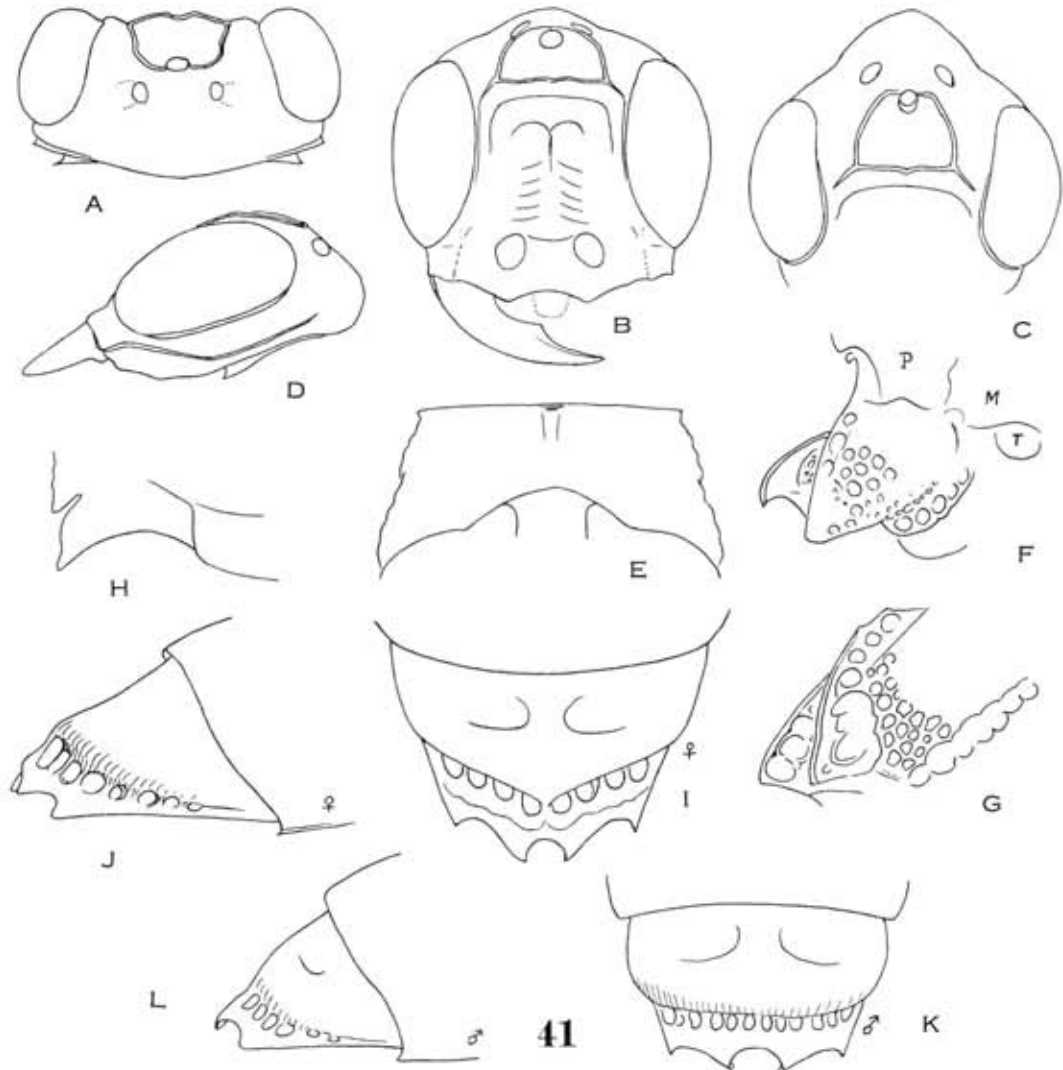
II. CHRYSIDIDAE

1. Chrysis (Chrysis) fuscipennis Brulle, 1846

Chrysis (Chrysis) fuscipennis: Tsuneki, Etizenia, 49: 13, 1970 (60 ♀ 26 ♂, Formosa).

Among the quadridentate Chrysidids this species is a remarkable species, having several unique characters. As it has not fully been explained in East Asia the main characters of it will simply be given with illustrations in the following:

Frontal area distinctly enclosed with carinae: Fig. 41, A (dorsal), B (frontal), C (vertical), vertex posteriorly remarkably swollen out: C and D (lateral), occipital carina acutely toothed and produced at lower ends: Figs. A and D, pronotum nearly straightly convergent forwards: Fig. E, but without lateral carinae, mesopleuron very stoutly bidentate below: Figs. F (dorso-lateral, P.. pronotum, M..mesonotum, T.. tegula) and G (posterior), lateral margins of propodeum parallel and acutely toothed postero-laterally: Fig. H (left half, dorsal), G3 dorsal: I, K; G3 lateral: J, L.



Figs. 14, A-L. Chrysis (Chrysis) fuscipennis Brullé

Length ♀ 10-11 mm, ♂ 7-8 mm, distinctly smaller than the northern form murasaki Uchida. In colouration much more greenish than in this: Brilliant metallic green, with golden tint on pronotum, scutellum, postscutellum, mesopleuron, sides of gastral tergites 1 and 2 and apical margin of tergite 2; posterior half of median lobe of mesoscutum distinctly violaceous black, a marked bluish shine on posterior part of vertex, mesoscutum and gastral tergite 3, especially on apical margin behind series of foveae, antenna till A2 metallic golden, thence apically black, gastral sternites bluish green with a pair of large black marks on sternite 2.

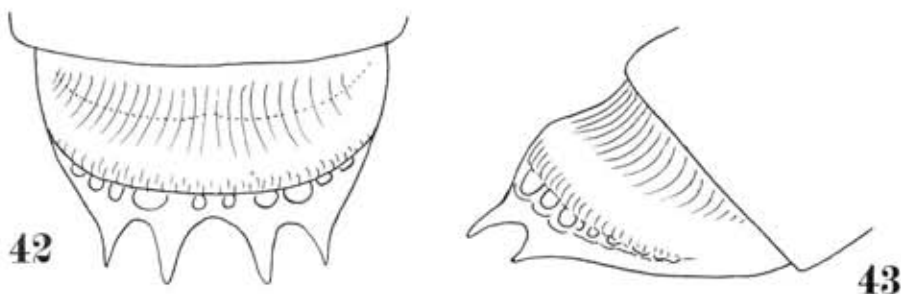
Specimens newly examined: 1 ♀ 1 ♂, Formosa, Pingtung Pref., Hengchun, 12. VIII. 1980, T. Nambu.

2. Chrysis (Chrysis) bishamon* sp. nov.

Characteristic in the highly raised ante-apical incassation of gastral tergite 3 and the very long teeth at its apex.

♀. 7.5 mm. Metallic greenish blue, more strongly bluish on mesoscutum, postscutellum and basal area of gastral tergite 3; on apical margin of tergite 2 and on ante-apical incassation of tergite 3 partly greenish golden; violaceous black marks present on ocellar area, median furrow of pronotum, median area of mesoscutum, middle part of scutellum which is transversely expanded at apex, a vaguely outlined band across middle of gastral tergite 1 and tergite 2 broadly except sides and apical margin. Antenna and tarsi of legs black. Wings hyaline, apically slightly darkened. Hair silvery, on head and thorax above greyish (when back is white appears blackish), on propodeum more distinctly whitish.

Head from above transverse, W:L=2:1, inner orbits convergent anteriorly, OOD,Od, POD,OD=3:2:4:4.5, each ocellus inclined outwards, with a lunate impression just outside, seen in front HW:HL=100:76, vertex roundly raised and ocellar area further raised above, IOD at vertex, in middle of face and at lower ends of eyes relatively 28,20,32. Frontal carina gently bisinuate, nearly straight, not reaching inner orbits, without enclosed frontal area, facial cavity fairly deeply hollowed, from about 1/4 from frontal carina downward suddenly deepened, clypeus roundly and fairly highly elevated, with apical margin gently emarginate, antenna till A3 metallic green, widest at A6-8, thence slightly narrowed apically, not so marked as in preceding species, relative length of A2-5=6,10,6,5. A3=AW×3, A4=AW×1.5, A5=AW×1.2. Gena slightly shorter than A5 (5:4). Head seen in profile temporal carina well developed and end of occipital carina strongly toothed as in preceding species. Pronotum medianly distinctly furrowed, the furrow not reaching posterior margin, lateral margin bisinuate and acutely toothed at anterior end, relative length at lateral margin and in middle 1.7:1. On mesopleuron epicnemial carina bifid below, upper branch curved posteriorly and jointed with post-marginal carina of episternal furrow, accompanied with a large U-shaped furrow enclosing the prepectus, but not produced into a tooth as in fuscipennis, while the lower branch jointed at the end with the extended post-marginal carina of episternal furrow, forming a triangular area (as usual in most of Chrysis), but here the area is broadly smooth and polished except narrow dorsal part. Postscutellum-propodeum complex rounded, not particularly produced. Gastral tergite 2 medianly bluntly carinate, except extreme base and apex. Tergite 3: Figs. 42 (dorsal) and 43 (lateral).



* One of the Seven Deities of Good Fortune in the old tale of Japan

Head above punctate-rugoso-subreticulate with medium-sized punctures, on the impressions at outer side of hind ocelli punctures lacking, deeply hollowed area of facial cavity very finely and transversely punctate-striate, punctures on pro- and mesonotums slightly larger in general and with more or less PIS carrying scattered minute points on it, scutellum and postscutellum reticulate-punctate, without PIS, punctures on tergite 2 except medial line as on mesonotum, on tergite 3 at basal depressed area finely somewhat longitudinally rugoso-punctate and striate, on ante-serial incrasation punctures fine, close and shallow, partly longitudinally rugosely confluent, but on lateral portions mixed with large strong punctures, apical marginal area and teeth very minutely closely punctulate, mixed with microstriae.

♂, unknown.

Holotype: ♀, Formosa, Nantou Pref., Pempuchi valley, 17. VIII. 1980, T. Nambu (Coll. Tsuneki).

Remarks. The present species considerably well resembles *Chrysis* (*Chrysis*) *nigropilosa* m. (1970), but is different from it in that hairs on head and thorax above are greyish and on propodeum rather whitish, A3 is distinctly green and much longer (in the compared species A3=AWx2.5), frontal area is not enclosed with carinae, central elevation of clypeus is higher, ante-apical swelling of G3 stronger (though considerably similar), punctures on G2 larger, more regular in size and somewhat sparser in general, and the rugosity on it is also somewhat less strong.

3. *Chrysis* (*Chrysis*) *schenklingi* Mocsáry, 1913

Chrysis (*Tetrachrysis*) *schenklingi* Mocsáry, Ann. Mus. Nat. Hung., 11: 618, 1913 (2 ♀, Ampin).

Chrysis (*Chrysis*) *schenklingi*: Tsuneki, Itizenia, 49: 14, 1970 (23 ♀ 1 ♂, Formosa).

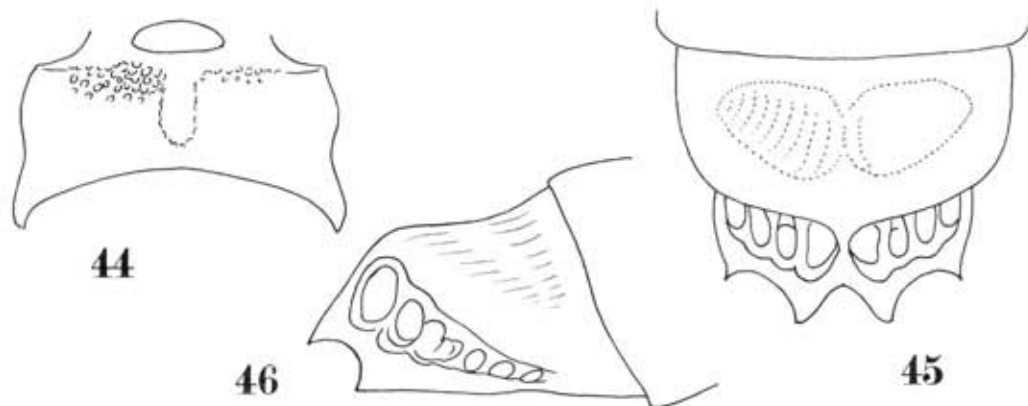
Specimen examined: 1 ♀, Formosa, Niaotaokeng, 20. VIII. 1980, N. Nambu.

Remarks. This specimen is markedly greenish in colour, lacking almost completely golden or coppery effulgence. But the structure of frontal transverse carina, enclosed frontal area, gastral tergite 3, especially form of apical teeth, and violaceous marks on head, thorax, especially on pronotum, are similar to those of the typical form.

4. *Chrysis* (*Chrysis*) *takeuchii* Tsuneki, 1956

Chrysis (*Tetrachrysis*) *takeuchii* Tsuneki, Mushi (Fukuoka), 21 (18): 76, 1956 (1 ♀, Formosa: Fuli).

Chrysis (*Chrysis*) *takeuchii*: Tsuneki, Etizenia, 49: 14, 1970 (1 ♀, Nantou Pref., Nanshanchi).



Figs. 44-46. *Chrysis* (*Chrysis*) *takeuchii* Tsuneki, ♀

Specimen newly observed: 1 ♀, Formosa, Mt. Ali, 4-7, VIII. 1968, K. Tsuneki leg. (hitherto unrecorded).

5. Chrysis (Chrysis) alishana sp. nov.

Closely related to C. takeuchii m., differs from it in the wider pronotum, deeper basal excavation of GT3 and shorter apical margin of the segment.

♀. 7.0 mm, when stretched amply reaching 7.5 mm, robust in form, comparatively wider (L:W of gaster seen vertically from above 100:56, in takeuchii 100:50).

Bluish green; cavitas facialis, sides of head and thorax and abdomen partly golden green, violaceous black or violaceous purple are a large mark on head above, occiput, nape region of pronotum, two lateral marks on pronotum, base and median lobe of mesoscutum (except central blue patch), inner apical areas of lateral lobes also, median and apical margins of scutellum, obscurely outlined large central (transverse) mark of tergite 1, tergite 2 largely (except lateral and apical marginal areas), basal half of tergite 3; in some light apical margin also appears purple. Ventral side green with lateral elongate marks on GS2 black. A1-3 and legs till apices of tibiae green, rest of antenna and legs black, mandible at base of outer side green, rest black, but inner half except medial area ferruginous. Hairs on head and thorax above dark grey, under whitish back side appearing black and under dark back side appearing greyish, abundant, soft and long.

Head from above transverse, W:L=100:44, ocelli in low triangle, OOD,POD,OCD=10,8,10, ocellar area elevated, each ocellus inclined outwards, with a flattened or depressed area along its outer side, in hind ocelli this area smooth and shining, frontal transverse carina distinctly raised, fine, not crenate, in frontal view up-curved, with lateral ends considerably apart from inner orbits, not triangularly raised before ends, not emitting branch carinae upwards to fore ocellus, facial cavity broad and shallow, in frontal view (when HW=100) IOD at vertex, in middle and at lower ends of eyes =60,50,66 (in takeuchii 58,46,72). A2,3,4,5=6,10,7,5. A3 in lateral view =AW×3.3, in dorsal view =AW×2.7 (in takeuchii A2,3,4,5=7,10,7,5 and A3 in lateral view =AW×2.8, in dorsal view =AW×2.2. Pronotum in dorsal view relatively shorter than in takeuchii, with anterior margin more distinct (that is to say, rounded inclining angle at verge to nape area more acute), with sinuation of lateral margins much weaker and anterolateral corners more acutely angled (Fig. 47, cf. Fig. 44), mesonotum relatively wider and shorter than in takeuchii (width at posterior margin and length in middle =100:62, in takeuchii 100:80), scutellum also relatively shorter and postscutellum more weakly roundly elevated, structure of mesopleuron and propodeum generally similar, but lateral tooth of propodeum more strongly and broadly excavated on dorso-posterior area; gaster relatively broader, lateral angle of G2 slightly produced posteriorly, with apex rounded, G3 in dorsal view and lateral view: Figs. 48 and 49 (cf. Figs. 45 and 46). Notice the relative length to width, relative size of the series of foveae and difference in form of apical teeth and the emarginations between them!

Punctures generally somewhat smaller and more irregular than in takeuchii, this is marked on G2 and 3. Facial cavity closely punctate-reticulate, without transverse striae, G2 with median carina more distinct, with punctures considerably larger, with shining PIS on which fine punctules are scattered, in most places punctures forming oblique rows in which punctures are close together (in takeuchii punctures are more re-



gular, with micropoints much less in number). On G3 PIS microshagreened, not shining, posterior margin covered with shallow punctures, irregular in size, density and distribution pattern.

♂, unknown.

Holotype: ♀, Formosa, Mt. Ali, 4. VIII. 1968, K. Tsuneki leg. (Coll. Tsuneki).

KEY TO THE FORMOSAN SPECIES OF CHRYSIS (CHRYSIS)

1. Mesopleuron stoutly bidentate below (frontal area distinctly enclosed with carina, wings considerably strongly clouded), ♀ 8-11, ♂ 7-9 mm
fuscipennis Brullé, 1846
- Mesopleuron simply triangularly narrowed below 2
- 2 Frontal area enclosed with carina, sometimes incompletely so (when incomplete frontal transverse carina triangularly raised before the lateral ends) 3
- Frontal area only flattened and slightly depressed, but without enclosing carina 6
- 3 Hairs on head and thorax above black, mixed with short greyish ones (frontal area enclosed only on sides with distinct carinae, A3=A2x1.7 in ♀, =A2x2 in ♂, HW:IODm=100:38-39(♂), OOD,POD,OCD=10,11,14(♀), =10,10,12(♂), G3 at base fairly strongly depressed in ♀, apical teeth moderately long, Al-2 green), ♀ 9, ♂ 6 mm.
nigripilosa Tsuneki, 1970
- Hairs on head and thorax silky white 4
- 4 G3 with foveae of ante-apical series long, narrow, much longer than apical margin between teeth, the teeth short, broad, nearly equilateral triangular, with apex pointed (mesonotum with a violaceous mark on each side of medial furrow which is also violaceous, Al-3 green, sometimes A4 partly or obscurely so, HW:IODm=100:44, facial basin deep, medianly transversely rugoso-punctulate, in ♀ basal depression and ante-apical incassation not strong, punctures on G2 comparatively large, almost without micropoints on PIS, usually with rich golden or coppery tint, but not always so), ♀ ♂ 6-7 mm
schenklingi Mocsáry, 1913
- Foveae of ante-apical series not elongate, but rounded, depressed, confluent, furrow-like, medianly interrupted with carina, apical margin between teeth long, as long as, or longer than foveae-furrow, teeth also long, longer than its basal width 5
- 5 A3=A4+5, median pair of apical teeth of G3 closer to each other than to the outer (Al-2 violet, G3 at base slightly depressed even in ♂, ante-series of foveae convex, frontal carina crenate, at ends not extended obliquely downwards, series of foveae furrow-like, apical teeth comparatively shorter, scutellum with a violaceous mark medianly, postscutellum somewhat gibbous-convex, gena=A2, wing hyaline, slightly clouded), 7 mm
hoozana Mocsáry, 1913 ♂
- A3 only slightly longer than A2, median pair of apical teeth more widely apart from each other than from the outer (Al-2 green, A3-4 blue, G3 even in ♀ subconvex, frontal carina not crenate, at lateral ends extended obliquely downwards, median carina of G2 more acute and more distinct, series of foveae not furrow-like, only confluent with each other, apical teeth comparatively longer, scutellum without violaceous mark, postscutellum simply convex, gena slightly longer than A2), 7.5 mm
talitha Mocsary, 1913, ♀
- 6 Hairs on head and thorax above blackish 7
- Hairs on head and thorax above greyish or whitish 8
- 7 Head from above thick, distinctly longer than half the width: 100:56 (vertex behind ocellar area gently roundly elevated, face narrower, at frontal carina HW:IOD=100:45, facial cavity fairly deep, transversely punctate-striate, hairs on head and thorax above black, short and stiff, postscutellum roundly raised, with dorsal surface level with scutellum, body slenderer, G2 as long as wide, or slightly longer than wide, G3 with basal depression less deep, with punctures larger, foveae of series longer than apical margin between teeth, median emargination as wide as deep, sinus nearly pointed, outer ones shallower, broader, simply upcurved), 6.5-7.0 mm
takeuchii Tsuneki, 1956, ♀
- Head from above transverse, distinctly less than half the width: 100:44 (vertex behind ocellar area roundly inclined posteriorly, face broader, at frontal carina HW:IOD=100:61, frontal cavity shallow, simply closely punctured, not striate, hairs on head and thorax above dark grey, fine, long and soft, postscutellum gently rounded, with dorsal surface somewhat inclined posteriorly from level of

- scutellum, body robust, G2 distinctly wider than long, G3 also relatively shorter, with basal depression deeper and ante-apical incassation stronger, foveae of the series rounded, nearly as long as apical margin between teeth, median emargination wider than deep, sinus broadly rounded, not so markedly different in form from the lateral), 7-7.5 mm alishana sp. nov., ♀
- 8 A3=A2×2 (OOD=POD, HW:IODm=100:41(♂), =100:45(♀), G3 in ♀ at base gently concave, foveae of the series rounded, apical margin narrow, shorter than foveae diameter, lateral pair of apical teeth equilateral triangle in form, median pair elongate, apices of the teeth equidistant and in a curve even in ♂, A1-3 green, sometimes A3 only partly green or coppery, hair on head and thorax above silkey white, G2 except marginal area broadly violaceous purple, somewhat sparsely punctured, PIS with rich small points), ♀ 7-8, ♂ 6-7 mm faceta Mocsary, 1912
- A3=A2×1.5 9
- 9 Facial basin narrow (HW:IODm=100:40) and deep, apical teeth of G3 very long, equidistant (G3 at base transversely deeply depressed, without medial ridge-like elevation, ante-apical incassation markedly strong, series of foveae depressed, furrow-like, each fovea longer than wide, confluent with adjacent ones, about 7 on one side, frontal carina bisinuate, not reaching inner orbits, A1-3 blue, punctures on mesonotum fairly sparse, with PIS inutely punctulate, on G2 moderately large, mostly transversely arranged, PIS bearing sparse minute points, G3 on basal depressed area minutely punctate-striate, ante-series incassation and apical margin very finely and closely punctulate), 7.5 mm bishamon, sp. nov., ♀
- Facial basin broad and shallow, apical teeth of G3 fairly long, inner pair closer to each other than to outer (G3 convex in ♂, series of foveae not furrow-like, each fovea rounded and deep, about 10 on one side, frontal carina curved and reflected in middle, reaching close to eyes, A1-3 green), 6 mm taihorina Mocsary, 1913, ♂

6. Chrysis (Pyria) principalis takasago Tsuneki, 1970

Chrysis (Pyria) principalis takasago Tsuneki, Etizenia, 49: 19, 1970 (88 ♀ 76 ♂, ormosa)

Specimens examined: 1 ♀, Formosa, Taipei Pref., Wulai, 23. VIII. 1980; 1 ♂, same Pref., Nanchiang, 7. VIII. 1980, T. Nambu leg.

Remarks. This subspecies is common and everywhere abundant in Formosa.

7. Chrysis (Pyria) fukaii Rohwer, 1911

Chrysis (Chrysis) fukaii Rohwer, Proc. U. S. Nat. Mus., 39 (1794): 478, 1911 (1 ♀, Formosa, Nantou Pref., Puli, leg. T. Fukai).

Chrysis (Pyria) principalis: Tsuneki, Etizenia, 49: 19, 1970.

Specimen examined: 1 ♀, Formosa, Ilan Pref., Tsukeng, 19. VIII. 1966, T. Tano leg.

Remarks. In my previous paper on the Formosan Chrysididae I dealt with this species as a variation of Chrysis principalis Smith. But now it has been confirmed that fukaii is a good species.

The present specimen well agrees with the original description of fukaii, except the body size (9 mm), but this may be within specific variation. Some supplements:

Length 6 mm. Metallic bluish green; ocellar area, pro and mesonotums both partly, scutellum on central area in some light appearing blackish (yet the bottoms of punctures there greenish shining), furrowed series of foveae on G3 purple, foveae themselves translucent; sides of G1, apical margin narrowly of G2 and central part of ante-series incassation golden; antenna till A2 green.

Head roundly convex above, with outer sides of hind ocelli deeply hollowed, hind ocelli each in a hollow and strongly inclined outwards, frontal area flattened, only at posterior margin enclosed with carina, frontal transverse carina lacking. In dorsal view HW:IODv at posterior margin and at anterior margin of hind ocelli =100:64:46. OOD,Od, POD=8,3,9. Head in frontal view with ratio of HW:IOD at vertex, in middle (minimum) and

at lower ends of eyes relatively =100,52,45,64. A2,3,4,5=6,10,7,5 and gena relatively 5. A3=AW 2.3 (dorsal or widest view). Elevation of postscutellum and structure of G3 generally similar to those of principalis, but in fukaii supra-series somewhat more highly raised than in this and foveae of the series only slightly longer (almost as long as) apical margin between teeth.

III. MUTILLIDAE

1. Smicromyrme friekae (Zavattari, 1913)

Smicromyrme friekae: Tsuneki, Etizenia, 64: 15-16, 1972 (list of ref. 1 ♂, Formosa, Pingtung Pref., figs.).

Specimen examined: 1 ♂, Formosa, Taipei Pref., Ulai, 4. VIII. 1980, T. Nambu.

Remarks. The present specimen is markedly larger than usual, measuring 12 mm in length (in the male specimen recorded by me from Pingtung Pref. (Kentin Park) is 8.5 mm). Tegulae dark, gastral tergite 4 fringed with whitish hair. On the clypeus, of the 3 rounded impressions across middle, the left one is abnormally lacking.

2. Smicromyrme drupa (Zavattari, 1913)

Smicromyrme drupa: Tsuneki, Etizenia, 64: 18, 1972 (7 ♂, Formosa, ref. list, figs.).

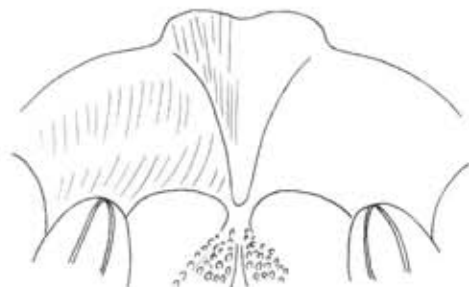
Specimen examined: 1 ♂, Formosa, Pingtung Pref., Ulampi, 13. VIII. 1980, T. Nambu leg.

3. Smicromyrme hombuceiana sp. nov.

The present species runs to S. oratoria Chen in the key of Chen, 1957, but differs from it at least in the relative length of A3 and 4, in the relative length of wing tegula to its width and in the presence of whitish pile-bands at apical margins of G1, 2 and 3.

♂. About 10 mm. Black; thorax including wing tegula ferruginous, except ventral side, mandible with a large ferruginous patch near apex, palpi and fore tibia and tarsus brown, fore tibial spur yellow, mid and hind ones white. Wings uniformly, considerably strongly brown, veins dark brown, finer ones paler. Hair long, silky white, on ferruginous areas of thorax somewhat ferruginous, on apical margins of G1, 2 and 3 appressed, forming a pile-band, mixed with some longer erect ones, on G4-7 long, erected and black, but basal part of these segments glabrous.

Head from above with postocellar area subtriangularly roundly swollen out posteriorly, with surface flat, ocelli in a low isosceles triangle, each inclined outwards and outer areas of hind ocelli and front area of fore ocellus longitudinally deeply furrow-



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ed, all these furrows extended anteriorly into 3 frontal furrows, medial one (= usual frontal furrow) deeper than the lateral, while the posterior area of fore ocellus elevated into a distinctly outlined and medianly acutely carinated ridge, the ridge runs between hind ocelli, reaching posterior margin of the swollen out area attenuating. OOD, Od, POD=10, 3, 6. Head in frontal view with ratio of W:L=100:75, length of eye relatively 50, vertex roundly raised, anterior margin of fore ocellus located distinctly above level of top margins of eyes, antennal tubercle (= roundly raised dorsal rim of antennal socket) marked, smooth and polished, outer sides of antennal bases and of clypeus abruptly and strongly depressed, clypeus at base highly keeled in middle, with sides obliquely inclined and lowering and widening anteriorly, apical margin of clypeus medianly gently emarginate (Fig. 50). Mandible bidentate at apex, inner dorsal tooth short, beside, it stoutly tooth beneath near middle (Fig. 51, left one, lateral). Al strongly bicarinate in front, surface between the carinae roundly furrowed, relative length of Al-6=20, 3, 3, 9, 10, 9 (frontal view), A2 and 3 incrassate posteriorly and if measured there each reaching 4 in relative length, A3 in frontal view 1.5 times, in lateral view 1.4 times as long as wide at apex, tegula in dorsal view: Fig. 52, scutellum nearly quadrate. G1 seen from above with sides subparallel and strongly keeled in middle beneath, G2 roundly constricted towards base as usual and at base weakly carinated beneath, G7 without carina or impressed line above. In fore wing abscissae of radial vein in the following length reducing order: 1=4, 3, 2, 5, transverse cubital vein 2 not angulate in middle, but roundly curved out.



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ing order: 1=4, 3, 2, 5, transverse cubital vein 2 not angulate in middle, but roundly curved out.

Vertex on the raised areas at both sides of fore ocellus finely, closely, on both sides of medial ridge more finely and sparsely and on lateral areas of lateral furrows strongly, grossly, subrugosely punctured, on frons punctures strong, close, mostly longitudinally confluent into rugoso-punctate-striate, punctures hair-bearing and hairs transversely and anteriorly radiately appressed, covering puncturation. Clypeus without labrous polished area, densely covered with hair, Al similarly covered with hair, thorax strongly coarsely punctate-reticulate, postscutellum with punctures gross but sparse, propodeum more grossly, more regularly reticulate. G1 and 2 above strongly and closely punctured, punctures slightly smaller than on mesonotum and somewhat sparser and much sparser posteriorly, from G2 posteriorly punctures gradually finer and sparser, not only on each segment, but also as a whole and each segment at base mixed with very fine transverse striae, ventral side of G1 and 2 similar to above, but G3-7 much more finely punctured, but contrary to the state above, closer and larger posteriorly, not only on each sternite, but also as a whole.

♀, unknown.

Holotype: ♂, Formosa, Nantou Pref., Pempuchi valley, 23. VIII. 1972, T. Murota. (Coll. Tsuneki).

4. Smicromyrme norna (Zavattari, 1913)

Mutilla norna Zavattari, Arch. Naturg. Abt. A, 1913 (3): 40, 1913 (♂♂, Formosa: Koshun, Taihorin, Taihorinsho, Hoozan).

Smicromyrme norna: Mickel, Ann. Ent. Soc. Amer., 26: 417, 1933 (material same as above); Trans. Ent. Soc. Lond., 83: 288, 1935 (do.).

Smicromyrme norna norna and norna abnormalis Chen, Quart. J. Taiwan Mus., 10 (3-4): 203, 1957 (typical race: 1 ♂, Fuli, 2 ♂, Pingtung Pref., 2 ♂, Formosa; abnormalis: All from China: 15 ♂, Anhmei: Ningkuo; 1 ♂ Ouyuan; 2 ♂, Hwangshan; 3 ♂, Chekiang: Tienmushan; 24 ♂, Kiangsi: Kuling; 8 ♂, Fukien: Shaowa).

Specimen examined: 1 ♂, Formosa, Nantou Pref., Pempuchi valley, 23. VIII. 1972, T. Murota.

Remarks. In the present species from Formosa the body is black, but the tegula of fore wing and G1-3 ferruginous. The structure of head closely resembles that of the preceding species, but the furrow behind each hind ocellus is not extended anteriorly into frons, posterior area medianly not ridged, vertex and frons longitudinally (somewhat

convergent below) and closely striate, with interspaces of striae sparsely punctured, clypeus at medio-anterior area broadly roundly excavated, with surface smooth and polished. A1 bicarinate in front as in the preceding species, but the inner one of the carinae not so acute, A3 about half the length of A4 (strictly slightly shorter), but mandible similar. Structure and punctuation of thorax-complex and abdomen generally similar. Dense silky white hairs covering outer orbits (forming hair band), lower part of temples, pronotum, mesopleuron except posterior area, thorax and coxae beneath, sides of scutellum and postscutellum, medio-basal impression of propodeum and posterior marginal areas of G2 and 3, the hairs on these areas mostly appressed and mixed with some erect ones, while on the rest of gaster hairs are black and erected.

According to Chen in the specimens from Continental China (ssp. abnorma) G3 is entirely or largely black and hairs on G1-3 are deep golden. In the specimen from Pempuchi before me G3 has a incomplete black hair band across middle above and wholly black hairs beneath.
