

# *Etizenia*

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STUDIES ON THE FORMOSAN SPHECIDAE (XII)  
A SUPPLEMENT TO THE SUBFAMILY NYSSONINAE, WITH THE  
*BEMBECINUS*-SPECIES OF THE SOUTHERN RYUKYUS  
(HYMENOPTERA)

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**STUDIES ON THE FORMOSAN SPHECIDAE (XII)**  
**A SUPPLEMENT TO THE SUBFAMILY NYSSONINAE, WITH THE**  
**BEMBEVINUS-SPECIES OF THE SOUTHERN RYUKYUS\*\***  
**(HYMENOPTERA)**

By K. TSUNEKI  
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The Formosan material used in the present paper was collected by myself in the summer of 1968 and that of the southern Ryukyus by Mr. T. Tano, Fukui, in the summer of 1969. I express my sincere gratitude to Mr. Tano for his kindness in placing the valuable specimens at my disposal.

**1. *Nysson basalis* F. Smith, 1856**

*Nysson basalis*: Tsuneki\*, Etizenia, 31: 1, 1968 (14 ♀ 18 ♂).

*Nysson basalis*: Haneda, Life Study, 15: 32, 1971 (1 ♀).

Material: 26 ♀ 90 ♂, Pingtung Pref. (Uluampi, Shatao, Kentin, Hengchun and Paoli, 8.-21. VII.).

*Remarks.* This species is common and fairly abundant in the southernmost region of Formosa and is very frequent on the flowers of a habaceous plant belonging to Amarantaceae. Without the knowledge of this habit, however, the collection of even a single specimen of this species will become a considerably difficult matter.

**2. *Argogorytes fuliginosus* Tsuneki, 1968**

*Argogorytes fuliginosus* Tsuneki, Etizenia, 31: 2, 1968 (2 ♀ 1 ♂).

Material: 1 ♀, Nantou Pref. (Pempuchi, 10. VIII.).

**3. *Gorytes taiwanus* sp. nov.**

Most closely allied to *G. fulvohirtus* m. occurring in Japan, especially in the structure of the antennae of the male and of the basal two segments of the abdomen, differs from it, however, in the general coloration and in the structure of the rest of the abdomen. This species is considered to show, together with *G. fulvohirtus*, an intermediate state between the genera, *Gorytes* s. str. and *Lestiphorus*.

♂. Length 11.0-11.5 mm. Pitchy black, with the following portions orange yellow: A spot at base on outer side of mandibles, clypeus on each side and sometimes with a short line behind the anterior margin, sometimes labrum in middle, lower inner orbits of eyes up to slightly above the upper edge of antennal sockets, collar of pronotum, humeral tubercles, sometimes a spot behind it on mesopleuron, tegulae, parategular areas, a laterally narrowed broad band on abdominal tergite 2, a lateral spot on sternite 2, all tibiae in front (in hind legs shorter) and ultimate tarsal joints of fore legs partly. Palpi ferruginous, mandibles on apical 3/5 reddish brown, antennal flagella beneath somewhat brownish, ante-apical narrow band on tergite 1 reddish yellow or reddish brown, varied in width with the specimen, in one of the materials posterior margin of

\*\* Contribution No. 161 from the Biological Laboratory, Fukui University, Japan.

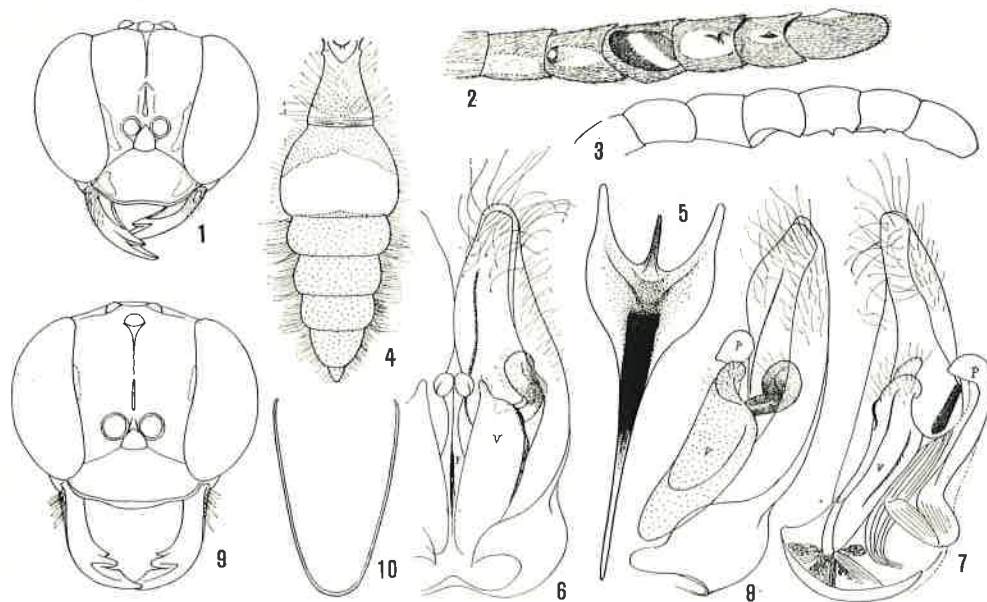
\* It denotes that it includes the detailed list of the references.

sternite 2 transparent reddish brown; articulations of legs ferruginous red, tibial spurs and tarsi of fore legs somewhat brownish. Wings strongly darkened, costa, subcosta and stigma black, remaining veins dark brown. Hairs on clypeus and supra-clypeal area sparse and white, mixing a few longer, slightly pale brownish ones, hairs on thorax and abdomen long, on frons, vertex, dorsal side of thorax, on propodeum wholly and on tergites 1 and 2 pale ferruginous, on sides of thorax greyish white, on tergites 3-6 black, but on 6 posteriorly somewhat brownish; sternites sparsely covered with pale brownish hairs, on posterior margin of sternites 3-5 hairs longer, stronger, turning into a distinct fringe.

Head seen from above with ocelli in a low isosceles triangle, anterior ocellus larger than the others, ocellar triangle almost completely enclosed by 3 comparatively broad furrows, each becomes somewhat shallower towards middle, OOD : POD = 10 : 9, Width of postocellus relatively 5, vertex in middle apparently roundly produced posteriorly, because of the sudden inclination of the lateral areas; head seen in front: Fig. 1, OAD : WAS : IAD\* = 4 : 7 : 6, supraantennal area in middle longitudinally broadly raised and longitudinally carinated on top, the carina clavately swollen at the lower end; between the bases of antennae supra-clypeal area distinctly margined by the fine impressed lines and longitudinally raised in a roof-shape, clypeus roundly elevated, with a lamellate brim at the anterior margin; mandibles as given in Fig. 1. Head seen in profile with occipital carina running parallel with the outer orbit, with temple half as wide as eye; antennae slender and long, joint 3 about 4 times as long as broad at apex, from joint 8 apically each joint more or less modified, each with a rounded excavation beneath, that of the 10th broadest and deepest, thereafter the hollow smaller and shallower, on joints 8 and 9 the excavated area glabrous and glossy and on 7 a weak glossy area also vaguely defined, from joint 10 apically the posterior margin of each hollow incrassate and turns into a glossy keel and on 11 and 12 these are topped by a distinct tooth (Figs. 2 and 3). Mesonotum medio-anteriorly with 2 considerably separated longitudinally impressed lines, attaining posteriorly a third of the scutum, on each side of which a further but shorter line present, somewhat farther separated from the median than between them; parategular areas obliquely raised, slightly broader posteriorly and semitransparent, anterior furrow of scutellum very coarsely foveolate, that of postscutellum more finely so, on mesopleuron dorso-posterior area roundly margined by a fine groove in front and the mesopleural scrobe is involved in the groove, epicnemial carina accompanied by a furrow, the carina at the lower end of mesopleuron turned posteriorly and suddenly terminated on the way, not extended towards mesocoxa, acetabular carina not present, metapleuron deeply excavated along the posterior line, the excavation at its lowermost part longitudinally enlarged, with a distinct carina on its lower edge, but the carina soon vanishes, without further extending forwards (usually in this genus the carina connected with the turned end of the epicnemial carina), the feature is very similar to that of *G. fulvohirtus*; mesosternum latero-anteriorly with a small rounded impression. Area dorsalis on propodeum distinctly margined by the crenate furrows and longitudinally coarsely and strongly striate, the striae reach almost the end of the area, sides of the segment with an obliquely running stigmal furrow. Abdomen: Fig. 4 (each segment seen vertically from above), segments 1 and 2 very similar in structure to those of *G. fulvohirtus*, but the following segments

\* OAD... oculo-antennal distance. WAS... width of antennal socket. IAD... interantennal distance.

more strongly roundly swollen (when curved ventrally the basal part of each segment is broadly exposed where the segment is more strongly constricted than in *fulvohirtus*); 8th sternite: Fig. 5; genitalia seen from beneath: Fig. 6 (left half omitted), seen from inside: Fig. 7 (left half), seen from outside: Fig. 8 (right half), the form of digitus and cuspis of the volsella well visible, paramere on both sides broadly membranaceous, penis: Figs. 6-8, p. Legs normal, fore tarsal joints 2-4 very short, venation also normal (in hind wing the cubital vein originated distinctly before the end of the anal cell).



Figs. 1-10. *Gorytes taiwanus* sp. nov. 1-8, ♂; 9-10, ♀.

1 and 9=Head seen in front. 2 and 3=Apical 6 joints of antenna (2, seen from beneath). 4=Abdomen (each segment seen vertically from above). 5=8th sternite. 6=Genitalia (left half omitted) seen from beneath. 7=Do. (left half) seen from inside. 8=Do (right half) seen from outside. 10=Pygidial area.

Vertex finely, sparsely punctured, shining, upper frons sparsely scattered with large rounded punctures, with intervals minutely, not closely duplipunctate, the micropunctules bearing hairs, supraantennal median area smooth and polished, supraclypeal area weakly punctured with medium-sized obsolete punctures, clypeus duplipunctate, with the micropunctules larger than those on frons and large punctures anteriorly much larger, but on anterior third punctures sparser and much sparser anteriorly, the lamellate margin without punctuation, polished. Mesonotum finely and sparsely punctured with hair-bearing points, punctures on mesopleuron slightly larger and sparser, propodeum outside area dorsalis including the sides of the segment sparsely, moderately grossly and deeply punctured, punctures on posterior wall medio-posteriorly grosser and closer. Abdomen sparsely covered with fine, but distinct hair-bearing punctules; sternite 2 more grossly and more sparsely punctured, sternites 3, 4 and 5 anteriorly very finely and delicately coriaceous, posteriorly finely punctured, mixing somewhat larger punctures, the punctures generally larger towards the sides, sternite 6 medio-

basally finely, closely, on remaining portions more largely and more sparsely punctured.

♀. Length 13.2 mm. Similar to ♂, but in colour clypeus wholly black, except pale brownish anterior margin, mandibles ferruginous red, apical 4th reddish black, with a yellow spot at base on outer side, labrum transparent and broadly margined with opaque yellow, inner orbital streaks shorter, defined only at the medial areas of the orbits (constant?), but similar short striae also present on upper outer orbits; on thorax paratergular spots and a transverse band across middle of scutellum added, a spot on mesopleuron distinct; tergites 1 and 2 coloured as in ♂, legs more broadly yellow maculated, fore femora beneath broadly yellowish, apices of coxae and trochanters also yellow, tibiae and tarsi similarly, but much more broadly yellow maculated. Hairing similar, but on upper frons more whitish and much closer.

Structure and punctuation also similar, ocellar disposition similar, head seen in front: Fig. 5, OAD:WAS:IAD similar, supraantennal median area not raised, a short distance above the base of antennae gently raised and shortly carinated on top, supraclypeal area subtriangular, shorter than in ♂, clypeo-antennal distance also smaller in length, mandibles tridentate as shown in Fig. 9; head in profile with occipital carina not parallel with the outer orbit, but with temple narrowed upwards and 3/4 as wide as eye. Antennal joint 3 more than 5 times (5.3 times) as long as wide at apex, penultimate joint 1.5 times as long as wide. Mesonotum and mesopleuron structured as in ♂. The form of abdomen also similar, pygidial area: Fig. 10; legs and wing venation as in ♂.

Punctuation also similar, but on upper frons finer punctures much closer, on clypeus gross punctures somewhat concentrated on the anterior part of the punctured area. Pygidial area fairly closely and grossly punctured, punctures longitudinally lengthened and frequently confluent with the following one, appearing punctate-rugoso-striate, especially on posterior portion.

Holotype: ♂, Nantou Pref. (Pempuchi), 26. VIII. 1968, K. Tsuneki leg.

Paratypes: 1 ♀ 1 ♂, the same place, 10, 11. VIII. 1968, K. Tsuneki leg.

#### 4. *Bembix taiwana* Bischoff, 1913

*Bembix taiwana*: Tsuneki\*, Etizenia, 31: 6, 1968 (12 ♀ 6 ♂).

Material: 2 ♀, Pingtung Pref. (Shatao, 18. VII.).

*Remarks.* In my previous paper I threw a doubt that the form designated as *B. taiwana kosemponis* by Strand (1923) might be a synonym of *B. niponica* Smith, the occurrence of which was formerly reported by Sonan. In my present revisional study when I have before me two specimens of *B. niponica* newly collected in Formosa (see below), I examined them in comparison with the description of *kosemponis* and found that they were different from each other and could confirm that *kosemponis* was certainly a form of *B. taiwana*. However, this variety is not a local race, but a mere variation, or judging from the simplification in the description of the original author, it may be practically an identical one, and is undeserved of a special nomination. Because the specimens at my hand from the southernmost (13 ♀ 1 ♂) and the central regions (15 ♂) of the Island belong in maculation all to the *kosemponis*-type. Further, the locality of my specimens from the southernmost region is near Taihanroku (the type locality), only 2 km south, and they are considered almost topotypical. Possibly the difference pointed out by Strand (die Stirn nicht einfarbig gelb, sondern gelb mit zwei schwarzen, subparallelen Längsstreifen) is due to the simplification in the original

description and of no significance whatever. At least it is certain that the specimens from the type locality belong all to his *kosemponis*-type.

#### 5. *Bembix formosana* Bischoff, 1913

*Bembix formosana*: Tsuneki\*, Etizenia, 31: 6, 1968 (12 ♀ 16 ♂).

Material: 8 ♀, Taitung Pref. (Taitung, 25, 27. VI.).

Remarks. This species could fairly abundantly be found at the sea-side of Taitung.

#### 6. *Bembix niponica* F. Smith, 1873

*Bembix niponica*: Sonan (partim), Trans. Nat. Hist. Soc. Formosa, 17 (93): 361, 363-366.

Material: 1 ♀, Hualien Pref. (Kuangfu, 24. VI.); 1 ♂, ditto (Yuili, 26. VI.).

Remarks. Sonan (1927) recorded for the first time the occurrence of this species in Formosa. According to his redescription in Japanese the external characters of the Formosan specimens he used well agree with those of the Japanese (topotypical) representatives, except that in the Formosan form the mesonotum often carries two yellow spots medio-posteriorly, although the maculation of this species is considerably varied (e. g. Yasumatsu, 1953).

The two specimens I could capture in the eastern side of the Island represented fortunately the different sexes of the species. According to my detailed comparison with the Japanese forms they respectively well agreed in characters including those of genitalia with the same sex of the Japanese examples, excepting a minor difference in maculation which was, however, referable to the intraspecific variation. The female of my specimen bears two spots on the mesonotum and in this respect also it is consistent with the Sonan's description. Thus it becomes certain that *B. niponica* occurs also in Formosa.

It seems an interesting problem whether this species is originated from the Oriental Region, or the Palaearctic Region, because it has been known that a geographical race of this species, *B. n. picticollis* F. Morawitz, a form having an orange coloured maculation, is widely distributed over the Asiatic Continent of the Palaearctic Region.

The male specimen of Formosa shows a distinct tendency to have an orange tone in the yellow coloration. In this respect it approaches ssp. *picticollis*, but not so much in degree as in the latter (in the male specimens in Japan the maculae are mostly pale greenish yellow in colour), while in the female the colour tone is very similar to that of the Japanese population.

#### 7. *Bembecinus hungaricus formosanus* (Sonan, 1928)

*Bembecinus hungaricus formosanus*: Tsuneki\*, Etizenia, 31: 6-12, 22, 23, 25, 1968 (269 ♀ 117 ♂).

*Bembecinus hungaricus formosanus*: Tsuneki, Etizenia, 37: 8-12, 1968 (biol.).

*Bembecinus hungaricus formosanus*: Iida, Ibid., p. 19 (larval description).

*Bembecinus hungaricus formosanus*: Haneda, Life Study, 15: 32, 1971 (4 ♀ 3 ♂).

Material newly collected: 90 ♀ 123 ♂. 21 ♀ 20 ♂, Pingtung Pref. (Kentin, Hengchun, Paoli, Checheng, Manchou, 8-21. VII.); 35 ♀ 32 ♂, Taitung Pref. (Taitung, Tulan, Chihpenchi, 27. VI. - 7. VII.); 8 ♀ 9 ♂, Chiai Pref. (Chuchi, 24-27. VII.); 11 ♀ 12 ♂, Hualien Pref. (Liyuchih, Kuangfu, Yuili, 22-26. VI.); 11 ♂, Nantou Pref. (Puli, 10-25. VIII.); 4 ♀ 27 ♂, Ilan Pref. (Tsukeng, Erchieh, 16-18. VI.); 11 ♀ 12 ♂, Taoyuan Pref. (Kuangyin, 13, 14. VI.).

*Remarks.* As to the status of *formosanus*, together with *japonicus*, there is a problem of which a discussion will be attempted in another paper.

#### 8. *Bembecinus pacificus* Tsuneki, 1968

*Bembecinus pacificus*: Tsuneki, Etizenia, 31: 17-19, 24, 25, 1968 (20 ♀ 28 ♂).

*Bembecinus pacificus*: Haneda, Life Study, 15: 32, 1971 (3 ♂).

Material: 16 ♀ 47 ♂, 11 ♀ 26 ♂, Pingtung Pref. (Kentin, Hengchun, Checheng, Manchou, 8-20. VII.); 1 ♂, Taitung Pref. (Chihpenchi, 30. VI.); 1 ♀, Tainan Pref. (Kuantsuling, 23. VII.); 1 ♀ 14 ♂, Nantou Pref. (Puli, 15-25. VIII.); 1 ♂, Ilan Pref. (Erchieh, 18. VI.); 3 ♀ 6 ♂, Taoyuan Pref. (Kuangyin, 14. VI.).

*Remarks.* Maculae on the ventral side of the abdomen in the males are usually 2-3 pairs, but in two specimens they were completely lacking.

#### 9. *Bembecinus nigriclypeus* (Sonan, 1928)

*Bembecinus nigriclypeus*: Tsuneki\*, Etizenia, 31: 12-15, 24, 25, 1968 (17 ♀ 8 ♂).

Material: 2 ♂, Nantou Pref. (Pempuchi, 10, 17. VIII.).

#### 10. *Bembecinus posterus* (Sonan, 1928)

*Bembecinus posterus*: Tsuneki\*, Etizenia, 31: 15-16, 23, 24, 1968 (10 ♀ 3 ♂).

*Bembecinus posterus*: Tsuneki, Etizenia 37: 12-13, 1969 (biol.).

*Bembecinus posterus*: Iida, Ibid., p. 18 (larval description).

Material: 7 ♀, Pingtung Pref. (Kentin Park, 9, 12, 20. VII.); 3 ♂♂, Nantou Pref. (Puli, 10, 17. VIII.).

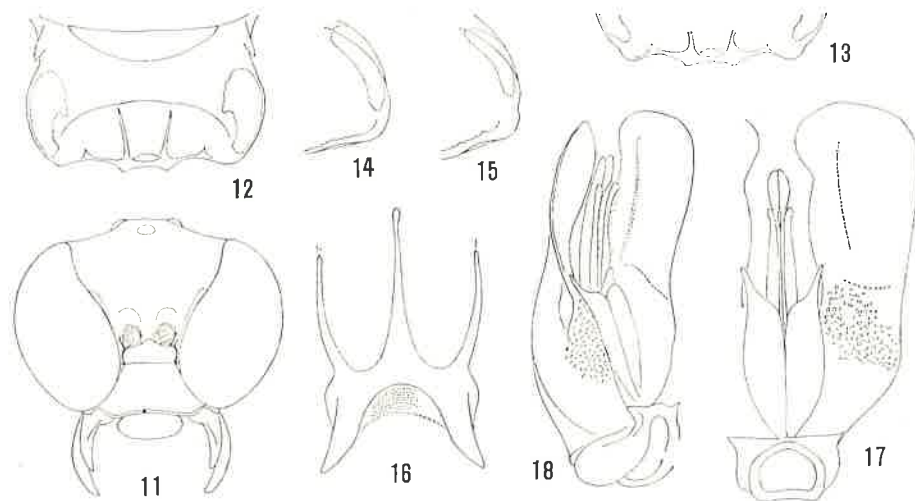
*Remarks.* In the brief explanation of this species in the determination table of the *Bembecinus* species (♂) of Formosa and the southern Ryukyus given on page 24 of Etizenia 31 the maculation of the abdomen was erroneously described: "... abdominal tergite 1, 2, 4 and 5 usually with a band, ..." should be corrected as "abdominal tergite 1 with two large lateral maculae, tergites 2, 4 and 5 usually with a band".

The male of this species is in appearance very close to the sympatric *pacificus* male. The following distinctions, however, are of use to separate it from *pacificus*: (1) Maculae on abdomen orange yellow, not lemon yellow, (2) clypeus and supraclpeal area relatively broader and shorter, (3) paramere broader and cuspis of volsella shorter.

In my previous paper the explanation of the male of this species was very incompletely given. On this occasion, therefore, I will try to reinterpret it in comparison with the closely resembling *B. pacificus*.

♂. Length 9.5-10.0 mm. Maculation on head similar (lemon yellow: palpi, labrum, clypeus except pale brownish narrow anterior lamellate margin, supraclpeal area wholly, a line along inner orbits, scape of antennae in front, flagellum beneath but apically brownish; rhinarial part of antennal joints 11 and 12 glossy ferruginous), but reddish part of mandibles more broadly extended; on thorax-complex also similar, but generally somewhat better developed (lemon yellow: a large transverse macula at the nape, a line on collar, humeral tubercles, a spot on tegulae, fairly large parategular spots, two medium to large maculae on scutellum, a large longitudinally lengthened macula on each side of propodeum occupying the posterior two thirds), lateral margins of propodeum at the yellow maculae turn into transparent edges which appear blackish seen from

above (in *pacificus* the maculae are usually very small and without such a transparent edge). On abdomen maculae orange yellow, on tergite 1 lateral maculae very large, approaching each other very close in the middle (in *pacificus* usually fairly remotely separated from each other), on tergite 2 fused into a moderately broad band and enlarged laterally (in *pacificus* usually with 2 maculae, only occasionally connected into a band), tergites 4 and 5 each with a band, somewhat broader than in *pacificus*, tergite 3 only rarely with two small spots, sternites 2, 3 or 2, 3, 4 with lateral maculae, the maculae posteriorly smaller. Colour and maculation of legs similar (yellow: coxae in front, two streaks or a streak and an apical spot on femora, tibiae and metatarsi both excepting posterior margin and remaining tarsi of fore and middle legs, a streak and a spot on tibiae and tarsi except joint 1 largely and joint 2 above of hind legs; ultimate joints above brownish).



Figs. 11-18. *Bembecinus posterus* (Sonan), ♂.

11=Head seen in front. 12=Propodeum. 13=Do., postero-lateral corners, with another form. 14 and 15=Propodeum seen from the side (corresponding respectively Fig. 12 and 13). 16=8th sternite. 17=Genitalia from beneath (left half omitted). 18=Do., seen obliquely from the side.

Head seen in front with outer margins of eyes much more roundly convergent below (Fig. 11) than in *pacificus*, with clypeus and supra-clypeal area relatively much broader, clypeal index of the newly collected specimens 1.27 (somewhat greater than in the previous specimens) and ocular index 2.5; clypeo-antennal distance less than as wide as antennal hollow (5.5 : 7.0), in *pacificus* ♂ nearly as wide as the latter, ocellar area medianly with a feeble impressed line or completely without such, if present not reaching the outside of the area, difference in length between antennal joints 3 and 4 slightly greater (1.30, in *pacificus* 1.22), but the structure of the 3 apical joints similar. Lateral margins of propodeum posteriorly very acutely and transparently edged (Fig. 12), postero-lateral incision lacking (Figs. 12 and 14) or very slight (Figs. 13 and 15) (in *pacificus* variable, usually not deep), 7th tergite with apical margin not bluntly pointed as in *pacificus*, but narrowly subtruncate, 8th sternite (Fig. 16) similar. As to



genitalia, paramere broader (Fig. 17) and thicker (Fig. 18) and cuspis of volsella shorter and dorso-ventrally broader (do.). Punctuation also similar.

Some of the male specimens dealt with here were collected in the valley of Penpuchi and in the river bed of Tahnan, not far from Penpuchi, and from Penpuchi a species most closely allied to *B. posterus* — *B. penpuchiensis* m. — was known, with its male remained undiscovered. In the female the chief difference between the species lies in the punctuation of tergite 6. In examining the male specimens, therefore, I paid a special attention to the fact and tried to find out any difference of characters which enabled me to divide them into 2 groups. All in vain. In the previous collection there was no couple captured at the same place and time. Strictly, therefore, it remains undetermined whether the males provisionally dealt with as *B. posterus* really belong to this species or they represent the other sex of *B. penpuchiensis*.

## ON TWO SPECIES OF THE SOUTHERN RYUKYUS

### 1. *Bembecinus bimaculatus* (Matsumura et Uchida, 1926)

*Stizus bimaculatus* Matsumura et Uchida, Ins. Matsumurana, 1 (1): 43, 1926 (♀, Ishigaki).

*Stizus bimaculatus*: Sonan, Trans. Nat. Hist. Soc. Formosa, 18 (97): 266, 1928 (cited).

*Stizus okinawanus* Sonan, Ibid., p. 265 (♂, Okinawa). (SYN. NOV.)

*Bembecinus tridens*: Tsuneki, Etizenia, 8: 14, 1965 (status presumed).

*Bembecinus tridens bimaculatus*: Tsuneki, Kontyu, 35: 388, 1967 (population of the Yaeyama Group).

*Bembecinus tridens okinawanus*: Tsuneki, Ibid., p. 388, 1965 (population of the Okinawa Group).

*Bembecinus ryukyuensis* Tsuneki, Etizenia, 31: 21, 24, 25, 1968. (SYN. NOV.)

*Bembecinus okinawanus*: Tsuneki, Ibid., p. 22, 25, 1968.

Mr. T. Tano, Fukui, in his recent collecting journey to the Yaeyama Group of the Ryukyus brought back, among others, a number of the specimens of the *Bembecinus*-species and kindly placed them at my disposal. The investigation of these abundant material which showed a marked variation in maculation brought to light the true status of the Ryukyu populations of the genus and served to readjust their taxonomic confusion. The result of the study made it possible to give the above listed synonymy. In the following some comments will be given regarding their local as well as the absolute variations:

Table 1. Ratio of length to width at the apex of antennal joints 3-7 in *Bembecinus bimaculatus* and *B. tridens*.

Antenn. joint	<i>B. bimaculatus</i>		<i>B. tridens</i>	
	♀	♂	♀	♂
3	2.7	2.5	2.2	2.0
4	2.3	2.0	1.5	1.5
5	1.8	1.5	1.2	1.2
6	1.5	1.3	1.0	1.0
7	1.2	1.1	0.8	0.8

As for *Stizus bimaculatus* and *S. okinawanus*, only the colour patterns were given in their original descriptions and their true status long remained doubtful. In my study in 1967 basing on the small collection of Japan-U.S. C.S.P., I found them to have the non-petiolated and quadrangular 2nd cubital cell of the fore wing and dealt with them

as respectively a local race of *B. tridens*. In connection with my recent study on the Formosan representatives of the genus I revised the Ryukyu specimens and confirmed that they were different from the European *B. tridens* and gave them a new name, *B. ryukyuensis*. This was, however, a distinct mistake. They had to be called *B. bimaculatus* (Mats. et Uch.).

In the present investigation I found that *B. okinawanus* was only a colour form of *B. bimaculatus*. First I will give the characters of this species in connection with the closely allied relatives.

This species belongs no doubt to the group of *B. tridens* (s. Beaumont, 1954). The 2nd cubital cell of fore wing not petiolated, always with a more or less space between insertions of the transverse cubital veins on the radial vein. As for the structure of the fore metatarsus, the propodeal

incisions, the male genitalia and the relative length of the supraclypeal area detailed explanations were already given (Tsuneki, 1968). Maculation markedly variable as given below, but as for the clypeus it is, as a rule, black in the female and yellow in the male.

This species differs from *tridens* in that (1) flagellar joints of antennae at the basal portion distinctly longer (♀♂, Table 1: ratio of length to width at apex), (2) clypeus almost always relatively longer (♂, clypeal index 0.95, see Table 2, in *tridens* 1.15), (3) generally speaking, the abdominal maculation tends to be more reduced and the clypeus tends to be more brightly maculated than in *tridens*.

*B. bimaculatus* is, in some cases, very similar in maculation to *B. posterus* or *B. pacificus*, differs from either of them in the relative length of the flagellar joints of antennae, for instance antennal joint 4 in the species mentioned:

In *B. bimaculatus*: ♂, just or very slightly more than twice as long as wide at apex. ♀, always distinctly more than twice as long as wide at apex.

In *B. pacificus*: ♂, slightly less than twice as long as wide at apex. ♀, almost just twice as long as wide at apex.

In *B. posterus*: ♂, distinctly less than twice as long as wide at apex. ♀, slightly less than or just twice as long as wide at apex.

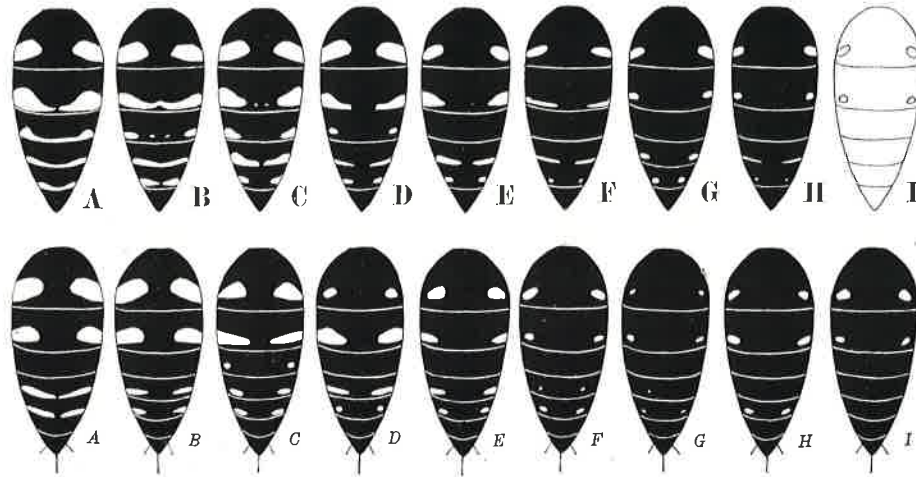
Besides the above, in *B. posterus* the clypeo-antennal space in ♀ about half the width of the antennal hollow and in ♂ distinctly less than the width of the latter.

On the other hand, *B. bimaculatus* resembles in appearance to *B. insularis* Handlirsch occurring in the southern regions of East Asia, differs from it, however, in that the ocular index much larger (in ♀ 2.2 or so and in ♂ 2.8-2.9) and the male has the yellow clypeus.

Table 2. Relative length of clypeus to minimum interocular distance.

Is.	LC	IOD	IOD/LC
Ishigaki	17	16.5	0.97
	19	17	0.89
	18	17	0.94
	18.5	17.7	0.96
	18	17	0.94
	17	15.5	0.91
	19	18.5	0.97
	18	18.5	1.03
	20	19	0.95
	16	17	1.06
	180.5	173.7	0.96
Iriomote	16.5	16	0.97
	18.5	18	0.97
	17.7	16.5	0.93
	17	16.5	0.97
	18.5	17	0.94
	19	16.5	0.87
	17.7	15.5	0.88
	18	17	0.94
	16	15.3	0.97
19	17	0.86	
	177.2	165.3	0.93
Total average.....			0.948
Range.....			(0.87-1.06)

As for the median impunctate line on tergite 6 in ♀ it is in most specimens defined, but its width and length are considerably varied and in some case the surface almost uniformly punctate and as for the median carina on sternite 7 in ♂ it is in most specimens unobservable, sometimes, however, under oblique light it becomes fairly distinct and when the sternite is long extended a short median carinate elevation comes usually to be observable at the base. The median impressed line on the ocellar area is always well defined in both sexes.



Figs. 19. Variation in maculation of the abdomen (A-H, ♀, I is practically lacking; A-I, ♂).

Table 3. Correlation between the maculae of abdomen and clypeus, and of abdomen and scutellum-propodeum (♀).

Macul. type	Ishigaki										Iriomote										S. total
	A	B	C	D	E	F	G	H	I	Total	A	B	C	D	E	F	G	H	I	Total	
Abdomen																					
Clypeus																					
A-H	2	2	1				1	2		8	6	2	3	3	3		1			18	26
I-J	6	5		4		2				17	4	1		2	3					10	27
K		3		1	1	3				8	1	4	2	2	1					10	18
N			1	3		2				6	1	1	1	4						7	13
Sc. Pr.																					
b b	7	10	1	8		4				30	7	3	4	2	3					19	49
b m	1				1	1	1			4	3		2	4	3					12	16
m b				1						1										0	1
m m						1				1	1	3		2	1					7	8
b s						1				1		1			2					3	4
s s								1		1					1					1	2
n m									1	0		1				1				1	1
n s										1					1					1	2
n n										0								1		1	1
Total	8	10	1	9	1	7	1	2	0	39	0	11	8	6	8	11	0	1	0	45	84

Remarks. As to the maculation type see Figs. 19, 20 and 21.

Abbreviation: Sc=Scutellum. Pr.=Pronotum. b=big, m=middle, s=small, n=none. A-N...see Fig. 20.

Table 4. Correlation between the maculae of abdomen and clypeus, and of abdomen and scutellum-propodeum (♂).

Macul. type	Ishigaki									Iriomote									S. total		
	A	B	C	D	E	F	G	H	I	Total	A	B	C	D	E	F	G	H		I	Total
Abdom.																					
Clypeus																					
A	4	20	1	8	6	1				40	13	12	9	6	1	2	2			45	85
B										0			1	1	2			1		5	5
C				1	1					2			1							1	3
D										0								1		1	1
E				1						1										0	1
F					1					1		1								1	2
G						1				1										0	1
H										0								1		1	1
Sc. Pr.																					
b n																					0
m m																					2
m s																					1
s b																					3
s m	1	4			2	1				6											3
s s	1	1				1				3	1	1	1							3	6
n m	2	8			2	2				14	1	2	2	2						7	21
n s		5			5	4				15	8	8	5	3	1	1	1			27	42
n n			1	1						1			3	2	3		2	3		13	14
Total	4	20	1	10	9	1	0	0	0	45	13	0	15	10	8	1	3	4		54	99

Explanation: The same as Table 3. A-H... see Fig. 21.

Variation in maculation

- (1) Of the abdomen: Fig. 19, A-H, ♀, I is not met with; A-I, ♂.
- (2) Of the clypeus, labrum and supraclypeal area in ♀: Fig. 20, A-K and N; in ♂: Fig. 21, A-H.

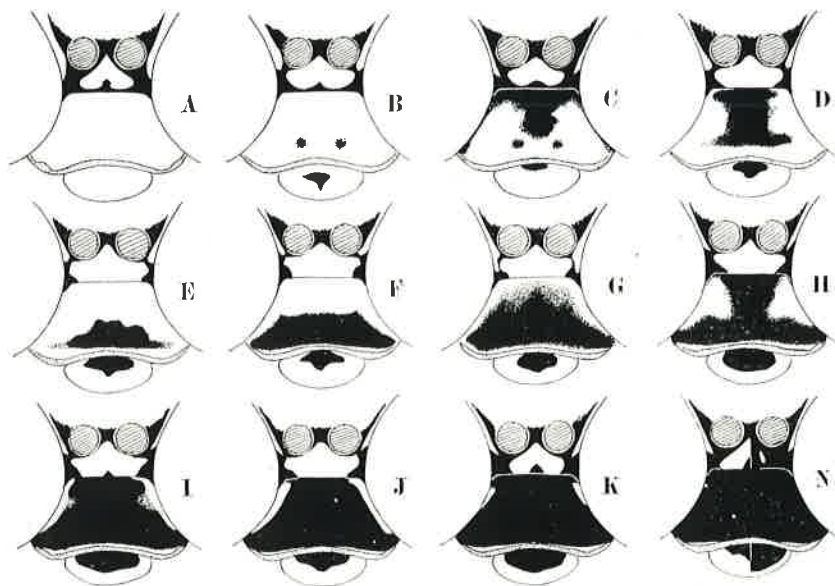


Fig. 20. Variation in maculation of the clypeus, labrum and supraclypeal area in ♀.

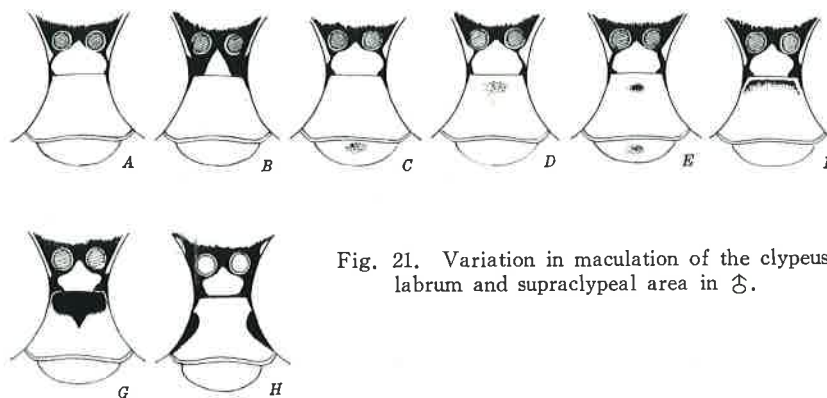


Fig. 21. Variation in maculation of the clypeus, labrum and supraclypeal area in ♂.

(3) Correlative relation was examined between (i) the maculae on clypeus and labrum and on abdomen, and (ii) the maculae on scutellum and propodeum and on abdomen separately with the sexes and with the localities — the Island of Ishigaki and of Iriomote (Tables 3 and 4). As a direct or indirect result the following facts were made clear:

(a) *Correlation between the maculae on different parts of the body.* Almost no correlation is present, maculae on each part of the body vary indendently of those of another. Only in the males of the Iriomote a feeble tendency is observed between the maculae of the abdomen and of the scutellum and propodeum (Table 4). However, with respect to the abdomen a certain correlative development is perceived between

Table 5. Correlation of maculation (♀).

Cly.	Scut.	Prop.	Abd.	Loc.
A	s	s	F	S
B	b	m	B	S
C	n	s	G	S
D	b	b	C	S
E	b	m	C	R
F	b	b	B	R
F	b	b	A	R
F	b	b	B	R
G	b	b	A	S
G	b	m	B	R
G	m	s	E	R
H	m	m	B	R
H	b	b	A	R
N	n	s	G	R
N	b	b	C	S
N	m	m	E	R
N	b	b	E	S
N	b	m	F	R
N	s	s	E	R
N	b	s	E	R
N	m	m	E	S
N	n	m	D	R

As to the types of maculation see Table 3. Cly. = Clypeus. Scut. = Scutellum. Prop. = Propodeum. Abd. = Abdomen. Loc. = Locality. S = Ishigaki. R = Iriomote.

the maculae of each segment. Similarly so between the maculae of the clypeus and of the supraclypeal area, but always with more or less exceptions.

(b) *Abdominal maculation.* In both sexes the maculation of types A and A is restricted to the specimens of the Ishigaki and that of type I is to the males of the Iriomote. This type is just the maculation of *B. okinawanus* which also has ever been known in the male specimens only. It seems perceivable that as a general tendency the maculae in the specimens of the Iriomote are somewhat less developed than in those of the Ishigaki. The occurrence of type I in the Iriomote males is an instance of this general tendency. Similarly the tendency towards the appearance of the maculae on the 3rd abdominal segment is commoner in the Ishigaki specimens than in the other. As a whole the abdominal maculation is mainly distributed within the range

from type A or A to type F or F and types G-I or G-I are considered rather exception.

Table 6. Ocular index and clypeal index.

Loc.	Female					Male				
	V	C	L	V/C	C/L	V	C	L	V/C	C/L
Ishigaki	58.5	26	20	2.25	1.30	54	20	21	2.70	0.95
	60	28	22	2.14	1.27	49	19.5	19.5	2.51	1.00
	55	25	19.5	2.20	1.28	51	18	20.5	2.83	0.88
	54	24	19.5	2.25	1.23	50	19	19	2.63	1.00
	55	26.5	18	2.08	1.47	45	17	17	2.65	1.00
Aver.				2.18	1.31				2.67	0.96
Iriomote	55	25	20	2.20	1.25	47	17	17	2.76	1.00
	56	26	20	2.15	1.30	44	14.5	16	3.03	0.91
	54	25.5	18	2.12	1.44	47	16	17	2.94	0.94
	51.5	23.5	18	2.17	1.30	48	18	18	2.67	1.00
	54	25	18	2.16	1.39	49	17.5	18	2.80	0.97
Aver.				2.16	1.33				2.83	0.97
Total average				2.17	1.32				2.74	0.96

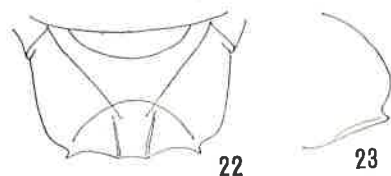
V=IOD at anterior margin of postocelli. C=IOD at base of clypeus.

L=Length of clypeus in middle.

(c) *Maculae on the clypeus.* The maculation of the clypeus, the supraclypeal area and the labrum is also independently varied of each other. Generally speaking, in this species the female has the black clypeus and the male the yellow. Rarely, however, the wholly yellow clypeus and labrum are observed also in the female and the general tendency towards the albinism in this sex is fairly marked (Table 3 and Fig. 20). It seems worthy of special mention that the tendency is more striking in the Iriomote specimens than in the Ishigaki (Table 3). The commonest in the female, however, are types I and J, but occasionally the wholly black clypeus is also observed and the intermediate state towards this — type K — is not always rare (Table 3). In the specimens having the wholly black clypeus the yellow mark on the supraclypeal area is usually not well developed and in some case it completely vanishes. If these intermediate specimens are lacking and the two extreme ones only are examined they may be dealt with as separate species, as was the case of *B. okinawanus*.

Table 7. Ocular and clypeal indices of the specimens with clypeus of types A-H and of type N (♀).

With types A-H					With type N				
V	C	L	V/C	C/L	V	C	L	V/C	C/L
58.5	26	20	2.25	1.30	54	24	19.5	2.25	1.23
55	26.5	18	2.08	1.47	55	25	19.5	2.20	1.28
54	25	18	2.16	1.39	51.5	23.5	18	2.17	1.30
54	25.5	18	2.12	1.42	51	22.5	18	2.27	1.25
56	27	21	2.07	1.29	45	20	15.5	2.25	1.29
45	22	15	2.04	1.47	52	23.7	18	2.19	1.32
49.5	23	18.5	2.15	1.24	54	24	19	2.25	1.26
56	27	20.5	2.07	1.32	55.5	25	20.2	2.26	1.24
55	26	19.5	2.12	1.23	52.5	24	19	2.18	1.26
56	26.5	21	2.11	1.26	49	22	18	2.23	1.22
Average			2.12	1.34				2.23	1.26



Figs. 22-23. *Bembecinus tanoi* sp. nov., ♀.  
22 = Propodeum. 23 = Ditto seen from the side.

On the other hand, the variation in the male is comparatively less in extent as well as in frequency. At the moment of my description of *B. ryukyuensis* I could examine a single male specimen alone and it has a black mark at the base of the clypeus. I thought it a specific character and used it in the key. Through the present investigation it was made clear that such was a very rare exceptional type in the maculation of the male of this species.

(d) *Maculae on the scutellum and the propodeum.* The maculae on the two parts vary also independently of each other (Tables 3 and 4). In the female, however, the well-developed maculae on both parts are the rule (Table 3). Sometimes, however, there are specimens having the two parts poorly maculated or completely immaculated, and the intermediate states towards such are gradually discovered in the specimens. (Tables 3 and 4). In general, the individuals having the less developed maculae on both parts are more abundant in the Iriomote specimens than in the Ishigaki's. In the male the maculae on the two parts are far less developed than in the female and the specimens having the two parts wholly or partly immaculated are considerably frequent, especially in those of the Island of Iriomote.

(e) *The marking on the nape region and the band on collar.* Both are comparatively better developed in the female than in the male. The band on the posterior margin of the pronotum is usually attenuated in the middle and sometimes completely interrupted. In the male the band is narrower, especially in those of the Iriomote and frequently it is much abbreviated and rarely completely disappeared.

The humeral tubercles and parategulae are yellow maculated and their development is also considerably variable.

(f) *Maculae of the specimens (♀) having (i) the brightly maculated and (ii) the wholly black clypeus:* Table 5.

#### Ocular and clypeal indices

Both the indices were measured using 5 females and males from the two Islands. The result was given in Table 6. There was no significant difference between the populations of the two Islands. It appeared that in the female specimens having the wholly black clypeus the clypeus was longer and narrower than in those with the brightly maculated clypeus. I therefore examined it with ten specimens respectively. In the black type it was 1.26 (range 1.22-1.32) and in the light type 1.34 (range 1.23-1.47). There was certainly a tendency towards such, but it was very slight. The same was also the case with respect to the ocular index (Table 7).

#### 2. *Bembecinus tanoi* sp. nov.

This species (based on ♀ only) belongs to the group of *B. tridens* and is very close to this species. It is, however, much smaller in body size, more poorly maculated on the thorax and abdomen, antennal joints 4-7 relatively longer and with the 6th tergite medianly on apical half almost impunctate. In maculation of the thorax and

abdomen it fairly resembles the *okinawanus*-type of *B. bimaculatus*, differs from it, however, in the relative length of the antennal joints, in the punctuation of the 6th tergite and in the lack of maculae on the 1st tergite.

♀. Length 6.3 mm. Black. Yellow are labrum wholly, scape of antennae in front, posterior half of humeral tubercles, a minute spot on axillae, a small somewhat darkened spot on each side of scutellum, two lateral marks (approximately as large as wing tegula) on 2nd tergite of abdomen, fore tibiae in front, a spot towards middle of hind tibiae. Palpi, mouth parts, flagellum beneath, joints 3 and 4 in front and ultimate joint wholly of fore tarsi ferruginous; mid and hind tarsi apically more or less brownish. Two small very faint yellowish maculae on supraclypeal area defined. Clypeus, pronotum and propodeum wholly black, abdomen except the two maculae completely black. Wings hyaline, veins brown, those on anterior portion much darker. Pilosity as usual.

OOD : POD = 10 : 9, postocellus relatively 3, ocellar area with a weak median impressed line, head seen in front with OAD < CAD (clypeo-antennal distance), CAD greater than half the width of antennal socket, ocular index 2.20; clypeal index 1.78, antennal joints 3, 4, 5 and 6 only very slightly and gradually reducing in length apically, these joints, seen from above, approximately 2.2 times, 2 times, 1.7 times and 1.4 times as long as wide at apex respectively; propodeum in form as given in Fig. 22, in lateral view: Fig. 23, with lateral incisions moderately deep. Abdomen comparatively slender, sternite 6 bluntly carinated in middle.

Punctuation as usual, area dorsalis at base with a very narrow impunctate area, slightly broadened in middle, punctures on dorsal side of abdomen appear somewhat coarser and sparser than in *B. tridens*, tergite 6 medianly on apical half with a narrow impunctate area, it was coarsely punctate towards the base, sternite 6 also medianly broadly impunctate and laterally with sparse, large, rounded, hair-bearing punctures.

♂, unknown.

Holotype: ♀, Sonai, the Island of Iriomote, the southern Ryukyus, 25. VII. 1969, T. Tano leg. (in the author's coll.).

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