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STUDIES ON THE FORMOSAN SPHECIDAE (X) REVISION OF AND SUPPLEMENT TO THE SUBFAMILY TRYPOXYLONINAE (HYMENOPTERA)

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In my second personal Expedition from June 10 to August 31, 1968, the wasps of Trypoxyloninae were less abundantly captured than in the first. This is mainly due to that the period of my eastern tour was somewhat too early to meet with emergence of most of the members of the group. In the mountain regions of the western side, however, I could found some interesting hitherto unknown species, two of which lived in the timbers of the half broken house near Fenchihu, Mt. Ali, that was repeatedly spoken of in Etizenia, No. 51.

In connection with the investigation of the newly collected specimens I had to revise the previous material and as a result the specimens that were referred to *T. melanocorne* Strand with a query in the previous report were split into two distinct species, one of which was described as new in the present paper.

Judging from the present state of our knowledge a fair number of the species of the genus must remain undiscovered in Formosa and a further ardent research is desired. In this paper, however, in order to arrange the knowledge acquired heretofore and to give facilities to the future investigators I supplemented the species-determining table previously published in regard to the female with the new material and futher I attempted newly to prepare the table with respect to the male also. On this occasion a form of the southern Islands of the Ryukyus (*okinawanum*) which was formerly allocated as a subspecies of a Formosan species (*T. koshunicon* Strand) was raised to a valid species and included in the keys of Formosan representatives, because the knowledge of the species is expected to be of use to find the further closely allied species in Formosa.

From the south eastern regions of Asia a fair number of the species of Trpoxyloninae have been described**, possibly with a considerable nummber of synonyms or local races. Most of the descriptions of the previous authors were, however, very simple and superficial, completely lacking illustrations (except those of Kohl – Hymenopteren Südarabiens, 1906) and except for the particularly well characterized species or some of the special situation, they are almost of no value to help the conscientious identification of the species from another localities. Among them, however, those of Turner and Strand are comparatively detailed. Despite the fact, even in them lack of illustrations and of the study of the male genital organs is sometimes almost fatal to identify even the topotypical specimens, because in this genus there are some species which can be separated only by the comparison of the male genitaia or of some delicate differences of certain external characters.

LIST AND DESCRIPTIONS OF THE SPECIES NEWLY COLLECTED WITH A REVISION OF SOME PREVIOUS SPECIES

1. *Trypoxylon subpileatum* Strand, 1922

Trypoxylon subpileatum: Tsuneki*, Etizenia, 22: 3, 1967 (62 ♀ 35 ♂).

* *Contribution No. 159, from the Biological Laboratory, Fukui University, Japan.*
Reference with * includes the list of the related literature.

Trypoxylon subpileatum: Haneda, Life Study, 15: 30, 1971 (1 ♀).

Material: 3 ♀ 3 ♂. 1 ♀, Ilan Pref. (Tsukeng, 15. VI.); 1 ♀ 1 ♂, Nantou Pref. (Puli, 25. VIII.); 1 ♀ 2 ♂, Pingtung Pref. (Hengchun, Paoli, Kentin, 8–20. VII.).

2. *Trypoxylon formosicola* Strand, 1922

Trypoxylon formosicola: Tsuneki*, Etizenia, 22: 4, 1967 (102 ♀ 28 ♂).
Trypoxylon formosicola: Haneda, Life Study, 15: 30, 1971 (7 ♀ 6 ♂).

Material: 6 ♀ 4 ♂, Taitung Pref. (Chihpenchi, 1, 2. VIII.); 2 ♀, Nantou Pref. (Pempuchi, 12, 21. VIII.).

I have never tried to give a detailed description of the male of this species. In the follwing it will be given:

♂. Length 9.0–12.0 mm. Black, with varying aeneous shine on mesonotum and scutellum, mandibles reddish brown except the basal third and inner margin, wing tegulae posteriorly transparent dark brown, palpi and ultimate tarsal joint of fore legs ferruginous, penultimate joints of fore tarsi and apical joints of mid and hind tarsi somewhat yellowish dark brown. Wings more or less darkened throughout, somewhat markedly so on outer margin, stigma and veins blackish. Pile on lower frons and clypeus silvery, appressed, mixing a small number of longer, half erected hairs, hairs on vertex sparse, erected and whitish, with a few slightly brownish ones, those on temples, thorax, propodeum, anterior part of petiole and basal parts of legs

** As for the genus *Trypoxylon:*

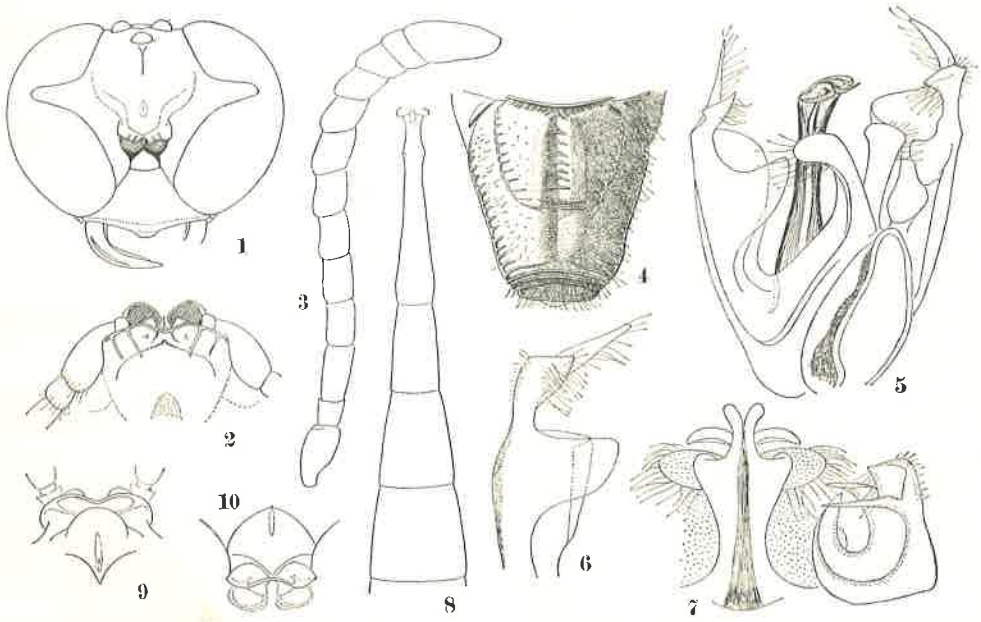
T. bicolor Smith, 1856 (Singapore, Java), *coloratum* Sm., 1856 (Borneo, Sarawak), *pileatum* Sm., 1856 (India), *petiolatum* Sm., 1857 (Borneo, Sarawak), *eximius* Sm., 1858 (Key, Aru), *ferox* Sm., 1860 (Celebes, Makassar), *elegantulum* Sm., 1860 (Makassar), *gracilescens* Sm., 1860 (Celebes, Makassar), *providum* Sm., 1860 (Batchian), *gracillimum* Sm., 1863 (Mysol), *placidum* Sm., 1863 (Mysol), *intrudens* Sm., 1870 (India), *rejector* Sm., 1870 (India), *obsonator* Sm., 1873 (Japan, later India), *accumulator* Sm., 1875 (=*bicolor* Sm., India), *javanum* Taschenberg, 1875 (Java), *buddha* Cameron, 1889 (India), *canaliculatum* Cam., 1889 (India), *tinctipenne* Cam., 1889 (=*bicolor* Sm., India), *nigricans* Cam., 1889 (=*pileatum* Sm., India), *cognatum* Cam., 1897 (Himalaya), *pygmaeum* Cam., 1900 (India,) *varipilosum* Cam., 1901 (Singapore), *geniculatum* Cam., 1902 (India: Khasia Hills), *trochanteratum* Cam., 1902 (ditto), *erythrozonatum* Cam., 1902 (Maldives), *melanulum* Cam., 1902 (ditto), *responsum* Nurse, 1903 (India), *mediator* Nurse, 1903 (Quetta), *placidum* Cam., 1904 (→*montanum* Schulz, 1906, N. India), *fulvocollare* Cam., 1904 (N. India), *khasiae* Cam., 1904 (ditto), *orientale* Cam., 1904 (ditto), *philippinensis* Ashmead, 1904 (Philippines), *elongatum* Ashm., 1905 (=*obsonator* Sm., Manila), *schmiedeknechti* Kohl, 1906 (Java), *testaceicorne* Cam., 1907 (India: Deesa), *gardineri* Cam., 1908 (Seychelles), *ornatipes* Cam., 1913 (Himalaya), *nodosicornis* Turner, 1917 (N. India), *fletcheri* Turner, 1918 (India: Assam), *puttalamum* Strand, 1922 (Ceylon), *formosicola* Strand, 1922 (Formosa, incl. var. *kankauensis* and ab. *calcaralis*), *koshunicon* Str., 1922 (Formosa), *gracilescens* var. *petioloides*, 1922 (ditto, ssp. unnecessary), *hyperorientale* Str., 1922 (Formosa, possibly=*obsonator* Sm.), *melanocorne* Str., 1922 (Formosa), *pileatum* var. *subpileatum* Str, 1922 (Formosa, raised to species), *tainanense* Str., 1923 (Formosa), *inornatum* Mats. et Uchida, 1926 (Ryukyus, ssp of. *formosicola* Str.), *mandibulatum* Richards, 1933 (Ceylon, Bengal), *obsonator tropicale* Tsuneki, 1961 (Thailand), *thaianum* Tsuneki, 1961 (ditto), *bilobatum* Tsuneki, 1961 (ditto), *nagamasae* Tsuneki, 1963 (ditto) *funatui* Tsuneki, 1963 (ditto), *crassifrons* Tsuneki, 1963 (ditto), *dubiosum* Tsuneki, 1964 (Ryukyus), *ryukyuense* Tsuneki (ditto,→ssp. of *responsum* Nurse), *takasago* Tsuneki, 1966 (Formosa), *kumaso* Tsuneki, 1966 (Ryukyus), *shirozui* Tsuneki, 1966 (Formosa), *koshunicon okinavanum* (Ryukyus, raised to sp.), *tanoi* Tsuneki 1967, (Formosa), *puliense* Tsuneki, 1967 (ditto), *fenchihuense* Tsuneki, 1967 (ditto).

In the present paper I have further described the following new species from Formosa:

T. vallicola, kansitakum, chingi, quadriceps and *chihpense.*

long, sparse, hoary white and erected.

Head from above transverse, width to length in middle relatively 64 : 30, ocelli in an equilateral triangle, OOD : POD = 4 : 7, width of postocellus relatively 9, head seen in front: Fig. 1, frons distinctly raised and longitudinally broadly, not strongly impressed in middle, supraantennal tubercle very large but low, only gently roundly raised, without medial carina, instead with an impressed line and margined in front with a broad lamella which is in middle triangularly (with varying angles) incised and sometimes coarsely radiately carinated (Fig. 2, seen vertically from above), IOD* at vertex and at base of clypeus 19 : 14 (≒ 4 : 3), OAD* ≒ WAS*, supraclypeal area distinctly wider than high, clypeus as shown in Fig. 1, antenna: Fig. 3, joint 3 in narrowest view 2.3 times, in widest view 2.1 times as long as wide at apex, ultimate joint as long as 3 preceding joints taken together, each joint of the apical half at base markedly raised dorsally. Pronotum transversely furrowed across middle, posterior part discoloured and anterior part considerably markedly broadened sideways and rounded at the ends, without medial notch; mesonotum not impressed anteriorly in middle, mesopleuron with anterior transverse furrow deep, narrow, not crenate and ends at the bordering area to mesosternum, thence very indistinctly as a fine, pure black line runs to the acetabular suture; area dorsalis on propodeum: Fig. 4, medial furrow on posterior inclination markedly broad and comparatively deep, in a cross section V-formed. Segment 1 of abdomen usually long petiolated, behind stigmata usually narrow sylindric and at apex gradually broadened, in most specimens it is about 8 times as



Figs. 1-10. *Trypoxylon formosicola* Strand. 9, 10, ♀; all others, ♂.
1: Head seen in front. 2: Supraantennal tubercle, seen vertically from above, with anterior portion upward. 3: Antenna. 4: Structure and sculpture of propodeum. 5: genitalia, seen obliquely from beneath. 6: Paramere (apical portion). 7: Genitalia, seen from apex. 8: Abdominal segments 1-4 (aberration). 9: Supraantennal tubercle seen vertically from above, with anterior portion upward. 10: Ditto, seen vertically in front, with anterior portlon downward.

* OAD... Oculoantennal distance. WAS... Width of antennal socket. IOD... Interocular distance.

long as wide at apex, and equal in length to the 3 following segments united, in some specimens, however, the form and the relative length to width are more or less varied. Genitalia: Fig. 5, paramere: Fig. 6, it is deeply bifid at apex, but one of the lobes very stumpy, subtriangularly broadened, with abundant hairs on inner surface, basal plates (volsella?) apically roundly flattened, with a fringe of long hairs at the margin; genitalia seen from apex: Fig. 7, the dotted parts the basal plates, the right hand body the paramere (the left side omtted), the central non-dotted organ the penis valve. Legs and wings normal, but the radial vein reaching near the extreme apex as in *T. malaisei* Guss.

Punctures on upper frons medium-sized, sparse, with intervals 1-2 times as large as punctures and distinctly microcoriaceous, on vertex punctures finer and ground microsculpture also finer and more delicate; mesonotum, scutellum and mesopleureon smooth and highly polished, with very fine hair-bearing punctules sparsely scattered; sculpture on area dorsalis: Fig. 4, posterior inclination with a few strong transverse carinae on posterior portion, behind the carinae the area perpendicular, more or less smooth, inside the medial broad furrow also without striae and punctuation; dorsal and posterior aspects bordered from the sides of the segment by a longitudinal carina on each lateral margin, along and inside the carinae accompanied a very coarsely crenated furrow, intervalic area between this furrow and the lateral furrow of area dorsalis as well as the disc of the area sparsely, less strongly punctured with hair-bearing points. Abdomen rather sparsely covered with fine points bearing a short soft pubescence.

In the female the structure of the supraantennal tubercle similar (Figs. 9 and 10; 9, seen vertically from above and 10, seen in front). The median longitudinal carina is, however, usually observable, though varied in strength.

An aberrant form. A male specimen collected by Mr. Y. Haneda in the town of Puli, Nantou Prefecture, on July 28, 1970, showed an aberration on the form of the petiole and appeared to be a different species. The petiole was not cylindric behind the stigmata, but gradually broadened posteriorly as if the specimen belonged to another short petiolated group (Fig. 8). It is only slightly more than 4 times as long as wide at the widest part before apex (63 : 14) and approximately as long as 2 (usually 3) following segments combined. There was no trace of the medial furrow on the petiole. But the structure of clypeus, supraantennal tubercle, antennae and propodeum completely agreed with that of the typical specimen of *T. formosicola.* So I examined the genital organs and found that it belonged no doubt to *formosicola.*

3. *Trypoxylon responsum taiwanum* Tsuneki, 1967

Trypoxylon responsum taiwanum Tsuneki*, Etizenia, 22: 8, 1967 (3 ♀ 1 ♂).

Material: 1 ♂, Nantou Pref. (Pempuchi, 26. VIII.).

Remarks. In the specimen the plumbeous shine on the mesonotum, scutellum and area dorsalis of the propodeum is much stronger than in the specimens formerly captured and the lateral furrows of the area dorsalis are slightly deeper and somewhat more strongly crenate. Apical margins of abdominal segments 1 and 2 and under half of segment 1 (apical portion only), 2 and 3 are ferruginous red. Otherwise (including characters of the genital organs) there can be found no note-worthy difference whatever.

4. *Trypoxylon gracilescens* Smith, 1860

Trypoxylon gracilescens: Tsuneki*, Etizenia, 22: 9, 1967 (5 ♀ 2 ♂).

Trypoxylon gracilescens: Haneda, Life Study, 15: 30, 1971 (2 ♂).

Material: 3 ♀ 9 ♂, Nantou Pref. (Pempuchi, 10, 17, 26. VIII.).

Remarks. As pointed out in my previous paper it seems highly possible that *T. eximium, elegantulum* (not *elongatum*) and *ferox* are conspecific with *T. gracilescens*, at most to be subspecies. If so *T. eximium* Sm. (1858) has the priority and all others must be sunk to subspecies or variety. In Formosa this species is not abundant.

5. *Trypoxylon obsonator* Smith, 1873

Trypoxylon obsonator: Tsuneki*, Etizenia, 22: 10, 1967 (39 ♀ 3 ♂).
Trypoxylon obsonator: Haneda, Life Study, 15: 30, 1971 (2 ♀ 4 ♂).

Material: 6 ♀ 5 ♂. 3 ♀ 4 ♂, Chiai Pref. (Chuchi, 26. VII.); 3 ♀ 1 ♂, Pingtung Pref. (Manchou, 13, 14. VII.).

6. *Trypoxylon melanocorne* Strand, 1922

Trypoxylon melanocorne: Tsuneki*, Etizenia, 22: 11, 1967 (partim, the Chulu specimen only).

Specimen: 1 ♀, Taitung Pref. (Chihpenchi, 2. VIII.).

Remarks. In my previous paper I dealt with 2 specimens of this species, both females, one from Pempuchi, Nantou Prefecture and the other from Chulu, Taitung Prefecture, and pointed out the presence of a fair degree of differences in some characters between them. However, basing upon the general agreement in many other distinctions and upon the admission of the original author of a considerable variation I placed them under the same specific category. I therefore payed a special attention upon the newly captured specimen above listed (Chihpenchi specimen) and found that it completely agreed in characters with the Chulu specimen except that it was somewhat larger in body length (15.0 mm as against 12.5 mm). On the other hand, I have 2 female and 1 male specimens from Pemphchi which I placed at my first preliminary division of the specimens in one group of the undescribed species, because of the characteristic feature of the clypeus. Upon comparing the Pempuchi specimen of the former year with these new Pempuchi specimens I found with a surprise that it completely agreed with them except the curvature of the anterior margin of the clypeus. By the examination of the state of the mandibles, however, it was easily realized that the median part of the clypeus of the specimen was considerably abraded, probably through the mud collecting activity. Further investigation of the newly collected Pempuchi specimens showed that some of the different characters which I considered previously the mere individual variations were, to my surprise, constantly possessed by them and were no doubt the characters of the species. Thus it was made out that the Pempuchi specimen and the Chulu specimen of my previous paper belonged respectively to a different species. As a result the characters of the Pempuchi specimen dealt with in the paper must be removed from the distinctions of *T. melanocorne* and the latter must be rearranged as follows:

(1) Clypeus not medianly longitudinally carinated (in my description "disc gently roundly raised and *medianly sometimes with a bluntly raised line*").

(2) Interocular space at vertex and at base of clypeus relatively about 5 : 4 (not about 3 : 2).

(3) OOD : POD = 1 : 3 (not 1 : 2).

(4) Front and middle tarsi dark brown, the former at base and on apical portion somewhat paler (not broadly yellowish white).

(5) Supraantennal tubercle not obliquely flattened at apex of the median carina.

As to the depth and crenation of the lateral furrows of the area cordata a more or less variation is present among the specimens.

Strand, in his original description of *melanocorne* says that die Basis der Tibien, die Tarsen I-II sowie die Tibialsporen meistens etwas bräunlich *oder gar gelblich*. The colour given in italics seems to suggest that the two species discussed here may be admixed in his material, a problem presented to the investigator who will have a chance of review of his specimens.

In *T. melanocorne* the supraantennal tubercle is comparativly highly raised, though not so acute as to be called nose-shaped, and this is separated from the socket ring of the antennae by a very deeply excavated furrow (Fig. 11, seen obliquely from above and side). Further, the socket ring is highly raised at the upper side, with the dorsal surface acutely tricarinated (Fig. 11, shown with an arrow)*. The ventral side of the abdomen except the basal 3/4 of the petiole is wholly ferruginous and mostly the colour is extended to greater part of the lateral walls. Sometimes (in the Chihpenchi specimen) the black on the dorsal surface is markedly narrowed, turning into a mere longitudinal stripe.

7. *Trypoxylon vallicola* sp. nov.

Trypoxylon melanocorne: Tsuneki, Etizenia, 22: 11, 1967 (partim, the Pempuchi specimen only, not the Chulu specimen).

In connection with the revision of *T. melanocorne* I have separated a closely allied form as distinct from this species. The new species dealt with here is the form newly separated. Together with the additional specimens the characters that are different from those of *T. melanocorne* will be listed below:

♀. (1) Clypeus medianly on basal portion longitudinally subcarinated and in the fresh specimens it is subtriangularly, more markedly produced anteriorly, with apex feebly incised in middle (Fig. 12).

(2) Interocular space at vertex and at base of clypeus relatively about 3 : 2.

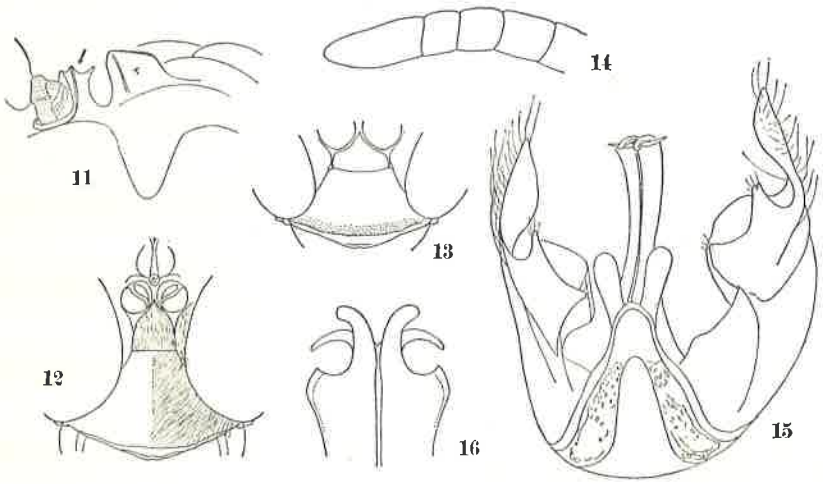
(3) OOD : POD = 4 : 7 (width of postocellus relatively 10).

(4) Supraantennal tubercle similarly comparatively highly raised, near nose-shaped, with the top longitudinally carinated, but the carina at the lower apex obliquely truncate, providing there with a small rounded flattened area (Fig. 12...slightly schematic), with the surface irregularly coarsely wrinkled, a constant character of the species. (Structure of the socket of antenna and the deep furrow between this and the supraantennal tubercle similar to those of *melanocorne*.)

(5) Fore tibiae on greater part and the following tarsi wholly (except pulvilli) yellowish white, middle tarsi on basal 1 or 2 or 3 joints also yellowish white (articulation, knees and basal rings of mid and hind tibiae also yellowish, but this is also the case in *melanocorne*).

Mesonotum, mesopleuron and scutellum with distinct plumbeous shine and with sparse fine hair-bearing punctures, sides of propodeum also with sparse fine punctures except the polished anterior portion, but the punctures somewhat closer than in *melanocorne* and sometimes mixed with feeble oblique rugae. Mandibles ferruginous and towards apex more reddish, clypeus on anterior margin dark brownish; antennae and petiole as in *melanocorne* in colour. Antennal joint 3 about 1.4 times as long as joint 4 and abut 5 times as long as broad at apex, petiole slightly longer than 3 subsequent segments united. Pronotum seen from above medially narrowed and laterally enlarged and distinctly furrowed across middle, anterior part laterally gently roundly

* The male of *T. obsonator* has the same structure, but in the female the furrow between the antennal socket and the supraantennal tubercle is much shallower. In *gracilescens* the furrow is similarly deep, but the medial carina on the tubercle (and the tubercle itself) is much narrower.



Figs. 11-16. 11: *Trypoxylon melanocorne* Strand, ♀. Antennal socket and supraantennal tubercle (T), seen obliquely from the side.
12-16: *Trypoxylon vallicola* sp. nov. 12, ♀; 13-16, ♂. 12 and 13: Clypeus. 14: Antenna (apical 4 joints). 15: Genitalia. 16: Penis (apical portion).

swollen and posterior part posteriorly discoloured, area dorsalis with a median longitudinal shallow furrow which is markedly widened posteriorly and on basal half distinctly crenate, lateral furrows not strong, but distinct, with a weak crenation. Median furrow on posterior inclination broad and deep, in a cross section nearly V-formed. Wings somewhat clouded throughout, distinctly and broadly darker at the apical margin. Length 13.0–14.0 mm.

♂. Length 11.0 mm. Closely resembling female, differences:

(1) Clypeus: Fig. 13, with the median carina more obtuse, rather in a blunt ridge.

(2) OOD : POD÷6 : 7, while width of postocellus relatively 8 (possibly with a more or less variation).

(3) Interocular space at vertex and at base of clypeus relatively about 4 : 3.

(4) Antennal joints shorter, joint 3 distinctly shorter than the length of joint 1 and 2 put together and about thrice as long as wide at apex, ultimate joint: Fig. 14, in the longest view slightly less than as long as 3 preceeding joints united.

(5) Front legs coloured as in ♀, but the middle tarsi brownish black, with apex only of each joint ferruginous.

Petiole very slender and long, slightly more than as long as 3 following segments combined, total length and maximum and minimum widths are relatively 102, 12 and 5. Genital organs: Fig. 15, paramere unequally divided into two lobes at the apex, one of which is only a short process, bearing a few hairs on top. Apical portion of penis: Fig. 16 (seen from backside).

Holotype: ♂, Nantou Pref. (Pempuchi, 25. VIII. 1968), K. Tsuneki leg.

Paratypes: 1 ♀, ditto, 13. VII. 1966, K. Tsuneki leg.; 2 ♀♀, ditto, 11, 17. VIII. 1968, K. Tsuneki leg.

8. *Trypoxylon tanoi* Tsuneki, 1967

Trypoxylon tanoi Tsuneki, Etizenia, 22: 15, 1967 (6 ♀ 8 ♂).
Trypoxylon tanoi: Haneda, Life Study, 15 (1-2): 30, 1971 (3 ♀ 1 ♂).

I could not find out the species again. Recently, however, Haneda collected specimens of this species in the town of Puli, Nantou Prefecture. This is the northernmost record of distribution of this species.

9. *Trypoxylon puliense* Tsuneki, 1967

Trypoxylon puliense Tsuneki, Etizenia, 22: 15, 1967 (3 ♀).
Trypoxylon puliense: Haneda, Life Study, 15 (1-2): 30, 1971 (2 ♀).

Material: 1 ♀, Nantou Pref. (Puli, 13. VIII.).

Remarks. The male of this species remains still undiscovered.

10. *Trypoxylon fenchihuense* Tsuneki, 1967

Trypoxylon fenchihuense Tsuneki, Etizenia, 22: 16, 1967 (1 ♂).

Supplementary notes. Supraantennal tubercle considerably high, near nose-shaped, distinctly carinated on top, the carina reaching upward 2/5 of the distance to front ocellus, upper half of which is somewhat divergent and in middle very finely furrowed, the furrow also slightly divergent and weakened upwards. The female of this species remains undiscovered.

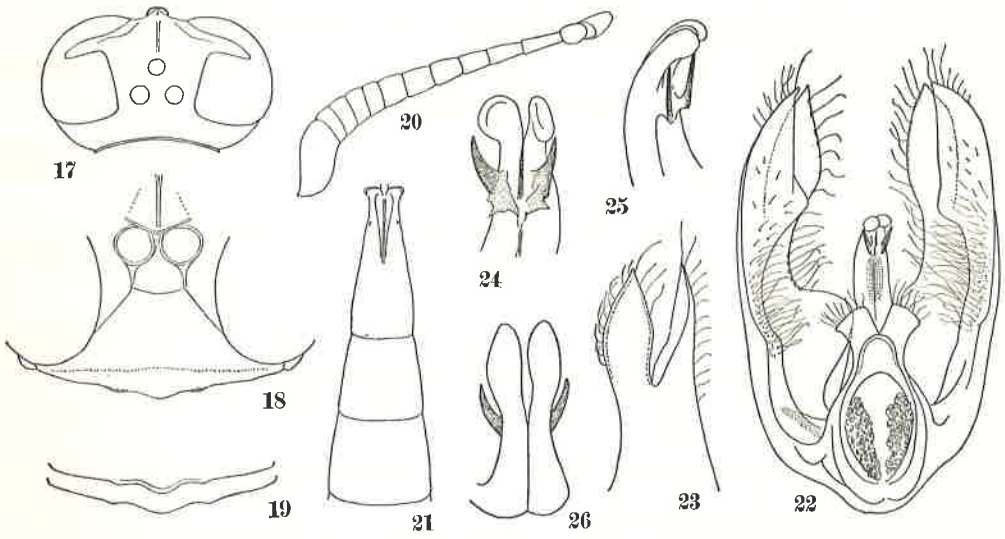
11. *Trypoxylon kansitakum* sp. nov.

Very closely resembles *T. fenchihuense* m., differing from it in the following respects: (1) Abdomen more extensively blackish. (2) Clypeus on anterior margin ferruginous (in *fenchihuense* black) and somewhat more distinctly (but bluntly) tridentate. (3) Head seen from above relatively much wider. (4) Supraantennal tubercle much low, not near nose-shaped, with a longitudinal carina on top. (5) Flagellum of antennae not geniculated in middle and ultimate joint as long as 4 preceeding joints united. (6) The first abdominal segment somewhat more robust. (7) Genital organs otherwise structured.

♂. Length 6.5–8.0 mm. Black; ferruginous yellow are mandibles (apically reddish), palpi (apically whitish), anterior marginal area of clypeus (variable in extention), antennal joint 1 and 2 in front and at apex, humeral tubercles (rather whitish) except a large basal blackish spot, a spot on semitransparent tegulae and basal plate of fore wings, base comparatively broadly of abdominal tergites 2, 3 and 4 (the extent fairly variable, sometimes the apex of tergite 1 also ferruginous and sometimes the dark brownish remaining areas of the tergites much paler and appear ferruginous brown), sides of these, sternite 1 on apical portion, sternites 2 and 3 except brownish obscure maculae, sternites 6, 7 and 8, fore legs except black coxae and a brownish streak in front of trochanters and femora (tibiae in front and tarsi much paler, pulvilli dark brownish), middle legs except the base of coxae, an obscure brownish streak on outer margin of tibiae and brownish tibial spurs (tarsi above apically brownish) and apex of coxae, trochanters, base (much paler) and inner side of tibiae, metatarsi and base of following joints of hind legs (rest of the legs brown to dark brown). Antennae dark brown, pronotum on posterior portion discoloured and pale brownish. Wings hyaline, apically slightly clouded, but without the distinctly clouded zone, veins and stigma brownish black. Hairs on head and thorax silvery, on lower frons and clypeus dense and appressed, on thorax short, fine, less dense and obliquely erected, on posterior inclination of propodeum fairly dense, comparatively thick and appressed.

Head seen in front not subquadrate, rounded and seen from above wider than in *fenchihuense* (Fig. 17), ocelli in a nearly equilateral triangle, anterior one slightly smaller, IOD at vertex and at base of clypeus relatively about 4 : 3, OOD : POD=5 : 8, width of postocellus relatively 7, OAD : WAS=5 : 8, supraantennal tubercle somewhat nose-formed, but very low, in a general expression rather gently rounded, with a longitudinal carina on top, the carina

usually reaches a third of the distance to the anterior ocellus and at the upper end longitudinally finely furrowed or simply pitted, the lower margin of the tubercle transversely, somewhat arcuately carinated, the carina at the lateral portions in touch with the raised upper margin of the antennal sockets; clypeus: Fig. 18, the states of the trisinuate margin more or less varied (Fig. 19), occipital carina at the lower ends not reaching the buccal carina, nor completely encircling the neck. Antenna: Fig. 20, joint 6 shows a feeble inclination to be excavated beneath at base, but almost unnoticeable, ultimate joint markedly incrassate and nearly as long as 4 preceeding joints taken together. Pronotum broadly furrowed across middle, posterior part discoloured and anterior part slightly roundly widened at the lateral corners, not markedly narrowed towards middle, not incised nor furrowed longitudinally in middle; mesonotum not depressed medioanteriorly, anterior oblique furrow on mesopleuron nearly vertical, at the lower end turned forwards and distinctly reaches the acetabular suture, scrobe markedly large. Area dorsalis on propodeum distinctly marked off by the fine, weakly crenulated furrow and medianly comparatively broadly and shallowly furrowed, this furrow broader and shallower towards apex (the feature is similar to that of *fenchihuense* — Etizenia, 22, fig. 44). The first segment of abdomen: Fig. 21, genitalia: Fig. 22, paramere with apex deeply split in two and broadly bilobated (Fig. 23, seen from backwards), inner lobe on dorsal side flattened and always considerably shining, the basiparamere on inner margin broadly roundly expanded, half rolled, at the innermost edge, however, not pointed at the top and not provided with a tuft of bristles as in *fenchihuense*. It is very strange that the elongated sickle-shaped appendages at the neck of the glans are not produced sideways as usual, but always produced apically along the glans (Fig. 24, from beneath; Fig. 25, from the side; Fig. 26, vertically from above)*. Legs and venation



Figs. 17-26. *Trypoxylon kansitakum* Tsuneki sp. nov., ♂.
17: Head seen from above. 18: Clypeus. 19: Ditto, variation in the form of anterior margin. 20: Antenna. 21: Abdominal segments 1-3. 22: Genitalia, seen from beneath. 23: Paramere (apical portion). 24: Penis (apical portion seen from beneath). 25: Ditto, seen from the side. 26: Ditto, seen from above.

* Usually the appendages, when present, always produced sideways. Are they able to be opened or closed freely and when in the abdomen are they as a rule closed? At any rate, in 3 examples that I examined the appendages are always closed, while in no species examined by me have I never observed such a state.

normal.

Punctures on vertex and upper frons fine and comparatively sparse, puncture intervals as great in width as punctures and distinctly microreticulated, with the surface not glossy; mesonotum, scutellum and mesopleuron similarly punctured, but on mesopleuron punctures somewhat sparser, with the microsculpture also sparser and weaker, with the surface more glossy. Area dorsalis at base longitudinally, partly obliquely, comparatively coarsely striate, disc obliquely weakly rugoso-punctate, medio-apical flattened area fairly smooth and shining, posterior inclination covered with hair-bearing punctures, lateral margins of the dorsal and posterior aspects bordered by a not strong carina from the sides of the segment, the carina accompanied just inside by a weak crenated furrow, sides of the segment smooth and polished and except for the anterior portion sparsely scattered with fine punctures, sometimes with very delicate close striae obliquely running. Abdomen covered with pile-bearing punctules, not shining.

♀. Unknown.

Holotype: ♂, Chiai Pref. (Kuanghua or Kansitaku), 1. VIII. 1968, K. Tsuneki leg.

Paratypes: 20 ♂♂, ditto, 1, 2, 6 and 7. VIII. 1968, K. Tsuneki leg.

Other specimens: 19 ♂♂, ditto.

Remarks. This species is somewhat similar to *T. koshunicon* Strand, 1922, especially in the coloration of the legs including the tibial spurs. At least, however, by the form of the head seen in front and by the structure of the ultimate antennal joint it can easily be separated from this species.

The specimens of this species were all captured at the half broken house repeatedly spoken of in my previous paper on the Formosan Crabroninae (supplement). In spite of the abundant males no female specimen could be captured. Possibly the time was too early for the emergence of the female. When it became suddenly rainy, the males successively came back and entered the hollows of timbers of the house.

12. *Trypoxylon chingi* sp. nov.

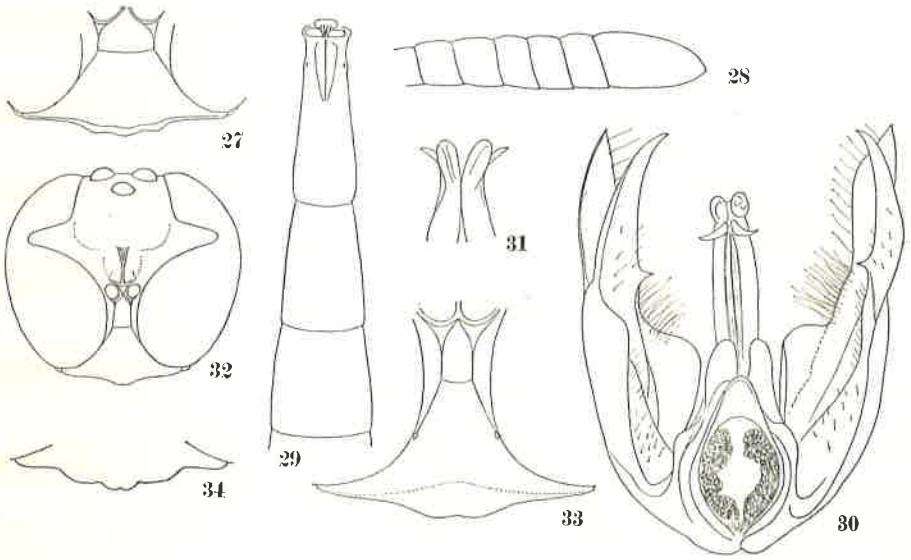
This species is very closely allied to the preceding. In the male at least, however, it can be separated therefrom by the following distinctions:

(1) Ultimate antennal joint as long as 3 preceding joints combined. (2) Supraantennal tubercle much higher. (3) Head seen from above much thicker (as in *fenchihuense*). (4) Body somewhat smaller.

♂. Length 5.2-6.0 mm. Coloration as in *kansitakum* excepting that fore and middle legs wholly ferruginous, without dark brown stripe and hind metatarsi at base more narrowly ferruginous (coxae and pulvilli blackish); sometimes antennal joints 1 and 2 wholly ferruginous (outer margin of humeral tubercles whitish).

Head seen from above distinctly thicker than in *kansitakum* (relative width to length in middle 37 : 25 (=1.48), in *kansitakum* 50 : 29 (=1.72)), ocelli in a nearly equilateral triangle, anterior ocellus somewhat smaller, OOD : POD=3 : 6, width of postocellus relatively 7; head seen in front rounded, IOD at vertex and at base of clypeus 13 : 9 (≒5 : 3), OAD: WAS= 4 : 5, supraantennal tubercle markedly high, distinctly nose-formed and longitudinally carinated on top, the carina at the upper end deeply excavated by a short furrow or a pit, the tubercle at the lower end margined by a transverse carina. Clypeus: Fig. 27, antennal joint 3 approximately 2.5 times as long as wide at apex, ultimate joint: Fig. 28, about as long as 3 preceeding joints taken together, joint 6 not (distinctly) excavated beneath; pronotum transverse, with the lateral swellings very slight, fairly deeply furrowed across middle, posterior

part discoloured, no incision in middle, mesonotum not depressed medio-anteriorly, mesopleuron and propodeum structured as in *kansitakum;* 3 basal segments of abdomen: Fig. 29, somewhat slenderer than in the compared species. Genitalia: Fig. 30, paramere at the apex deeply bilobated, inner lobe glabrous and on inner margin towards the base armed with a strong tooth, outer (or dorsal) lobe at the basal main body broadly expanded inwards and slightly rolled ventrallly, penis valve provided with a pair of sickle-shaped appendages near apex, the appendages produced obliquely forwards (or ventrally), not normally produced sideways (Fig. 31).



Figs. 27-34. 27-33: *Trypoxylon chingi* Tsuneki, sp. nov., ♂. 34: *Trypoxylon koshunicon* Strand, ♀.
27, 33, 34: Clypeus. 28: Antenna (apical portion). 29: Abdominal segments 1-3. 30: Genitalia. 31: Penis (apical portion, seen from above). 32: Head in front.

Punctuation on head and thorax as in *kansitakum;* area dorsalis on propodeum at base obliquely, fairly strongly striate, disc transversely very finely and closely striate, the striae on anterior portion first oblique, then curved and finally directed forwards, thus drawing subconcentric close circles at the antero-lateral areas, the striae on median furrow transverse and connected with the striae on disc; posterior inclination finely, moderately closely punctured with hair-bearing points, sides of the segment microcoriaceous, with a few punctures scattered on dorso-posterior portion, sometimes the delicate sculpture shows an inclination to be arranged in very feeble oblique striae.

♀. Length 7.5–8.5 mm. Coloration as in ♂, but antennal flagellum beneath more broadly and more brightly brownish. Head seen from above relatively a little wider (ratio of width to length in middle till tip of supraantennal tubercle 1.55), seen in front almost as in ♂, not subquadrate in outline (Fig. 32), ocelli in a complete equilateral triangle and the anterior a little smaller, OOD : POD= 3 : 6, width of postocellus relatively 10, IOD at vertex and at base of clypeus relatively 15 : 5.5 (nearly 3 : 1), OAD almost none, supraantennal tubercle as in ♂, apparently somewhat higher and the excavation on upper end of the medial carina longer, clypeus: Fig. 33, antennae much slenderer than in ♂, joint 3 approximately 3.3 times as long as wide at apex, penultimate joint slightly longer than wide. Pronotum slightly narrowed to-

wards middle, otherwise as in ♂, abdomen also similar. Punctuation on head, thorax and propodeum similar, but area dorsalis more coarsely striate, the pattern of striation as in ♂.

Holotype: ♂, Chiai Pref. (Kuanghua or kansitaku, 6. VIII. 1968), K. Tsuneki leg.

Paratypes: 7 ♀♀ 20 ♂♂, ditto, 1, 2, 6, 7. VIII. 1968, K. Tsuneki leg.

Other specimens: 5 ♂♂, ditto.

Remarks. This species seems closely resembling *T. koshunicon* Strand, 1922; in the male, however, differs from this in the following points:

(1) Two distal joints of hind tarsi not pale yellw, but dark brown. (2) Tibial spurs of middle legs not black, but pale yellow. (3) Clypeus on anterior margin broadly ferruginous. (4) Ultimate antennal joint amply as long as 3 (not 2) preceeding joints united.

In the female the present species is separable from *koshunicon* (ref. Tsuneki, 1966) by the form of the head seen in front (not subquadrate) and by the state of the anterior margin of the clypeus (Fig. 33, cf. Fig. 34).

The wasps of this species lived in the half broken house near Fenchihu, Mt. Ali, together with the preceding species. The owner of the house was Mr. R. K. Ching, that I knew through the discarded name-plate and to him the wasp name was dedicated.

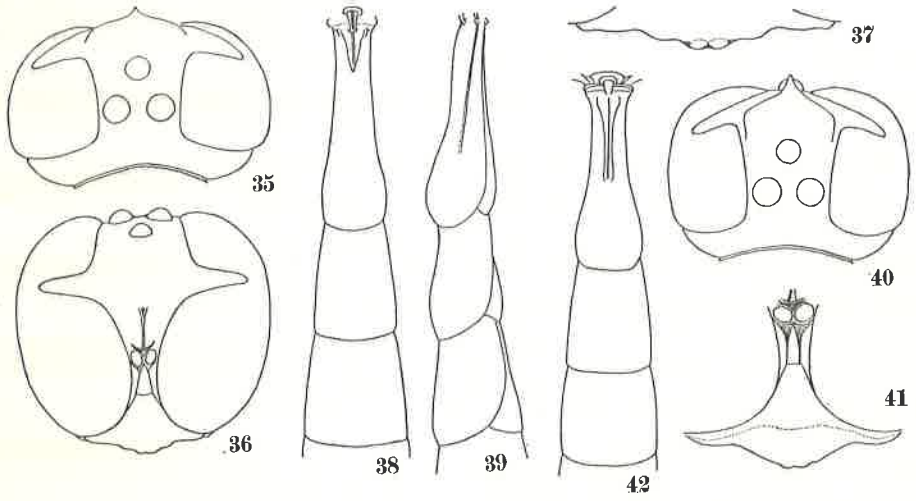
13. *Trypoxylon quadriceps* sp. nov.

♀. Similar to the preceding species, easily separable therefrom, however, in the form of the head seen in front and of abdominal segment 1 and in the ratio of OOD to POD. Further, the colour of the abdomen and of middle legs is also of use to distinguish the species.

Length 7.5 mm. Black; ferruginous are mandibles, anterior margin of clypeus broadly, antennal joint 1 wholly, 2 beneath, a mark on transparent brownish tegulae, anterior inserted parts of abdominal segment 2, 3 and 4 (on the tergites usually concealed, at the sides the colour is extended posteriorly and well visible and on the sternites always wholly dim ferruginous), front legs except the greater part of coxae, a brown stripe on femora and pulvilli, middlle legs except coxae above, brownish posterior (or outer) sides of femora and tibiae and tarsi above (brownish) from distal third of joint 1 apically, and hind legs on apex of coxae, trochanters and at base of tibiae and of following tarsal joints (remaining parts of hind legs distinctly black); tibial spurs of mid and hind legs dark brownish. Palpi and outer margin of humeral tubercles pale yellowish white. Wings hyaline, veins and stigma black. Hairs on lower frons, clypeus, temples, nape region of pronotum, sides of mesonotum, mesopleuron, sides of dorsal aspect and posterior inclination of propodeum not long, appressed and silvery; abdominal tergites 2, 3 and 4 at base comparatively broadly, but not strikingly adorned with a band of moderately close and laterally recumbent pubescence.

Head from above very thick (Fig. 35), ratio of width to length in middle 1.46, OOD very narrow, almost none, ratio of OOD, width of postocellus and POD approximately 1, 10 and 5, ocelli uniform and the ocellar triangle slightly higher than the equilateral one, head seen in front: Fig. 36, IOD at vertex and at base of clypeus relatively 13: 5, supraantennal tubercle nose-formed, longitudinally carinated on top and at upper end of the carina longitudinally excavated, medial furrow on frons very feeble, almost unnoticeable; clypeus: Fig. 37, head in profile with eye approximately thrice as wide as temple; antennal joint 3 about 3.3 times as long as wide at apex, distinctly longer than joint 1 (16 : 12), joint 8 approximately 1.3 times as long as wide. Pronotum transversely furrowed across middle, posterior part discoloured and anterior part moderately roundly incrassate at the sides, mesonotum from base roundly raised, not impressed, area dorsalis as in the preceding species, but the lateral furrows somewhat

deeper and more distinct, the feature as in *fenchihuense*, medial furrow shallow, broad, divergent posteriorly, with apex rounded, medial furrow on posterior inclination narrower and longer than in *chingi*, at the posterior half sharply outlined. Abdominal segments 1–3: Fig. 38, in lateral viev: Fig. 39, posterior portion of each segment more or less roundly raised, more strikingly so than in *chingi*. Legs and wing venation normal.



Figs. 35-42. 35-39: *Trypoxylon quadriceps* Tsuneki, sp. nov., ♀. 40-42: *Trypoxylon chihpense* Tsuneki, sp. nov., ♀.
35, 40: Head seen from above. 36: Head seen in front. 37: Clypeus (anterior margin). 38, 42: Abdominal segments 1-3. 39: Ditto, lateral view. 41: Clypeus.

Punctuation on head and thorax generally as in *chingi* (sparsely punctured, with micro-reticulated intervals), but on frons somewhat stronger and on mesopleuron punctures slightly closer, with intervals as large as punctures or slightly less than so; area dorsalis at base longitudinally coarsely and strongly, on middle portion obliquely and on posterior portion transversely, both finely and closely striate, the striae at base extended over the middle portion, becoming finer, mixed with others, turn sideways and then forwards, thus drawing concentric semicircles at the lateral areas of the basal portion; on the sides of the segment the extreme anterior portion smooth and polished, middle portion obliquely and delicately microstriate and posterior portion scattered with moderate-sized punctures; posterior inclination finely closely punctured, the punctures covered with dense pubescence and almost invisible. Abdomen on the incrassate part of each tergite glabrous, punctureless and shining, other parts covered with very fine pile-bearing punctules.

Holotype: ♀, Nantou Pref. (Pempuchi, 11. VIII. 1968), K. Tsuneki leg.

14. *Trypoxylon chihpense* sp. nov.

This psecies (♀) closely resembles *T. koshunicon* Strand. In comparison with the topotypical specimen described by me in 1966 (Etizenia, 13: 16) the present species differs from *koshunicon* in the following distinctions:

(1) The form of clypeus (Fig. 41, cf. Fig. 34). (2) Eye incision; in the present species deeper and narrower. (3) petiole relatively longer. (4) Lateral furrows of area dorsalis deeper. Further, the colour of middle legs and ratio of OOD : POD are more or less dissimilar.

On the other hand, the present species is very similar to the preceding species from Pemphuchi, but can be distinguished therefrom by the form of clypeus, by the shorter abdominal tergites 2 and 3, and by the colour of the basal portion of the antennal flagellum. To *T. chingi* is the new species also similar, but is easily separable from it by the form of the head, clypeus and petiole and by the colour of the tibial spurs and other parts of the middle legs.

♀. Length 7.5 mm. Black; ferruginous are mandibles (apically brownish red), anterior margin of clypeus fairly broadly, antennal joint 1 wholly, 2 beneath and 3 at base, humeral tubercles largely, a spot on transparent pale brownish tegulae, basal plate of fore wings, sides (especially at base) and underside of abdominal segments 2–4, apical sides of tergite 1 and sternite 5 at base, front legs except coxae (apex ferruginous), a streak on femora and pulvilli, middle legs except base of coxae, tibial spurs, greater part of tarsal joints 2 and 3 above and pulvilli and hind legs on apex of coxae, whole the trochanters and at base and at apex of femora, tibiae and 3 basal joints of tarsi. Penultimate joints of mid and hind legs wholly pale brownish, end joints somewhat darker brown; exceptional parts of front and mid legs except coxae and pulvilli brownish; external side of femora and tibiae of mid legs in some light appears pale brownish; antennal flagellum darker brown, basal portion beneath light brown to ferruginous. Wings hyaline, feebly clouded throughout, stigma and veins dark brown. Pilosity similar to that of the preceding species, abdominal tergites 2–4 possess a broad obscure pile band on anterior portion of each segment.

Head seen from above (Fig. 40) slightly thicker and more quadrangular than in *quadriceps*, width to length in middle relatively 39 : 27, seen in front as in this species except the clypeal form (Fig. 41), ocellar disposition, the form of supraantennal elevation and ratio of interocular space at vertex and at base of clypeus also similar, only OOD relatively slightly greater (OOD : POD 2 : 5, width of postocellus relatively 10), structure of thorax and propodeum follows the same pattern as in *quadriceps*, but the medial and especially the lateral furrows of area dorsalis somewhat deeper and more distinct. Abdominal segments 1–3: Fig. 42. Legs and venation of wings normal. Punctuation also similar, but the sculpture on area dorsalis a little sparser, at base transversely narrowly impressed and very coarsely crenate, on anterior portion obiquely, on posterior portion transversely finely but rather coarsely striate, sides of the segment anteriorly smooth and highly polished, on posterior half microcoriaceous, with an inclination to be arranged in to oblique striae, and scattered with fine punctures.

Holotype: ♀, Taitung Pref. (Chihpenchi, 4. VIII. 1968), K. Tsuneki leg.

On *Trypoxylon koshunicon okinawanum* Tsuneki, 1966

Judging by the fact that several very closely allied species of *T. koshunicon* occur in Formosa which was made clear through the present investigation it seems better to raise *T. koshunicon okinawanum* m., 1966, to a distinct species, because the differences enumerated between the two forms are great enough to separate them at the specific level (cf. Etizenia 13: 18, 1966).

15. *Trypoxylon shirozui* Tsuneki, 1966

Trypoxylon shirozui Tsuneki, Etizenia, 13: 14, 1966 (1 ♀).
Trypoxylon shirozui: Tsuneki, Ibid., 22: 18, 1967 (9 ♀ 10 ♂).
Trypoxylon shirozui: Haneda, Life Study, 15 (1-2): 31, 1971 (1 ♀).

Material: 1 ♀, Nantou Pref. (Chienching - Wushe, 24, VIII.).

INSERTION OF THE NEW SPECIES INTO THE PREVIOUS KEY TO THE FORMOSAN SPECIES

Female

1 (Correction: Length of *T. subpileatum* Strand→10–13 mm.)

7 Length about 18–20 mm, red band on abdomen distinct (rarely dorsal side with small blackish maculae), clypeus and antennae completely black (area dorsalis with marginal furrows very weak and indistinct, mesonotum smooth and glossy, with a plumbeous shine, finely sparsely and rather obscurely punctured with hair-bearing points)
***responsum taiwanum* Tsuneki, 1967**

– Length about 13–15 mm, red band on abdomen usually incomplete, but sternites 2–6 ferruginous, clypeus with apical margin more or less brownish, antennal joints 1–4 at apex ferruginous (area dorsalis distinctly margined by impressed lines)……7a

7a Clypeus medianly not longitudinally carinated, supraantennal tubercle low, gently roundly raised, with a median carina on top, the carina at apex pointed or nearly (interocular space at vertex and at base of clypeus relatively about 5 : 4, OOD : POD = 1 : 3, fore and mid tarsi dark brown, the former at base and at apical portion somewhat paler) ***melanocorne* Strand, 1922**

– Clypeus medianly longitudinally carinated, supraantennal tubercle fairly high, subnose-formed, with a median carina on top, the carina obliquely truncate at apex, forming a small flattened area there (interocular space at vertex and at base of clypeus relatively about 3 : 2, OOD : POD = 1 : 2, fore and mid tarsi broadly yellowish white)
***vallicola* Tsuneki, sp. nov.**

11 Abdomen wholly black (IOD at base of clypeus only slightly smaller than at vertex, area dorsalis with marginal furrows shallow and indistinct, supraantennal tubercle nose-shaped, high and stout), 8–10 mm ***shirozui* Tsuneki, 1966**

– Abdomen at least at the middle part of the ventral side ferruginous red……12

12* Probably abdomen broadly red, with a few blacktsh maculae (antennal joints 1 and 2, greater part of fore and middle legs, together with their tibial spurs ferruginous, supraantennal tubercle high, near nose-formed, area dorsalis distinctly marked off by the fine carinae), 10 mm or so, the inhabitant of high altitude
(*fenchihuense* Tsuneki, 1967)

– Abdomen largely black, at least sides and underside of segment 2–4 more or less ferruginous (mandibles and fore and middle legs largely ferruginous, area dorsalis marginated by the furrow……13

13* Supraantennal tubercle low, gently roundly raised, with a medial carina on top (lateral furrows of area dorsalis shallow and weak, front femora with a blackish streak, often femora and tibiae of middle legs also, fore and middle tibial spurs dark brown), 7–8 mm, inhabitant of high altitude (*kansitakum* Tsuneki, sp. nov.)

– Supraantennal tubercle comparatively high, near nose-formed……14

14 Head seen in front subquadrate, with lateral margins approximately parallel (interocular distance at vertex and at base of clypeus about 5 : 2, mid and hind tibial spurs dark brown)……15

– Head seen in front more rounded, with lateral margins roundly convergent above

* shows that the characters are the presumation based on those of the male.

and below 17

15 Eye incision comparatively broad and not deep, anterior margin of clypeus: Fig. 34, 7.5 mm, southernmost region of the Island ***koshunicon* Strand, 1922**

– Eye incision narrow and deep, clypeus otherwise 16

16 Clypeus: Fig. 41, abdominal segments 1, 2 and 3 comparatively shorter and wider (Fig. 42) (antennal joint 1 wholly, 2 beneath and 3 at the basal portion and beneath ferruginous yellow, 2 and 3 above only very slightly darkened, 4 and 5 beneath also somewhat paler), 7.5 mm, from highland (about 500 m) of Taitung Pref. known ***chihpense* Tsuneki, sp. nov.**

– Clypeus: Fig. 37, abdominal segments 1, 2 and 3 comparatively longer and narrower (Fig. 38) (antennal joint 1 beneath and 2 at base beneath ferruginous, 1 and rest of 2 dark yellowish brown, 3 and 4 beneath not paler), 7.5 mm, hitherto from low mountain region (about 700 m) of Cental Formosa known ***quadriceps* Tsuneki, sp. nov.**

17 Interocular distance at base of clypeus relatively smaller, ratio to that at vertex approximately 1/3, clypeus: Fig. 33 (front and mid legs except base of coxae, a streak on femora and pulvilli yellow), 7.5–8.5 mm, inhabitant of high altitude (1300 m) ***chingi* Tsuneki, sp. nov.**

– Interocular distance at base of clypeus relatively greater, ratio to that at vertex approximately 2/5 (all legs fairly broadly dark brownish), 7.0–7.5 mm, found in Yaeyama group of the Ryukyus ***okinawanum* Tsuneki, 1966**

KEY IN THE MALE, NEWLY PREPARED

1 First segment of abdomen long, petiolated or subpetiolated, always more than 4 times as long as wide at (the widest part before) apex 2

– First segment of abdomen not so long, gradually widening posteriorly and less than 3.5 times as long as wide at apex 11

2 Frons with shield-shaped enclosure (body wholly black) 3

– Frons without the shield-shaped enclosure 4

3 Frontal shield deeply impressed inside, very distinct and complete, ultimate joint of antennae slightly bent, as long as 3 preceding joints united, 8–11 mm ***subpileatum* Strand, 1922**

–* Frontal shield on lower half very shallow, level with the surrounding areas, only marked off by the carinae, 8–10 mm (*tainanense* Strand, 1923)

4 Supraantennal tubercle near nose-shaped, the carina on top obliquely truncate at the anterior end, provided there with a small rounded area (IOD at vertex and at base of clypeus approximately 4 : 3, ultimate joint of antennae not distinctly bent, more than as long as 2 preceding joints united, but less than 3 preceding joints so) 5

– Supraantennal tubercle not so high, gently roundly raised, with a carina on top which is not truncate at apex 6

5 Abdomen at least from apex of segment 1 to base of segment 5 (mostly more broadly) ferruginous, anterior margin of clypeus, front and mid legs except main part of coxae also ferruginous (anterior margin of clypeus broadly roundly produced, almost without the medial protuberance, area dorsalis with lateral furrows very feeble and indistinct, paramere with apex simple, not bifurcate, with main body dorsally broadly and ventrally narrowly expanded to form an incomplete roll, penis with a pair of sickles near

apex which are produced sideways), 12–14 mm, not abundant
***gracilescens* Smith, 1860**

– Abdomen with segments 2–4 on sides and beneath dark brown, apex of segment 1 similarly coloured, anterior margin of clypeus and legs except tibiae in front and whole tarsi of fore legs black (clypeus anteriorly broadly roundly produced, with a weak median protuberance in middle, area dorsalis with lateral furrows distinct, closely crenate, paramere with apex bifid, one of the lobes very short, subtriangular, basiparamere with the dorsal side quadrately and ventral side narrow-triangularly expanded and rolled, penis as in the preceding species), about 11 mm, rare
***vallicola* Tsuneki, sp. nov.**

6 Ultimate antennal joint very large, as long as 5 preceding joints taken together (clypeus on anterior margin medianly comparatively broadly roundly produced, IOD at vertex and at base of clypeus relatively about 3 : 2, area dorsalis with medial and lateral furrows broad and deep, coarsely transversely striate, paramere with apex simple, basiparamere forming an incomplete roll, penis with a pair of sickles near apex produced sideways, abdomen towards middle red banded, the banded part usually with blackish maculae), 10 mm or so, South and Central Formosa ***tanoi* Tsuneki, 1967**

– Ultimate antennal joint not so long 7

7 Front tibiae wholly black (abdomen also wholly black, supraantennal tubercle gently rounded and medianly with an impressed line or a weak carina, anterior margin of the tubercle with a broad transverse lamella covering the upper raised rings of the antennal sockets and medianly triangularly incised (Fig. 2), ultimate joint of antennae as long as 3 preceding joints united. IOD at vertex and at base of clypeus approximately 4 : 3, area dorsalis: Fig. 4, abdominal segment 1 as a rule long petiolated, sometimes subpetiolated (Fig. 8), paramere unequally bilobated at apex, penis with the sickles produced sideways), 12-14 mm, common and abundant ***formosicola* Strand, 1922**

– Front tibiae more or less ferruginous (abdomen with a more or less reddish or ferruginous or brownish area, supraantennal tubercle distinctly carinated on top, its anterior margin not expanded into a transverse lamella 8

8 Area dorsalis with lateral furrows very weak and indistinct, or almost completely lacking 9

– Area dorsalis with lateral furrows very distinct 10

9 Ultimate antennal joint slightly more than as long as 2 preceding joints combined, penis of genitalia without the sickle-shaped appendages before apex, paramere equally bilobated at apex (clypeus at base medianly not carinated, anterior margin medianly with a slight protuberance, IOD at vertex and at base of clypeus relatively about 4 : 3, abdomen with a red band, usually black maculated dorsally, antennae wholly black, sometimes with flagellum beneath dark brownish), 10-13 mm
***responsum taiwanum* Tsuneki, 1967**

– Ultimate antennal joint as long as 3 preceding joints combined, penis with a pair of sickles before apex (clypeus at base medianly bluntly carinated, with anterior margin rounded, and medianly very weakly trisinuate, ratio of IODs similar, abdomen with a red band, usually black maculated dorsally, antennal flagellum beneath broadly ferruginous or brownish), 10-12 mm ***obsonator* Smith 1873**

–* Ultimate antennal joint? genitalia? (possibly abdomen and antennae wholly black and base of mid and hind tibiae yellowish) (*takasago* Tsuneki, 1966)

10 Ultimate antennal joints? genitalia? ratio of IODs? abdomen with red band? (*puliense* Tsuneki, *melanocorne* Strand, *takasago* Tsuneki)
(As to *takasago* see also above, possibly 9* is correct)

11 Wholly black, IOD at base of clypeus only slightly less than as great as that at vertex (ultimate antennal joint distinctly bent, approximately as long as 3 preceding joints united, area dorsalis with lateral furrows shallow and indistinct, supraantennal tubercle nose-shaped, high and stout, paramere deeply bifid at apex, basal body without the roll-shaped lamellate expansions, penis with the sickles produced sideways), 7–8 mm, inhabitant of high altitude ***shirozui* Tsuneki, 1966**

– Abdomen with a more or less reddish area and fore and middle legs more or less yellow 12

12 Abdomen wholly ferruginous red, with scattered blackish small maculae, antennal joint 6 at base beneath distinctly excavated (ultimate joint of antennae very thick, about as long as 3 preceding joints taken together, ratio of IODs approximately 3 : 2, supraantennal tubercle nose-shaped, area dorsallis marked off by the furrow, paramere deeply split into 2 lobes at apex, subequal in length, but one is very slender and the other lobiform and provided with a lingulate lamellate process at base, penis with the sickles produced sideways), 6.5 mm, inhabitant of high altitude ***fenchihuense* Tsuneki, 1967**

– Abdomen largely black, with a more or less reddish area towards middle (mainly on the underside), antennal joint 6 not excavated beneath 13

13 Head seen in front rounded, with lateral margins roundly convergent above and below 14

– Head seen in front subquadrate, with lateral margins medianly subparallel 16

14 Supraantennal tubercle low, gently rounded, with a median carina on top (ratio of IODs 4 : 3, clypeus weakly produced anteriorly and in middle feebly trisinuate, ultimate antennal joint approximately as long as 4 preceding joints taken together, lateral furrows of area dorsalis not strong, usually fairly distinctly crenate, from apex of abdominal segment 1 to base of 4 ferruginous red, with brownish maculae dorsally, fore and middle legs almost wholly yellow except coxae, paramere deeply bifid at apex, the lobes uniform and fairly broad, expantion at the basal part not completely forming a roll, penis with the sickles near apex, but they directed apicalward, not produced sideways as usual), 7–8 mm, inhabitant of high altitude ***kansitakum* Tsuneki, sp. nov.**

– Supraantennal tubercle high, nose-shaped, with a median carina on top 15

15 Ultimate antennal joint as long as 3 preceding joints taken together (ratio of IODs approximately 3 : 2, clypeus: Fig. 27, area dorsalis weakly marked off by the fine crenulated furrow, abdomen with a reddish area towards middle, fore and middle legs largely ferruginous, paramere deeply divided into 2 lobes, the ventral one provided with an acute triangular process at the base, penis with the sickles obliquely produced apicalwards), 7–8 mm, inhabitant of high altitude ***chingi* Tsuneki, sp. nov.**

–* Ultimate antennal joint? (ratio of IODs? clypeus? area dorsalis marked off by a weak furrow, abdomen with ferruginous band or patches, fore and middle legs yellow, but with a considerable extent brownish, genitalia?), 6–7 mm, southern Islands of the Ryukyus (*okinawanum* Tsuneki 1966)

16 Ultimate antennal joint amply as long as 2 preceding joints taken togetther (supraantennal tubercle with a fine longitudinal carina (meaning nose-shaped?), eye incision

triangular, not deep, antennal joint 3 equal in length to joint 1, abdomen only slightly longer than head and thorax put together, segment 2 about 3/4 times as long as petiole, ratio of IODs? area dorsalis? genitalia? pale yellow are antennal joints 1-3 (above a little darker), fore and middle legs, hind legs with trochanters and 2 distal tarsal joints wholly and end or both ends of all other segments; tibial spurs of middle and hind legs black, mandibles brownish yellow) 5.5 mm, southernmost region of Formosa
***koshunicon* Strand, 1922**

_* Ultimate antennal joint? (supraantennal tubercle nose-shaped, area dorsalis enclosed by a fine furrow and medianly broadly shallowly grooved, mandibles and greater part of fore and middle legs ferruginous, tibial spurs? abdomen partly reddish, ratio of IODs? genitalia?), 6–7 mm
(*quadriceps* Tsuneki, sp. nov., *chihpense* Tsuneki, sp. nov.)

GENUS *PISON* JURINE

16. *Pison punctifrons* (Shuckard, 1837)

Pison punctifrons: Tsuneki*, Etizenia, 22: 20, 1967 (80 ♀ 59 ♂).
Pison punctifrons: Haneda, Life Study, 15: 31, 1971 (5 ♀ 17 ♂).

Material: 15 ♀ 10 ♂, Kuangyin, Erhchieh, Chihpenchi, Manchou and Kentin Park.

Remarks. This species is common and everywhere very abundant.

17. *Pison ignavum* Turner, 1908

Pison ignavum: Tsuneki*, Etizenia, 22: 21, 1967 (1 ♀).

Material: 5 ♀ 3 ♂, Pingtung Pref. (Paoli), 19. VII.

Literature

Tsuneki, K. 1966. Taxonomic notes on *Trypoxylon* of Formosa and the Ryukyus, with descriptions of new species and subspecies (Hymenoptera, Sphecidae). Etizenia, 13, 19 pp (with a detailed list of literature).

Tsuneki, K. 1967. Studies on the Formsan Sphecidae (II). The subfamily Trypoxyloninae (Hymenoptera).

Haneda, Y. 1971. Sphecidae collected in Formosa in 1970. Life Study (Fukui), 15 (1-2): 29–33.