

NOTES ON EPEOLUS
(HYMENOPTERA ACULEATA, APIDAE)

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A. THE *Epeolus tarsalis* GROUP

In this paper special attention has been given to the forms of *Epeolus* Latr. which belong to the *sibiricus*-group of Bischoff (1930), then consisting of the species *sibiricus* Rad., *tarsalis* Mor. and *praenustus* Pér.

BISCHOFF was the first to draw attention to the peculiar shape of the frontal area in this group. The longitudinal carina between the eyes is enlarged laterally and these enlargements partly cover the insertions of the antennae. He also remarked that the only male he then knew — a *tarsalis* Mor. from Sarepta — had no long hairs just before the margin of the last sternites.

PITTIONI (1945) called this "die Gruppe des *Epeolus tarsalis* Mor." and as *tarsalis* was described fourteen years earlier than *sibiricus* his term seems to be more correct.

Since the discovery of *Epeolus rozenburgensis* in Holland in 1948 no further material of the *tarsalis* group seems to have been collected in other parts of western Europe. The specimens of this group are still very scarce and the fact that of some forms only one sex is known so far, does not facilitate comparative studies. In his interesting paper PITTIONI (1945) described what he considered to be the male of *praenustus* Pérez and the female of *tarsalis* Mor. Unfortunately he had not had the opportunity to examine the type of *praenustus*, but based his description of *praenustus* on a female from Tyrol which FRIESE (1895) had compared with the type and declared to be similar. However, this Tyrol specimen is much finer and much more sparsely punctured than the type from the Pyrenees. During the IXth International Congress for Entomology of Amsterdam Dr. BERLAND of the Paris Museum had the kindness to show me the only female *praenustus* left in the collection of PÉREZ. At that time I had already returned the specimens of the Vienna Museum, and therefore could not compare them with those, but I was able to ascertain that the puncturation of the type was only slightly less close than that of *rozenburgensis*. I am indebted to Dr. AUBER, who is the present curator of the Paris collections of Hymenoptera, for recently making for me a drawing of the puncturation of the temples of the type of *praenustus*. This drawing confirmed my opinion that the specimens from Tyrol — male as well as female — represent a form which is clearly different from the type of PÉREZ from the Pyrenees.

Through intermediary of Mr. Y. HIRASHIMA, Fukuoka (Japan), Prof. K. TSUNEKI, Fukui (Japan), and of Mr. P. M. F. VERHOEFF, Den Dolder (Nether-

lands), I have now been able to study some very interesting specimens of the *tarsalis* group, originating from East Asia and Southeast Europe, which may throw some light on the relationship of the various forms.

A male from Japan, which Prof. TSUNEKI sent me, has a frontal area which is only slightly different from that of the other forms of the *tarsalis* group, but it differs in some other very important respects. Firstly there are long, backward curved hairs on the fourth and fifth sternites. Secondly the genital apparatus is different from that of the other forms, the appendices of the aedeagus being much shorter. A female from Japan, which does not originate from exactly the same locality but which undoubtedly belongs to the same species, has an almost complete white band on the anterior edge of the first tergite.

So this is a form which in view of the shape of the frontal area must be allied to the other species of this group but which shows yet some important differences. From the key just published by HIRASHIMA (1955) it appears that this bee must be identical with *melectiformis* Yasumatsu, which was confirmed by the examination of a couple which Mr. HIRASHIMA was so kind to send to me.

The other forms of the group which we knew so far, are difficult to distinguish. As is evident from the analytical tables the material from each locality shows only slight differences as compared with that from other localities.

I have to thank Dr. M. BEIER of the Vienna Museum for kindly sending me for examination all the specimens of the *tarsalis* group which are in the collections of that Museum and which have been studied previously by PITTIONI (1945). I had already seen part of this material in 1948.

PITTIONI (1945, p. 146) remarked that the *tarsalis* group could be considered either as a subgenus or as a species divided into subspecies. After the study of *melectiformis*, which is a distinctly separate species, there is now more reason, on comparative taxonomical grounds, to suppose that all or nearly all of these very closely related forms (*tarsalis*, *praustus* and *rozenburgensis*) are subspecies (geographical races) only of *tarsalis*. The latter was described by MORAWITZ in 1873 and originates from Derbent in Transcaucasia. Presumably even *sibiricus* is not more than a subspecies of *tarsalis*. However, with the very scarce material which we have at our disposal at the present moment it is not yet possible to say definitely whether the forms of PITTIONI's *tarsalis* group are reproductively isolated or not. For a long time I have therefore been hesitating to sink *praustus* and *rozenburgensis* to the subspecific rank. Finally, for practical reasons, I have considered it advisable not to wait until we know more about their reproductive isolation, if any, and their distribution, but to re-arrange the forms which we now know as follows.

Epeolus sibiricus Rad.

Ep. sibiricus Radoszkowski 1887, Hor. soc. ent. Ross., vol. 21, p. 295 (♂ ♀).

Ep. sibiricus Bischoff 1930, Deutsche Ent. Zeitschr., Heft 1, p. 5 (♀).

Ep. sibiricus Pittioni 1945, Zeitschr. Wiener Ent. Ges., vol. 30, p. 132 (♂ ♀).

I have not seen this species. According to BISCHOFF it is distinguishable by the extension of the red colour of the thorax and the reduction of the white markings

TABLE I. Analytical table of *tarsalis* group (males)

Males	locality	punctuation of					colour of hairs on the basis of fifth sternite
		temples	front between oculi and ocelli	foreside of posterior femora	second sternite	tegulae	
<i>tarsalis</i> subsp.	Middle Korea	very close	close	very close	close	coarse and close	golden
<i>tarsalis tarsalis</i> Mor.	Derbent (Transcaucasia)	close	close	close	less close	somewhat finer	?
<i>tarsalis rozenburgensis</i> van Lith	Hook of Holland (Netherlands)	close	close	close	close	coarse and close	brown
<i>tarsalis</i> subsp.	Mt. Yufu (Japan)	fairly widespread	close	close	finer, somewhat less close, margin fine	coarse	light golden
<i>tarsalis</i> subsp.	Northern Mongolia	fairly widespread	close	fairly widespread	idem	coarse and close	golden
<i>tarsalis</i> subsp.	Weiden (Austria)	fairly widespread	?	fairly widespread	somewhat less close		golden
<i>tarsalis tirolensis</i> sp. nov. (<i>praestus</i> det. Pittioni)	Tyrol	widespread	less close	more widespread	somewhat more widespread margin fine, laterally close	less close more shining	golden

Females	locality	puncturation of				white markings on the margin of the fourth tergite	colour of scutellum and axillae
		temples	front between oculi and ocelli	foreside of posterior femora	second sternite		
<i>tarsalis</i> subsp. (<i>praenitens</i> det. Zavadii)	Hovorany (Moravia Mer.)	very close	close	fairly close and coarse	fairly widespread margin finer and more close	four, the outer spots very vague	black
<i>tarsalis rozenburgensis</i> van Lith	Hook of Holland (Netherlands)	very close	close	somewhat closer than in Moravian female	fairly close margin finer	two	scutellum entirely or nearly entirely red axillae mostly black, rarely entirely red
<i>tarsalis praenitens</i> Pér.	Pyrenees (France)	close	fairly close	somewhat less close than <i>rozenburgensis</i>	not visible	four, the outer spots small ("parfois oblitérées" according to Pérez)	only tubercles of scutellum reddish
<i>tarsalis</i> subsp.	Northern Mongolia	close	close	widespread	widespread and fine, margin very fine	two	scutellum and axillae orange-red
<i>tarsalis</i> subsp.	Bisamberg near Vienna (Austria)	less close than previous female	close	widespread	somewhat less widespread than previous female	four, the outer spots small	only tubercles of scutellum red
<i>tarsalis tirolensis</i> ssp. nov. (<i>praenitens</i> det. Pittioni)	Tyrol	very widespread	widespread	very widespread	widespread and fine margin very fine	four, the outer spots small	almost entirely black

on the abdomen. The puncturation on the foreside of the posterior femora is coarse and close.

The types originate from Wladiwostok. The identity of the host has not yet been established with certainty, but PITTIONI supposes this to be *Colletes collaris* Dours — or a closely related form — which has also been taken at Wladiwostok.

Epeolus tarsalis tarsalis Mor.

Ep. tarsalis Morawitz 1873, Hor. soc. ent. Ross., vol. 10, p. 182 (♂, Derbent).

Ep. tarsalis Friese 1895, Die Bienen Europas I, p. 190 (♂ partim).

Ep. tarsalis Bischoff 1930, Deutsche Ent. Zeitschr., Heft 1, p. 6 (♂, Sarepta).

Ep. tarsalis Pittioni 1945, Zeitschr. Wiener Ent. Ges., vol. 30, p. 133 (partim).

A male from Derbent (Transcaucasia) in the Vienna Museum is labelled "*Epeolus tarsalis* ♂ F. Moraw. var." in the same handwriting as the locality label. The puncturation of the temples, front and foreside of the posterior femora is close, like that of *rozenburgensis* from Holland. The puncturation of the second sternite is somewhat less close than in *rozenburgensis*, also on the margin. The puncturation of the tegulae is somewhat finer than in the other forms of this group.

A male from Middle Korea (Shoyo-Zan, 10.IX.1943) is still more closely punctured on the temples and on the foreside of the posterior femora and also on the second sternite and the margin thereof. The yellowish-grey pubescence of the head and thorax seems to be somewhat more dense than in the other forms. The long hairs on the basis of the last sternites are golden.

A male from Japan (Mt. Yufu, Aso-Kyushu, 2.X.1932), leg. K. TSUNEKI, differs from the preceding two males in having a fairly widespread puncturation of the temples. The last sternites (4, 5 and 6), especially the margins thereof, are yellowish and the long hairs on the basis of the sixth sternite are very light golden. The puncturation of the tegulae is as coarse as in *rozenburgensis*, with shining interstices on the anterior half.

I wonder whether this is the male which HIRASHIMA has described as *bimukanus* (1950, p. 40). As HIRASHIMA's male has no apical fringes of curved hairs on the sternites it is very likely that his species is indeed a subspecies of *tarsalis* Mor.

BISCHOFF (1930) records a male from Sarepta with large and shining interstices on the foreside of the posterior femora (as compared with *sibiricus*). Perhaps this is also a separate subspecies.

Epeolus tarsalis subsp.

A female from Moravia (Moravia Mer., Hovorany, 5.IX.1941, leg. ZAVADIL, coll. VERHOEFF) has an entirely black scutellum. There is a broadly interrupted white line on part of the margin of the fourth tergite and a very vague spot on each side thereof. This might be the opposite sex of the *tarsalis tarsalis* Morawitz. It will be better, however, to defer a definite conclusion until we have more material from this locality.



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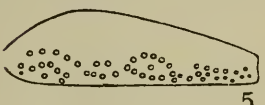
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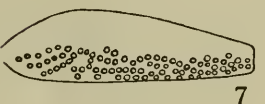
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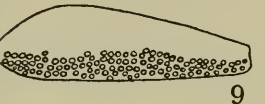
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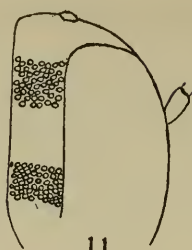
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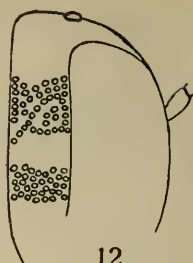
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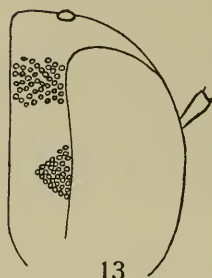
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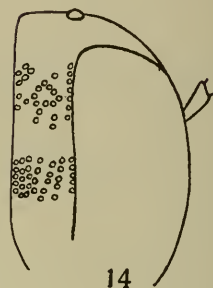
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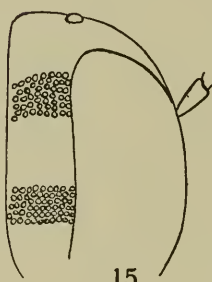
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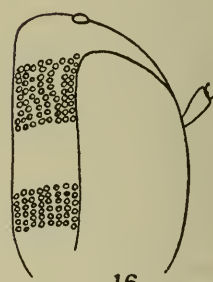
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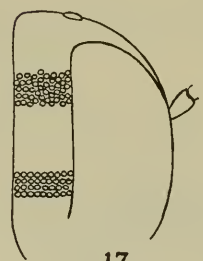
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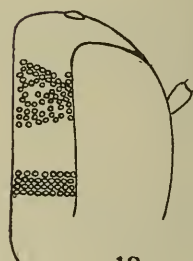
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Epeolus tarsalis praeustus Pérez

Ep. praeustus Pérez, 1883, Act. soc. Linn. Bord., vol. 37, p. 324 (♀ Eaux-Bonnes, Pyrenees).

Ep. praeustus Friese, 1895, Die Bienen Europas I, p. 194 (♀, partim).

Ep. praeustus Pittioni, 1945, Zeitschr. Wiener Ent. Ges., vol. 30, p. 138 (partim).

Of the three females taken at Eaux-Bonnes only one female is left in the Paris Museum. This is more closely punctured on the foreside of the posterior femora than *tirolensis* and the *tarsalis* subsp. from Mongolia and Austria. The puncturation is somewhat less close, however, than in *rozenburgensis* and resembles that of the female from Moravia. The tubercles of the scutellum are somewhat reddish. There are four white markings on the fourth tergite. The puncturation of the temples is somewhat less close than in the Moravian female.

The host is *Colletes frigidus* Pérez.

Epeolus tarsalis rozenburgensis van Lith

Ep. rozenburgensis van Lith, 1949, Tijdschr. Entom., vol. 91, p. 105.

The female is different from the other females which have closely punctured femora in having only two white spots on the fourth tergite. The scutellum is entirely or nearly entirely red whilst the axillae are black or partly black and only seldom entirely red. The puncturation of the second sternite is more close than in the other forms.

The male of *rozenburgensis* is the only male I know sofar which has the long hairs on the basis of the last sternites dark brown. In the other males — in the *tarsalis tarsalis* from Derbent they are not visible — these hairs are golden. The tegulae are more coarsely punctured than in the *tarsalis tarsalis* from Derbent.

All specimens have been taken at Hook of Holland in August-September during the years 1948-1952 in or near a colony of *Colletes succincta halophila* Verhoeff.

Epeolus tarsalis subsp.

Ep. tarsalis Friese 1895, Die Bienen Europas I, p. 190 (♂).

Ep. tarsalis Pittioni 1945, Zeitschr. Wiener Ent. Ges., vol. 30, p. 133 (partim).

The couple from Northern Mongolia and perhaps also the males from Weiden (Neusiedlersee, Austria) and the female from Bisamberg (near Vienna, Austria)

Figs. 1—10. Puncturation of the lower half of the foreside of the posterior femora; rest of the puncturation omitted. 1, *Epeolus tarsalis* subsp., ♀, Northern Mongolia. 2, idem, ♂. 3, *Epeolus tarsalis rozenburgensis* van Lith, ♀, Holland ("De Beer", Rozenburg). 4, idem, ♂. 5, *Epeolus tarsalis tirolensis* subsp., nov., ♀, Tyrol. 6, idem, ♂. 7, *Epeolus tarsalis* subsp., ♀, Moravia (Hovorany). 8, *Epeolus tarsalis tarsalis* Mor., ♂, Transcaucasia (Derbent). 9, *Epeolus tarsalis* subsp., ♂, Middle Korea. 10, *Epeolus tarsalis* subsp., ♂, Japan. Figs. 11—18. Puncturation on two places behind the eyes of: 11, *Epeolus tarsalis rozenburgensis* van Lith (♂ and ♀) and *Epeolus tarsalis tarsalis* Mor. ♂. 12, *Epeolus tarsalis tirolensis* subsp. nov., ♂. 13, *Epeolus tarsalis* subsp., ♂ and ♀, Northern Mongolia. 14, *Epeolus tarsalis tirolensis* subsp. nov., ♀. 15, *Epeolus tarsalis* subsp., ♀, Moravia. 16, *Epeolus tarsalis praeustus* Pérez, ♀, Pyrenees (copied from a drawing received from AUBER). 17, *Epeolus tarsalis* subsp., ♂, Middle Korea. 18, *Epeolus tarsalis* subsp., ♂, Japan.

are a form, or perhaps two forms, intermediate between *rozenburgensis* and *tirolensis*.

In the Mongolian female the legs are orange-red including the trochanters. Shoulders, tegulae, scutellum and axillae are red. The female from Bisamberg is less red-coloured; the shoulders are reddish only, not fully red and of the scutellum the tubercles only are reddish. The Mongolian female has two white spots on the margin of the fourth tergite, whereas the Bisamberg female has four spots, the outer two being small.

Northern Mongolia, 1892, leg. LEDER, ♂ and ♀, coll. Naturhistorisches Museum, Vienna; Weiden (Neusiedlersee) 1.IX.1935, ♂, leg. PITTIONI, coll. British Museum, London, Sept. 1940, ♂, coll. BISCHOFF; Bisamberg (Vienna) 30.VIII. 1936, ♀, leg. L. STRAUSS, coll. British Museum, London.

It is not unlikely that the Mongolian and Austrian forms represent two different subspecies but before naming these forms we better await more material from these regions.

Epeolus tarsalis tirolensis subsp. nov.

Ep. praeustus Friese, 1895, Die Bienen Europas I, p. 194 (♀, partim).

Ep. tarsalis Friese, 1895, l.c., p. 190 (♂, partim).

Ep. praeustus Friese 1926, Die Insekten Mitteleuropas, p. 110 (♀).

Ep. praeustus Bischoff, 1930, Deutsche Entom. Zeitschr., p. 6 (♀, Innsbruck).

Ep. praeustus Pittioni, 1945, Zeitschr. Wiener Ent. Ges., vol. 30, p. 138 (♂ and ♀, partim).

This subspecies is characterized by the very widespread puncturation of temples, front, foreside of posterior femora, and of the second sternite, in both sexes. PITTIONI has given an extensive description of the male in 1945. The scutellum of the female is almost black.

Holotype: ♀, St. Pauls (Tyrol), leg. SCHLETTERER (according to FRIESE, 1895), coll. Naturhistorisches Museum, Vienna.

Allotype: ♂, Tyrol, leg. SCHLETTERER, coll. Naturhistorisches Museum, Vienna.

I hope that in future studies of more extensive material will be possible which will ascertain whether the above mentioned characteristics are constant.

Male genitalia

PITTIONI gives drawings of the genital armature of *tarsalis tirolensis* (*praeustus* det. PITTIONI) and of the *tarsalis* subsp. from Weiden am Neusiedlersee in Austria, which drawings are copied in this paper (figs. 20 and 21, respectively). In figs. 19 and 22 the genitalia of the Korean *tarsalis* and of *rozenburgensis* are depicted. These genital armatures all agree with regard to the length of the appendices of the aedeagus which appendices nearly reach the end of the aedeagus or even equal the same in length (*tarsalis* subsp. from Weiden).

All parts of the genitalia are curved downward. The two parts which constitute the aedeagus are united on the ventral side and the enlarged and rounded lateral parts of the basal half are mostly bent to each other so that they just touch. The

distal half is much narrower and has the shape of a gutter which is open on the dorsal side. The end is flat again, except in the *tarsalis* from Korea. In *tarsalis tirolensis* and in *tarsalis rozenburgensis* the end is excavated. These parts, however, are very membranous and flexible and it is therefore advisable not to attach too much value to the shape thereof. As a result of this membranous nature the aedeagus can be either almost entirely folded or nearly unfolded. The latter situation seems to be the case in PITTIONI's sketch of *praeustus* (*tarsalis tirolensis*).

I have not been able to detect any conspicuous difference in the shape of the seventh and eighth sternites.

The genital armature of *melectiformis* (fig. 23) on the whole is very similar to that of the other forms of the group, with the exception of the very short appendices of the aedeagus, which make it easily distinguishable.

B. *Epeolus melectiformis* Yasumatsu

From the short description given by YASUMATSU in 1938 it was not clear that this species is so closely related to *tarsalis*, judging from the shape of the frontal carina.

In 1955 HIRASHIMA published a key in which he described the facial process as "large, prominent, remarkably projecting laterally" and also the other characteristics given by him for *melectiformis* correspond very well with those of the two specimens which I had received from TSUNEKI. This similarity was confirmed later by the examination of the couple which Mr. HIRASHIMA kindly sent me.

A detailed description of the two first mentioned specimens is given for the use in later studies and for comparison with *tarsalis*.

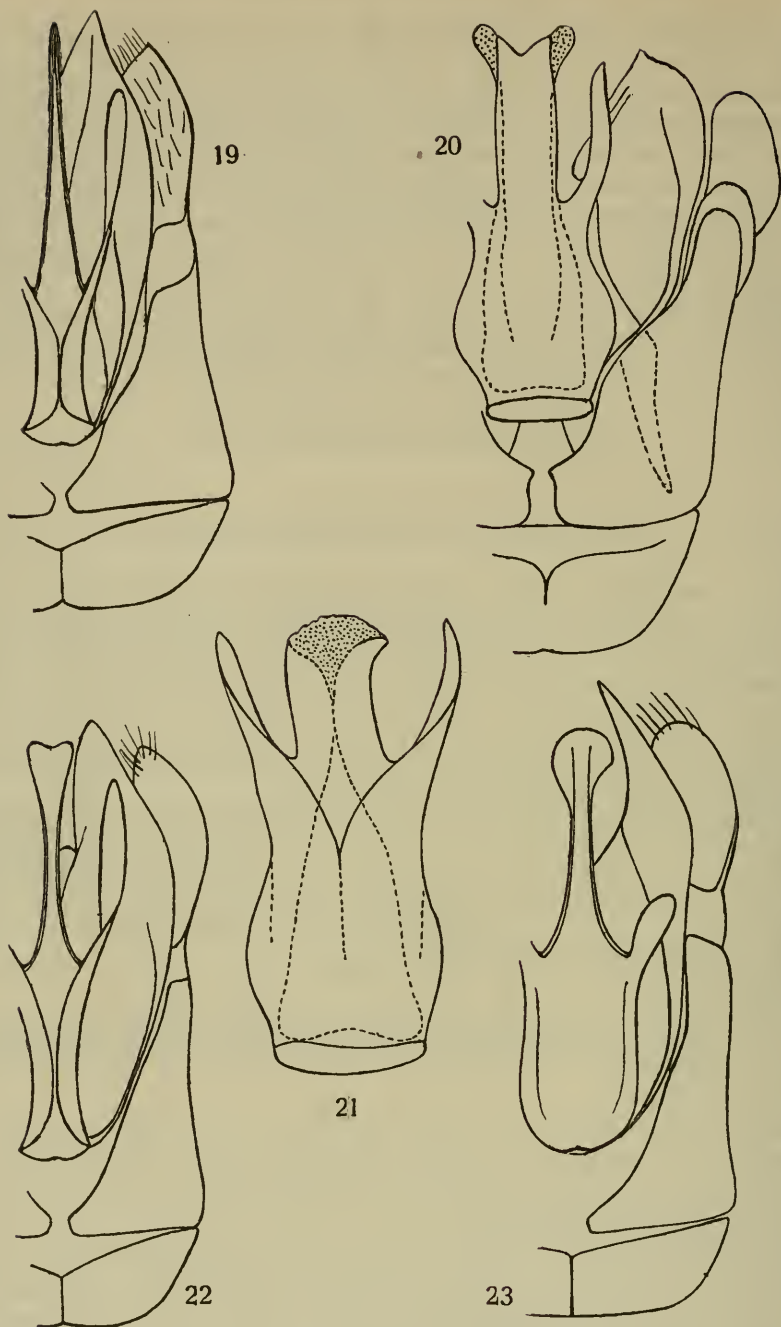
In both sexes the frontal area is raised and enlarged on both sides so that it partly covers the implantation of the antennae. Contrary to the previously mentioned allied forms this frontal area is somewhat excavated and therefore, when seen from above, the foreside of the longitudinal carina only reaches about as far as the forward bent tips of the enlargements.

Colour black; tarsi and ends of jaws reddish. The female has a narrowly interrupted white band on the anterior edge of the first tergite.

The male has long, curved hairs near the apex of the fourth and fifth sternites. The lateral processes of the aedeagus are considerably shorter than in the other species of this group.

Female. Labrum shining, very closely, coarsely and irregularly punctured, no smooth area near the basis. Two teeth of moderate size at a distance from the apex of about one quarter of the length of the labrum. A small tooth in the centre of the apex of the labrum.

Clypeus closely punctured, with narrow and shining apical margin. A longitudinal suture divides the clypeus in two parts each of which is somewhat convex, especially on the basal half. Front closely punctured with only a few narrow, shining lines near the ocelli. Between the oculi and ocelli a few shining interstices which are about as broad as the punctures. Vertex behind the eyes closely punctured. Temples very closely punctured, punctures often in rows, with narrow interstices which sometimes are nearly as broad as a puncture, but as a



Figs. 19—23. Male genitalia. 19, *Epeolus tarsalis* subsp., Korea. 20, *Epeolus tarsalis tirolensis* subsp. nov., Tyrol (copied from Pittioni, 1945). 21, *Epeolus tarsalis* subsp., Austria (Weiden) (copied from Pittioni, 1945). 22, *Epeolus tarsalis rozenburgensis* van Lith. 23, *Epeolus melectiformis* Yasumatsu.

rule less than half as broad. Third segment of the antennae longer than the following and nearly as long as the last segment.

Thorax coarsely punctured, especially on the anterior half, with a number of shining interstices which on the whole are as broad as the punctures. Tegulae closely and finely punctured, except the outer margin, which is very finely striated. Scutellum very coarsely and irregularly punctured, also on the sharp-triangular axillae. Postscutellum more closely, finely and regularly punctured. Area cordealis of the propodaeum dull, very fine - alutaceous, on the lateral parts nearly smooth. Around the area cordealis a shining area; the rest of the propodaeum closely punctured. Metapleurae coarsely and closely punctured.

Tergites with relatively fine punctures, the somewhat depressed posterior part still finer, with a narrow and shining apical margin. The blunt apex of the pygidium is somewhat excavated and the outer margin is raised.

The second sternite coarsely punctured, in the central part the interstices are somewhat larger than the punctures, punctures on the apical margin only half as large, near the edge still finer. Apical margin of the second and third sternite considerably depressed, in the middle about twice as broad as laterally. Fourth and fifth sternites very finely punctured. Processes of the sixth sternite with six teeth on the ventral margin at regular distances from each other; on the dorsal margin with three or four teeth which are somewhat smaller and also a few indistinct teeth.

Mesosternum very coarsely and irregularly punctured. Posterior coxae shining, coarsely punctured, on the posterior half interstices up to twice as large as the punctures. Foreside of the posterior femora coarsely punctured, on the basal half a few shining interstices as large as the punctures, margin finer punctured.

Colour black, tarsi and upper jaws reddish, apex of margin of second and third tergites transparent, horny-brownish.

Round the outside of the implantation of the antennae half a circle of decumbent white hairs. Rest of the head with short and greyish pubescence. Pronotum with a yellowish-white band. On the thorax from the foreside two indistinct and short, longitudinal, yellowish-white stripes. Margin of mesonotum, mesopleurae, shoulders, lower part of scutellum and postscutellum also with yellowish-white hairs. Rest of thorax and scutellum with very short and black hairs. Pubescence in the upper corners of the propodaeum silvery. Behind the wings a tuft of long and yellowish-brown hairs. Foreside of the posterior coxae with a very dense and silvery pubescence. Back of the posterior femora with a row of long and somewhat curved brown hairs. Back of posterior tibiae and inside of all tarsi with short and erect red hairs. Outside of middle tibiae with a row of short and red bristles. Rest of the legs with short grey pubescence. Wings with dark margin, veins brownish black.

Anterior edge of the first tergite with a white band which is narrowly interrupted; posterior margin with a broad white band, interruption in the middle as broad as the band. Posterior margin of the second, third and fourth tergites laterally with two white spots, those of the second tergite on both sides vaguely connected by some light hairs which are partly brown. Rest of the tergites with black and squamose pubescence. Fifth tergite with a lozenge-shaped patch of silvery

pubescence, laterally a vague spot of white squamose hairs. Pygidium with short brown bristles pointing backward.

Margin of the second and third sternites laterally with vague white spots. Fourth sternite with vague and white apical band. Margin of fifth sternite not visible. Rest of the sternites clothed with blackish pubescence.

Male. Labrum shining, coarsely and closely punctured; in the centre of the basis a small rectangular area. Apex with small tooth in the centre. Two teeth on the labrum as in female.

Clypeus and frontal area as in female, but no distinct suture. Front shining, coarsely punctured with small interstices which are smaller than the punctures; near the eyes the interstices are somewhat larger. Between oculi and ocelli there are very large interstices with a few very fine punctures. Vertex behind ocelli very closely punctured. Temples very coarsely and closely punctured, interstices smaller than punctures. Third segment of antennae longer than following segments.

Thorax, scutellum, and tegulae as in female. Postscutellum and propodeum not visible. Metapleurae as in female.

Tergites somewhat more coarsely punctured than in female, the depressed margin with finer punctures. Sides of the seventh tergite convergent, especially the basis thereof; apex rounded with a very slight emargination.

In the centre of the second sternite the interstices are somewhat larger than the punctures; margin depressed as in female. Fourth sternite deeply, fifth sternite less deeply emarginated. The latter is also considerably depressed on the posterior half. Third, fourth and fifth sternites with a broad and smooth apical margin. Mesosternum, posterior coxae and fore-side of posterior femora as in female; distal part of the latter not much finer punctured. Genitalia, see fig. 23.

Colour black, tarsi, the ends of the upper jaws and outer margin of tegulae reddish, the shining apices of the margins of the sternites are brownish transparent.

Clypeus with a very dense and decumbent white pubescence, especially around the implantation of the antennae. On the rest of the head short and grey erect pubescence. Yellowish white band on pronotum, a less dense greyish pubescence on the anterior half of the mesonotum with two vague longitudinal stripes; margin of mesonotum and of shoulders and also the mesopleurae with greyish pubescence. Rest of the thorax and the scutellum with short and dark erect hairs. Behind the basis of the wings a tuft of long hairs as in female. Foreside of the posterior coxae with a very dense and decumbent silvery pubescence. Outside of the middle tibiae with a longitudinal row of short golden bristles. Posterior side of hind tibiae and inside of the tarsi with erect red hairs. Rest of the legs with grey hairs.

Anterior part of first tergite with white band, apex of first and second tergites with broadly interrupted white band; some of the outer squamose hairs are brownish. Third and fourth tergites laterally with two white spots; the two on each side of the fourth tergite are connected. Fifth and sixth tergites with a narrowly interrupted apical band. Rest of the tergites with black squamose pubescence.

Second and third sternites with white apical bands, that of the second is interrupted (worn?). Fourth and fifth sternites with a row of long and curved brown hairs before the shining margin. Basis of the fifth tergite with long light brown

hairs. The basis of the other sternites is not visible. Sixth sternite with short reddish-brown hairs.

♀, 26.VIII.1954, Fukui Pref., Japan, leg. K. TSUNEKI.

♂, 23.VIII.1954, Mt. Haku, Japan, leg. K. TSUNEKI.

C. TAXONOMICAL NOTES ON *Epeolus tarsalis rozenburgensis*

Having studied a number of *tarsalis rozenburgensis* collected during five consecutive years in or near the same colony of *Collectes succincta halophila* Verhoeff, I should like to make a few remarks on the variability of this subspecies.

In the original description of *rozenburgensis* (1949) a peculiar mistake was made in using the term tibiae instead of femora when the puncturation of the latter was discussed.

In addition to the original description it should also be mentioned that the long dark hairs on the basal part of the fifth and sixth sternites are also present on the third and fourth sternites. As a rule, however, they are not visible in dried specimens.

I was not able to find much variation in the density of the puncturation of the femora of the second sternite and of the head. The most conspicuous variation in this population was in the coloration of the axillae and, to a lesser degree, also of the scutellum. In 19 out of 28 females the scutellum was entirely red, in the other nine specimens a narrow margin only on the anterior side of the scutellum was dark.

In 22 of the females the axillae were entirely black, in five of them the axillae were half red and of one female only the axillae were nearly entirely red.

Coloration of scutellum and axillae of 28 females

	Axillae black	Axillae half red	Axillae nearly entirely red
Scutellum red	13	5	1
Anterior margin of scutellum black	9		

The tegulae were red, in ten females they were somewhat darkened.

The posterior margin of the white markings on the tergites of the female has a golden brownish tinge, not only of the bands on the first two tergites, as described in the three types, but also of the white spots on the third and fourth segments. The later in the season the insects have been taken, the more these golden brown hairs have a tendency to grow pale (dried specimens will soon fatten, but can easily be cleaned by a 24 hours bath in acetone).

As one might expect, there was some variation in the size of the bees, but it is remarkable that there was a certain decline in the average size of the males as well as of the females. Although I had a relatively large number of both sexes at my disposal, it was not sufficient for obtaining reliable averages. Anyhow, in the years 1950 and 1951, when most of the specimens were taken, the decline was very striking.

The available data are arranged in the following table:

	1948	1949	1950	1951	1952
	mm	mm	mm	mm	mm
individual sizes of 28 females	8	9	9	8	8
	10	8	8	8	7,5
			9	7,5	7
			7,5	7	
			10	8	
			10	8	
			9,5	8	
			9	8,5	
			8	8	
			9	7	
				8	
average sizes	9	8,5	8,9	7,8	7,5

	1948	1949	1950	1951	1952
	mm	mm	mm	mm	mm
individual sizes of 32 males	9	8	8,5	7,5	7,5
		8	8	7,5	7
		9	8	7	8
			9	6	7,5
			8	6,5	7
			8	7	7
			7,5	7	8
			8	9,5	7
			7,5		
			9		
			8,5		
			9		
average sizes	9	8,3	8,25	7,25	7,4

The male and the largest female of 1948 measured respectively ten and eleven millimetres, but as the abdomens were pulled out during preparation, I have reduced their measured lengths by one millimetre.

D. BIOLOGICAL NOTES ON *Epeolus tarsalis rozenburgensis*

In 1934 I discovered a large colony of a subspecies of *Colletes succincta* L. on „De Beer”, a nature reserve near Hook of Holland. In 1943 P. M. F. VERHOEFF published a more detailed description of this subspecies and called it *halophila*.

In 1937 the colony was very large. The nests were distributed over a surface of about 500 square metres with a density on some places of about 80 nests per square meter.

During the war the site was not accessible. When I could resume my study in 1946 it appeared that a big dike had been constructed round the island which had thoroughly changed the landscape and it was only in 1948 that the colony or what was left of it was refound.

The first specimens of *Epeolus tarsalis rozenburgensis* were discovered in 1948

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