

The Cryptozoic Trechines of the Subgenus *Epaphiama* (Coleoptera, Trechinae)¹⁾

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In his revision of the trechine beetles of the Far East, JEANNEL (1962, pp. 188–189) described an interesting microphthalmic species from Ussuri under the name of *Epaphiama Semenovi*. According to his account, this trechine appeared to have all the diagnostic characters of *Pseudepaphius* S. UÉNO (1962, p. 70), though it looked unique in its peculiar facies and in this respect, considerably different from all the known members of the latter subgenus. JEANNEL expressly stated in his key to the genera of the “Série phylétique d’*Epaphius*” (p. 175) that there was no preapical pore (“pas de soie apicale”) in *Epaphiama*, and the pore was not shown in his drawing, either. This appeared to suggest that JEANNEL’s species might have certain relationship with the group of *Epaphiopsis* (*Pseudepaphius*) *janoi* (cf. UÉNO, 1975, pp. 138–144), which is endemic to the Island of Yaku-shima off southern Kyushu and is characterized by the absence of preapical pore on the elytra. However, difference in body form seemed so decisive between *Epaphiama semenovi* and the two Yaku-shima species of *Pseudepaphius*, and the known locality of the former was so widely isolated from the distributional range of *Pseudepaphius*, that I hesitated to suppress *Epaphiama* as a junior synonym of the latter, even though no substantial difference between them was detected in the original description of the former given by JEANNEL.

Two years after the publication of JEANNEL’s paper, I had an opportunity to make a collecting trip to the southwestern part of Hokkaido, and was able to obtain three series of trechine beetles which looked like *Epaphiama*. In these trechines, however, the preapical pore always exists on the apical anastomosis of the 2nd and 3rd elytral striae so as to make the apical triangle of setae complete. This is an advanced chaetotaxial condition not found in *Epaphiopsis* (s. str.) and *Pseudepaphius*, nor in *Epaphiama* if JEANNEL’s observation is accurate. In view of this peculiarity, I gave a notice that the Hokkaido species in question might form “a new group of the *Trechiamma* complex” (cf. UÉNO, 1971, pp. 24–26, C in fig. 18), an assumption that was not irrational under the situation at that time. Later, two more species of the same group were discovered on other high mountains of southwestern Hokkaido, and since no close relatives of these trechines had been known in any other parts of Hokkaido and northern Honshu, it became more and more important to introduce them into science not only from taxo-

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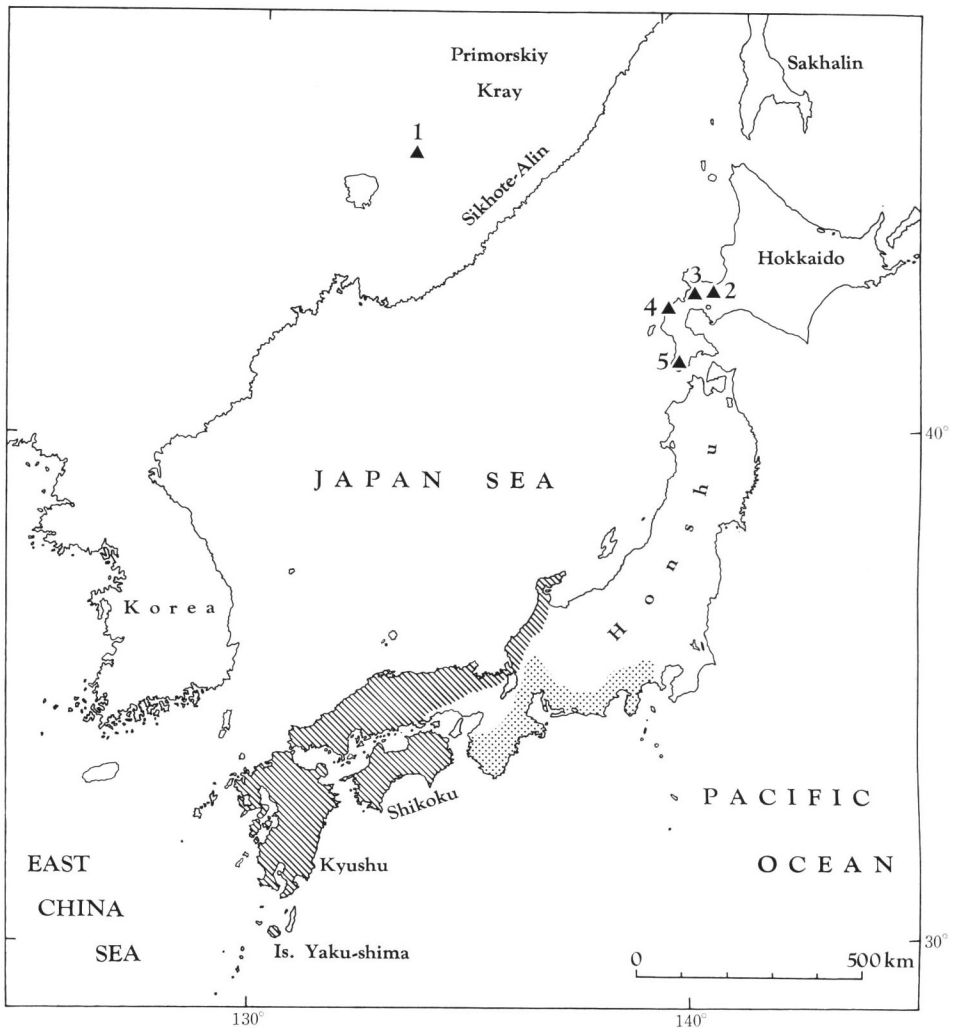


Fig. 1. Map showing the known localities of *Epaphiama* and the distributional ranges of *Pseudepaphius* (diagonal hatching) and *Epaphiopsis* (s. str.) (fine dots). — 1, Evseevka (*E. (Epaphiama) semenovi* (JEANNEL)); 2, Mt. Muiné-yama (*E. (E.) brevis rectilobata* S. UÉNO, subsp. nov.); 3, Niseko Volcanoes (*E. (E.) brevis brevis* S. UÉNO, sp. et subsp. nov.); 4, Mt. Kariba-yama (*E. (E.) alligops* S. UÉNO, sp. nov.); 5, Mt. Nakasengen-daké (*E. (E.) oligops* S. UÉNO, sp. nov.).

nomie but also from zoogeographic reasons. It was, however, indispensable to clarify the true taxonomic status of *Epaphiama semenovi* before a final decision was made on the erection of a new taxon for placing the Hokkaido species.

The type-series of *Epaphiama semenovi* consists of three specimens, two of which, including the holotype, are preserved in the Zoological Institute, Academy of Sciences,

Leningrad, and the remaining one in the Muséum National d'Histoire Naturelle, Paris. Very fortunately, I was afforded opportunities of visiting these museums, each twice, to re-examine the types of this and other species of Trechinae. To my utmost surprise, I found that a well developed preapical pore exists on each elytron in all the known specimens of *E. semenovi*, though its position is not perfectly stable due to the indefinite condition of the apical parts of the 2nd and 3rd striae. In spite of such an instability, the preapical pore is always situated on the apical declivity of each elytron within the field of the apical striole, forming a complete apical triangle with the two apical pores. Since no difference of supraspecific importance is detected between *E. semenovi* and the new species from southwestern Hokkaido, they should belong to the same taxonomic group beyond all doubt. Furthermore, *Epaphiama* thus revised is not fundamentally different from the subgenus *Pseudepaphius* except for body form and chaetotaxial peculiarity. Therefore, I prefer to regard it as a subgenus of *Epaphiopsis*, which has acquired more advanced characters than *Pseudepaphius* and has localized on either side of the northern part of the Japan Sea.

In the present paper, I am going to describe or redescribe all the known forms of the subgenus *Epaphiama*. It is not plausible that there still exist many other new forms of *Epaphiama* in Hokkaido, but occurrence of some other species can be expected doubtlessly in the Sikhote-Alin Mountains and probably also in northern Korea.

The abbreviations used in this paper are as follows: HW — greatest width of head; PW — greatest width of pronotum; PL — length of pronotum, measured along the mid-line; PA — width of pronotal apex; PB — width of pronotal base; EW — greatest width of elytra; EL — greatest length of elytra; M — arithmetic mean; NSMT — National Science Museum (Nat. Hist.), Tokyo; ZIL — Zoological Institute, Academy of Sciences, Leningrad; MP — Muséum National d'Histoire Naturelle, Paris.

Before going into further details, I wish to express my hearty thanks to Dr. O. L. KRYZHANOVSKIY and Mr. A. DESCARPENTRIES, who kindly permitted me to re-examine the type material of *Epaphiama semenovi* under their charge, and also to Dr. Ryôsuke ISHIKAWA, Dr. Yukio YASUDA and his sons, Messrs. Masahiko HASEGAWA, Satoru MIZUSHIMA and Kuniaki SUGA for their kind aid either in carrying out difficult collecting trips or in supplying me with valuable material.

Subgenus *Epaphiama* JEANNEL, 1962

Epaphiama JEANNEL, 1962, Rev. fr. Ent., **29**, pp. 175, 188; type-species: *Epaphiama semenovi* JEANNEL, 1962.

Similar in many ways to *Pseudepaphius* S. UÉNO (1962, p. 70), but distinguished at first sight from that subgenus by the position of preapical pore on elytra. Body glabrous on both the dorsal and ventral surfaces; fore-body small and narrow as compared with that in *Pseudepaphius*, hind body ample; always depigmented and devoid of inner wings. Head small, with entire frontal furrows; eyes small and flat, either perfectly faceted or represented on each side only by a whitish patch; genae convex,

sometimes tumid, either glabrous or sparsely pubescent; labrum emarginate at apex; mentum free, with the tooth broad and porrect, either truncated at the tip or bifid; submentum sexsetose; ligula triangularly produced at middle and octosetose, paraglossae narrow and thin, extending beyond ligula; palpi either slender or thick, penultimate segments glabrous and shorter than apical segments in maxillary palpus, quadrisetose and slightly longer than the apical in labial palpus; antennae not very long, usually filiform. Pronotum small, more or less transverse, and more or less wider at base than at apex, with entirely bordered sides which are either straight or only feebly sinuate behind; hind angles usually obtuse and not projecting, sometimes rounded off; lateral setae normal, the posterior one being almost on hind angle or slightly before it; post-angular carinae usually present though sometimes extremely obtuse. Elytra large and ample, entirely punctate-striate, with the prehumeral border complete to the base of stria 5; stria 2 usually forming apical anastomosis with stria 3, but in *E. semenovi*, it sometimes extends to apex without joining any stria; scutellar striole always distinct; apical striole short but deep, free at the anterior end and usually directed to stria 7 in the Japanese species, usually joining or directed to stria 7 in the type-species, though aberrant individuals occur rather frequently; internal series of setiferous dorsal pores composed of two pores situated on stria 3, external series of a single pore usually situated on stria 5 behind middle; preapical pore lying within the field of apical striole on the apical declivity of each elytron, usually situated at the apical anastomosis of striae 2 and 3, but sometimes adjoining stria 2 in *E. semenovi*; marginal umbilicate pores regular, the four pores of the humeral set being aggregated and equidistant.

Microsculpture of head reticulated and sharply impressed; that of pronotum and elytra composed of fine transverse lines though more or less degenerated, especially on elytra. Ventral surface smooth; anal sternite with a pair of sexual setae in ♂, with two or three pair of sexual setae in ♀. Legs not very long; protibiae externally grooved and practically glabrous on the anterior face, though a few microscopic hairs sometimes exist near the internal edge; tarsal segment 4 with a long ventral apophysis in pro- and mesotarsi; in ♂, two proximal segments of each protarsus widely dilated, stoutly produced inwards at apices and furnished beneath with sexual adhesive appendages.

Male genital organ variable in shape, sometimes large and robust (*E. semenovi*) or very elongate (*E. brevis* and *E. alloligops*). Aedeagus more or less arcuate, widely membranous on the dorsal surface, and usually with narrow apical lobe, which is remarkably prolonged in *E. brevis* and *E. alloligops*; basal part strongly bent towards the ventral side in *E. semenovi* but not particularly so in the other species; lateral sides of basal orifice either almost straight (type-species) or deeply emarginate (Japanese species); sagittal aileron small and very narrow in the type-species, but large and elongate in the others; inner sac scaly, the scales being hardly sclerotized in *E. brevis* and *E. alloligops*, moderately sclerotized throughout in *E. oligops*, and forming a compact mat of heavily sclerotized teeth in *E. semenovi*; no differentiated copulatory piece. Styles variable in shape though usually narrow at the apical parts; left style always longer than the right, each bearing four setae at apex.

Range. Primorskiy Kray in southeastern Siberia and southwestern Hokkaido in northern Japan.

Notes. This is the most advanced and most specialized subgenus of *Epaphiopsis*. It is considered advanced because of the complete loss of pubescence on the body surface and of the completion of the apical triangle of setae on the elytra. It is considered specialized because of the contraction of fore-body and of the reduction of eyes, both of which can be regarded as the result of adaptation to habitats below humus layers or under large stones embedded in the ground. The trechine beetles belonging to the other subgenera of *Epaphiopsis* never exhibit a tendency to lose functional eyes; they are invariably humicolous, never becoming adapted to endogean or semiendogean habitats. This must have been true also for the ancestors of *Epaphiama*; the inference can be readily drawn from the fact that *E. brevis* sp. nov., which is the most unspecialized known species of the subgenus, is primarily humicolous even at present. Under the cold climate of eastern Siberia and northern Japan, however, most species of *Epaphiama* came to colonize in deeper and more stable habitats, underwent morphological modification adaptive to dark humid environment, and have survived to our time as semi-endogean forms.

Besides the type-species, the subgenus *Epaphiama* comprises three new species and a new subspecies, all of which are endemic to southwestern Hokkaido. They are discriminated by the key given below.

Key to the Species and Subspecies

- 1 (2) Larger species (4.60–5.00 mm in body length) with functional eyes and fairly long appendages; pronotum subcordate, relatively long, and relatively narrow at base, with the sides feebly but distinctly sinuate at about one-fifth from base; aedeagus large and robust, with a small narrow sagittal aileron; aedeagal basal orifice with the sides almost straight; inner sac with a large compact mat of heavily sclerotized spine-like teeth; (Evseevka in Primorskiy Kray)
 *E. semenovi* (JEANNEL), comb. nov.
- 2 (1) Smaller species of less than 4.25 mm in body length; pronotal lateral sides without distinct ante-basal sinuation; aedeagus with a large elongate sagittal aileron; aedeagal basal orifice with the sides deeply emarginate; (southwestern Hokkaido).
- 3 (6) Eyes perfectly faceted; pronotum transverse; aedeagus with very long apical part; inner sac without sclerotized scales; (*E. brevis* S. UÉNO, sp. nov.).
- 4 (5) Genae tumid; antennae stouter, submoniliform, with segments 6–10 each oblong-ovate and a little less than twice as long as wide; pronotum with narrower base, PB/PA 1.12 on an average; elytral striae distinctly punctate; aedeagus rather strongly arcuate, with shorter apical lobe, which is slightly turned up; length 3.10–3.95 mm; (Niseko Volcanoes)
 *E. brevis brevis* S. UÉNO, subsp. nov.

- 5 (4) Genae moderately convex; antennae slenderer, subfiliform, with segments 6–10 each less ovate and a little more than twice as long as wide; pronotum with wider base, PB/PA 1.21 on an average; elytral striae rather weakly punctate; aedeagus less strongly arcuate, with longer and straightly prolonged apical lobe; length 3.55–4.05 mm; (Mt. Muiné-yama)
 *E. brevis rectilobata* S. UÉNO, subsp. nov.
- 6 (3) Eyes degenerated, ommatidia imperfect if perceptible; pronotum relatively long.
- 7 (8) Colour lighter reddish brown; pronotum relatively wide at apex (PW/PA 1.52 on an average) and narrow at base (PB/PA 1.23 on an average), with hind angles distinctly marked though obtuse; humeral borders of elytra moderately arcuate and less oblique; elytral striae shallower, distinctly but rather weakly punctate, becoming shallower at the side, stria 8 superficial in basal half; profemur obtusely subangulate on the ventral face in both ♂ and ♀; aedeagus very elongate, about a half as long as elytra, with very long apical part; inner sac without sclerotized scales; length 3.65–4.25 mm; (Mt. Kariba-yama)
 *E. alloligops* S. UÉNO, sp. nov.
- 8 (7) Colour darker reddish brown; pronotum narrow at apex (PW/PA 1.63 on an average) and wide at base (PB/PA 1.38 on an average), with hind angles very obtuse and sometimes rounded off; humeral borders of elytra feebly arcuate and very oblique; elytral striae deeply impressed throughout and coarsely punctate, stria 8 equally impressed throughout its length; profemur distinctly denticulate on the ventral face in ♂, obtusely angulate in ♀; aedeagus small and short, about three-eighths as long as elytra, and not prolonged at the apical part; inner sac with a compact mat of moderately sclerotized scales; length 3.90–4.15 mm; (Mt. Nakasengen-daké) *E. oligops* S. UÉNO, sp. nov.

Epaphiopsis (Epaphiama) semenovi (JEANNEL, 1962), comb. nov.

(Fig. 2)

Epaphiama Semenovi JEANNEL, 1962, Rev. fr. Ent., 29, p. 189, figs. 12–14; type-locality: Evseevka.

Length: 4.60–5.00 mm (from apical margin of clypeus to apices of elytra).

Relatively large within the genus; body fairly broad and depressed; fore-body large as compared with that in the other members of the subgenus. Colour reddish brown, shiny, faintly iridescent on elytra; epipleura and legs somewhat lighter than the body; palpi and antennae yellowish brown.

Head large, quadrate, only a little wider than long, and depressed above, with both frons and supraorbital areas only gently convex; frontal furrows fairly deep in front and gently divergent anteriorly, moderately distant and not angulate at middle, and not strongly curved behind; microsculpture sharply impressed, largely isodiametric, the meshes being coarser on neck; eyes small and flat though distinctly faceted, about as long as genae in ♂, a little shorter than (about seven-eighths as long as) genae in ♀;

genae gently convex and perfectly glabrous; neck very wide, with the anterior constriction shallow and not sharp; labrum very transverse, with the apex widely emarginate though nearly straight at the median part; mandibles long and fairly slender, with sharp apices, right mandible clearly tridentate while the left is bidentate; mentum tooth sharply bifid at the tip; palpi slender, penultimate segments gradually dilated towards apices, apical segments elongated subconical; antennae relatively long, filiform, reaching basal two-sevenths of elytra, segments 2, 8, 9 and 10 slightly shorter than the others, which are subequal in length to one another, with the exception of terminal segment

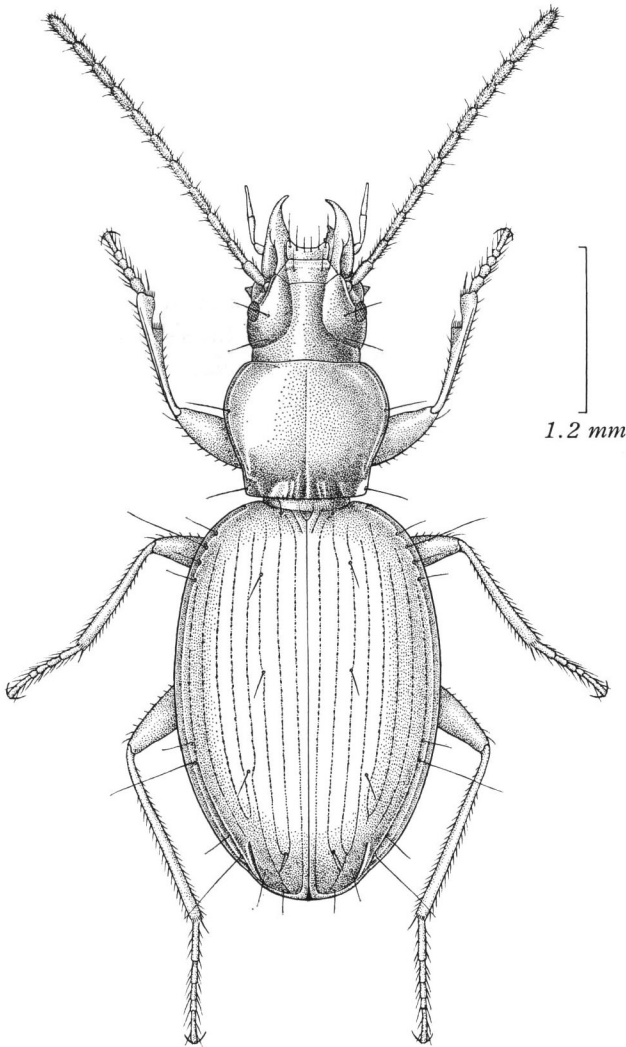


Fig. 2. *Epaphiopsis (Epaphiama) semenovi* (JEANNEL), ♀, from Evseevka in the Iman District.

which is the longest, middle segments each subcylindrical and more than twice as long as wide.

Pronotum subcordate, wider than long, widest at about five-eighths from base, and more rapidly contracted towards apex than towards base; PW/HW 1.38–1.42 (M 1.41), PW/PL 1.21–1.25 (M 1.23), PW/PA 1.47–1.50 (M 1.48), PW/PB 1.36–1.38 (M 1.37); surface moderately convex and smooth, microsculpture formed by fine transverse lines, though partially irregular and obliterated; sides rather widely reflexed, regularly and rather strongly arcuate in front, feebly sinuate at about one-fifth from base, and then slightly convergent towards hind angles, which are large, somewhat obtuse and not projecting; lateral setae normal, the anterior one being at the widest part and the posterior a little before hind angle; apex either slightly bisinuate or nearly straight, narrower than base, PB/PA 1.07–1.09 (M 1.08), with front angles obtuse and hardly advanced; base nearly straight though somewhat oblique on each side near hind angle; basal part wide, longitudinally strigose and without continuous transverse impression; basal foveae large and fairly deep, diverging anteriorly, and with a small longitudinal foveole at each inner end; apical transverse impression obsolete though vaguely wrinkled; median line fine on the disk but evidently widening and deepening near base; postangular carinae short and obtuse.

Elytra oval, much wider than prothorax, widest at about middle, and widely depressed on the disk though moderately convex at the sides and near apices; EW/PW 1.59–1.66 (M 1.63), EL/EW 1.42–1.46 (M 1.44); shoulders effaced; prehumeral borders oblique and slightly arcuate; sides rather widely reflexed throughout, feebly and regularly arcuate at middle, and very slightly emarginate before apices, which are widely and almost conjointly rounded; striae entire though shallow, punctate, stria 2 usually forming a sharply impressed apical anastomosis with stria 3 but sometimes extending to apex without joining any stria, stria 8 similar to the others, not particularly deepening even at the apical part; scutellar striole short though obvious; apical striole short but deep, not much curved, either joining or directed to stria 7 in the paratypes, but it joins stria 5 on the right elytron and stria 8 (!) on the left in the holotype; intervals smooth and flat; apical carina obtuse though distinct; stria 3 with two setiferous dorsal pores at $1/8$ – $1/7$ and about $2/5$ from base respectively; interval 5 with a single setiferous dorsal pore at about $3/5$ from base, usually on an anastomosis of striae 4 and 5 though adjoining stria 5 on both the elytra in the holotype; preapical pore variable in disposition, sometimes situated at the apical anastomosis of striae 2 and 3 but sometimes adjoining stria 2, always much closer to suture than to apex or to apical striole though always lying within the field of apical striole on the apical declivity; microsculpture formed by fine transverse lines but largely obliterated.

Ventral surface glabrous and smooth; each sternite usually with two pair of setae along the posterior margin; anal sternite with a pair of sexual setae in ♂, with three pair of sexual setae in ♀, the inner two pairs of which are much shorter than the outermost and close to each other. Legs long and fairly stout; protibiae straight, moderately dilated towards apices, deeply grooved on the external face and perfectly glabrous

on the anterior face; tarsi fairly stout, segment 1 shorter than segments 2 and 3 together in mesotarsus, about as long as segments 2 and 3 together in metatarsus, segment 4 much smaller than segment 3 in metatarsus.

Male genital organ very large and heavily sclerotized. Aedeagus almost a half as long as elytra, robust, and almost rectangularly bent at the basal part, which is elongate and bears a small narrow sagittal aileron on the anterior side; basal orifice fairly large, with the sides almost straight and not emarginate; in lateral view, aedeagus gradually narrowed towards apex from behind middle and produced into a narrow apical lobe, which is slightly arcuate ventrad and simply blunt at the extremity; ventral margin widely convex at the median part; inner sac covered with numerous scales, which form a large compact mat of heavily sclerotized spine-like teeth on the ventral side. Styles relatively short, with the apical parts short and fairly wide, each bearing four apical setae of moderate length.

Specimens examined. 1 ♂ (holotype), 1 ♀ (paratype), Evseevka, Iman District, Primorskiy Kray, East Siberia, 2-VI²⁾-1910, N. F. IKONNIKOV leg. (ZIL); 1 ♂ (paratype), same data (MP).

Range. Known so far only from the type-locality.

Notes. Unlike many of his excellent illustrations, the habitus drawing given by JEANNEL (p. 189, fig. 12) does not show the real facies of this interesting species; the elytra are too ample, the head too round, the palpi too thick, and the legs too long. As was already pointed out, most unexpected is that he overlooked the presence of the conspicuous preapical pore on each elytron of this trechine. JEANNEL himself repeatedly put emphasis on the significance of the position of this pore in trechine taxonomy, and regarded its primitive condition as a key character in defining his "Série phylétique d'*Epaphius*" (1962, p. 173). If we follow his classification, we cannot include *Epaphiopsis semenovi* even in his *Epaphius*-group.

It is true that the disposition of the preapical pore is almost always fixed in trechine beetles and not subject to individual variation. *Epaphiopsis semenovi* is very exceptional in this respect. In the holotype (♂), the apical anastomosis of the 2nd and 3rd striae is perfectly formed, but the preapical pore is situated slightly in front of it on the left elytron; in the ZIL paratype (♀), the apical anastomosis is perfect and has the preapical pore on it on the left elytron, whereas the 2nd stria on the right elytron does not form a normal anastomosis with the 3rd, though the preapical pore is situated at about the same position as on the left elytron (cf. Fig. 2). In the MP paratype (♂), the 2nd stria does not form an anastomosis with the 3rd and simply extends to apex on both the elytra, so that the preapical pore adjoins the 2nd stria a little before the level of the terminus of the 3rd stria, which forms an apical anastomosis with the 4th; however, the pore is situated on the apical declivity of each elytron, not so displaced forwards as in *Pseudepaphius*. The instability of the apical striation of elytra, and accordingly that of the disposition of preapical pore, is indicative of primitive condition, and though *E. semenovi* is specialized in many respects, it is probably more primitive than

2) Not May, though so recorded by JEANNEL in his original account.

the species occurring in southwestern Hokkaido.

It is unfortunate that the male genitalia of this species cannot be illustrated in the present paper. I was unable to make a detailed sketch of the organ with the inner sac *in situ*, since JEANNEL had dissected the aedeagus of the male paratype for examining the structure of its inner sac and had mounted it on a permanent slide. Re-examining the slide, however, I can point out at least that his drawing (p. 189, fig. 13) should be amended in several aspects: 1) in lateral view, the dorsal margin of aedeagus is not convex behind middle but almost straight (the convex part in JEANNEL's sketch seems to represent the everted apical portion of inner sac); 2) the apical lobe is slightly arcuate ventrad, not straight; 3) the lateral sides of the basal orifice are not emarginate; and 4) the basal part bears a distinct sagittal aileron, though it is very small and narrow.

Epaphiopsis (Epaphiama) brevis S. UÉNO, sp. nov.

(Figs. 3–5)

Length: 3.10–3.95 mm (from apical margin of clypeus to apices of elytra).

Readily recognized on the combination of its small size, short broad form of body, transverse prothorax, distinctly faceted eyes, short stout antennae, remarkably prolonged apical part of aedeagus, and hardly sclerotized scales covering inner sac.

Body short and broad, with small fore-body and ample elytra. Colour reddish brown, shiny, usually somewhat iridescent on elytra; palpi pale; antennae becoming lighter towards apices; legs and the ventral surface of hind body yellowish brown.

Head small, short, and depressed above, with frons and supraorbital areas gently convex; frontal furrows rather widely distant from each other, deeply impressed and not much curved in front, not angulate at middle, and distinctly impressed even behind genae; microsculpture sharply impressed, largely consisting of wide polygonal meshes though partially isodiametric; eyes functional, distinctly faceted, though small and only slightly convex, two-thirds to nine-tenths (usually about four-fifths) as long as genae, which are tumid and usually bear a few hairs at the lower parts; neck wide and thick, with the anterior constriction sharply marked at the sides; labrum transverse, with the anterior margin widely emarginate; mandibles stout though acute at apices, right mandible with a porrect premolar tooth; mentum tooth well produced, usually truncated at the tip though sometimes slightly emarginate; palpi short and stout, penultimate segments widely dilated towards apices, apical segments subconical; antennae short and stout, submoniliform rather than subfiliform, slightly dilated towards apices, and reaching basal one-fourth of elytra, segment 3 a little longer than 2 or 4, segments 6–10 each oblong-ovate and a little less than twice as long as wide, terminal segment the longest, obviously longer than scape.

Pronotum transverse, evidently wider than head, usually widest at about five-eighths from base, and more strongly contracted in front than behind; PW/HW 1.37–1.49 (M 1.44), PW/PL 1.28–1.38 (M 1.34), PW/PA 1.41–1.51 (M 1.47), PW/PB 1.25–1.35 (M 1.31); surface convex, especially at the sides, often with vague transverse stria-

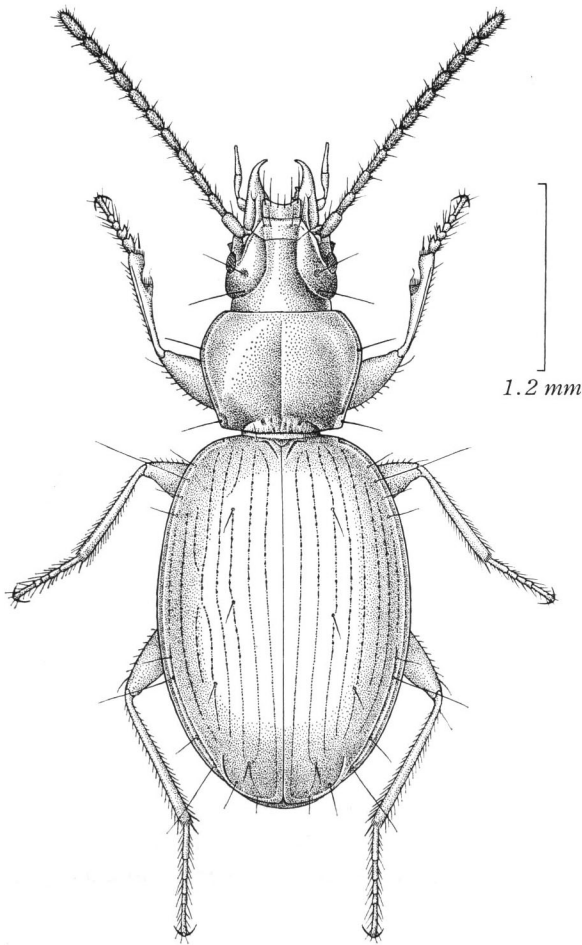


Fig. 3. *Epaphiopsis (Epaphiama) brevis brevis* S. UÉNO, sp. et subsp. nov., ♂, from Mt. Chisé-nupuri of the Niseko Volcanoes.

tions; microsculpture composed of fine transverse lines though partially obliterated; sides rather widely reflexed, moderately arcuate in front but almost straight behind, ante-basal sinuation either absent or very slight and brief; anterior lateral seta inserted a little before the widest part, and the posterior slightly before hind angle; apex nearly straight or slightly emarginate, with front angles rounded and not projecting; base more or less wider than apex, PB/PA 1.06–1.18 (M 1.12), almost straight at the median part but slightly oblique or somewhat arcuate on each side; hind angles always obtuse though usually distinct; median line distinct on the disc but obliterated near base; transverse impressions obsolete, basal foveae large, deep and smooth, having a small longitudinal foveole at each inner end; apical area often wrinkled longitudinally; basal area more or less uneven, longitudinally strigose in many individuals; postangular

carinae usually distinct though sometimes obtuse.

Elytra oval and convex, much wider than prothorax, widest at about middle, and equally contracted towards bases and towards apices; EW/PW 1.55–1.65 (M 1.60), EL/EW 1.38–1.48 (M 1.42); shoulders rounded, with prehumeral borders arcuate and not very oblique; sides rather widely reflexed before middle, feebly arcuate in front, more strongly so behind, and widely rounded at apices, which form a small re-entrant angle at suture; preapical emargination usually absent, very slight if perceptible; striae entire, distinctly punctate, rather deeply impressed on the disc though becoming shallower at the side, apical anastomosis of striae 2 and 3 nearly always complete, though incomplete on one elytron in exceptional cases, stria 8 deeply impressed in apical half; scutellar striole distinct though variable in length; apical striole short but deep, moderately curved, free at the anterior end, and usually directed to stria 7 though sometimes directed to stria 5; intervals slightly convex and smooth; apical carina prominent; stria 3 with two setiferous dorsal pores at 1/6–1/5 and 2/5–1/2 from base respectively; in one of the paratypes, the posterior dorsal pore is lacking, though such a chaetotaxial aberrancy is very rare in the members of *Epaphiama*; stria 5 with a single setiferous dorsal pore at 3/5–7/10 from base; preapical pore situated at the apical anastomosis of striae 2 and 3, being almost equidistant from suture and from apical striole and usually a little more distant from apex; microsculpture mostly obliterated though consisting of fine transverse lines.

Ventral surface glabrous and smooth; each sternite usually with a single pair of setae along the posterior margin, though an extra seta is sometimes present on one side; anal sternite provided with a pair of sexual setae in ♂, with two pair of sexual setae in ♀. Legs short and stout, especially in ♂; each profemur obtusely angulate at about basal one-fourth on the ventral face in ♂; protibiae rather widely dilated towards apices, deeply grooved on the external face and glabrous on the anterior face; tarsi short and fairly stout, segment 1 shorter than segments 2 and 3 together in mesotarsus, but slightly longer than segments 2 and 3 together in metatarsus.

Male genital organ elongate and heavily sclerotized. Aedeagus about a half as long as elytra, rather strongly arcuate, and remarkably prolonged and moderately flattened at the apical part; viewed laterally, apical lobe narrow and slightly turned up, with the terminal portion moderately dilated to form a fan-shaped apex; viewed dorsally, apical lobe gradually narrowed towards the blunt extremity; basal part small and not particularly bent towards the ventral side, with rather small basal orifice, the sides of which are very deeply emarginate; sagittal aileron well developed, remarkably elongate and curved; ventral margin moderately emarginate in front but slightly convex behind middle; inner sac scaly, but the scales are hardly sclerotized. Styles relatively small, short and narrow, each bearing four apical setae.

Type-series. Holotype: ♂, allotype: ♀, Mt. Chisé-nupuri, 700–750 m alt., 29–VII–1964, S. UÉNO, S. MIZUSHIMA & M. HASEGAWA leg. (NSMT). Paratypes: 20 ♂♂, 13 ♀♀,³⁾ Mt. Chisé-nupuri, 700–850 m alt., 29–VII–1964, S. UÉNO, S. MIZUSHIMA &

3) Of these, 5 ♂♂ and 10 ♀♀ are teneral.

M. HASEGAWA leg. (NSMT); 2 ♀♀, Mt. Iwao-nupuri, 900 m alt., 8–VIII–1965, K. SUGA leg. (NSMT); 5 ♂♂, 2 ♀♀, Mt. Nisekoan-nupuri, 1,100 m alt., 30–VII–1964, S. UÉNO & S. MIZUSHIMA leg. (NSMT); 6 ♂♂, 5 ♀♀, Mt. Nisekoan-nupuri, 1,100 m alt., 8–VIII–1965, K. SUGA leg. (NSMT).

Localities. Mt. Chisé-nupuri (type-locality !), Mt. Iwao-nupuri and Mt. Nisekoan-nupuri, all belonging to the Niseko Volcanoes of the Shiribeshi Mountains, in southwestern Hokkaido, northern Japan.

Notes. Because of its short broad body, short stout appendages, and more or less convex, functional eyes, this new trechine can be regarded as the most unspecialized species within the subgenus *Epaphiama*, though it is chaetotaxially advanced as compared with *E. semenovi*. This view is also supported from ecological evidence; *E. brevis* is primarily humicolous, mainly occurring under dead leaves accumulated on forest floors, whereas the other Japanese species are alpine inhabitants and are found under large stones embedded in the soil at the borders of snow patches.

The Niseko Volcanoes lie on the Japan Sea side of southwestern Hokkaido near the base of the Oshima Peninsula. Of the three peaks on which the present species has been obtained, Mt. Chisé-nupuri (1,135 m in height), the type-locality, is the westernmost, Mt. Nisekoan-nupuri (1,309 m in height) is the easternmost, and Mt. Iwao-nupuri (1,118 m in height) is situated between them. The distance between Mt. Chisé-nupuri and Mt. Nisekoan-nupuri is about 5 km in a bee-line, and Mt. Iwao-nupuri is nearer to the latter than to the former. All the Chisé-nupuri specimens were taken on the southern slope of the peak, mostly from under dead leaves accumulated on the floor of birch forests and also from among entwined roots of Sasa-bamboo growing in the forests, though some specimens were obtained from under stones lying in damp places along the trail leading to the top of the mountain. On Mt. Nisekoan-nupuri, the trechines were found on the western slope both in dead leaves and under stones. The Iwao-nupuri specimens are said to have been found under stones on the southwestern slope of the mountain.

Epaphiopsis (Epaphiama) brevis rectilobata S. UÉNO, subsp. nov.

(Figs. 6–7)

Length: 3.55–4.05 mm (from apical margin of clypeus to apices of elytra).

Slightly larger on an average than the nominate subspecies, and discriminated from the latter mainly by the combination of less convex genae, slenderer antennae, wider pronotal base, less strongly punctate elytral striae, and less strongly arcuate aedeagus with longer and straightly prolonged apical lobe, though no single characters are reliable for the recognition of this subspecies.

Head with frontal furrows a little more strongly curved and more widely divergent in front than in the nominate subspecies; eyes five-sevenths as long as genae to the same length as the latter; genae moderately convex but not tumid; neck constriction less sharply marked; labrum with the anterior margin rather shallowly emarginate; palpi

and antennae more or less slenderer than in the nominate subspecies, the latter usually subfiliform, reaching basal one-fourth of elytra or extending a little beyond that level, with segments 6–10 each less ovate and a little more than twice as long as wide. Pronotum usually widest at about three-fifths from base and less contracted towards base, which is wider than in the nominate subspecies; PW/HW 1.35–1.43 (M 1.39), PW/PL 1.28–1.35 (M 1.31), PW/PA 1.46–1.54 (M 1.50), PW/PB 1.21–1.28 (M 1.24), PB/PA 1.15–1.26 (M 1.21); front angles distinct, less widely rounded than in the nominate subspecies; hind angles less obtuse, sometimes almost rectangular. Elytra usually less convex on the disc and broader at the basal part than in the nominate subspecies, with the sides more gently arcuate at middle; EW/PW 1.53–1.68 (M 1.60), EL/EW 1.38–1.45 (M 1.42); striae rather weakly punctate, usually a little shallower on the disc than in the nominate subspecies though equally impressed on the disc and at the side; stria 3 with two setiferous dorsal pores at $1/7$ – $1/5$ and $2/5$ – $1/2$ from base respectively, stria 5 with a single dorsal pore at $3/5$ – $2/3$ from base. Legs, protibiae in particular, a little slenderer than in the nominate subspecies.

Aedeagus about a half as long as elytra as in the nominate subspecies, but less strongly arcuate, with longer and straightly prolonged apical lobe; basal part fairly large though short and not particularly bent, with elongate sagittal aileron; ventral margin slightly but widely emarginate. Styles long and narrow, with slender apical parts.

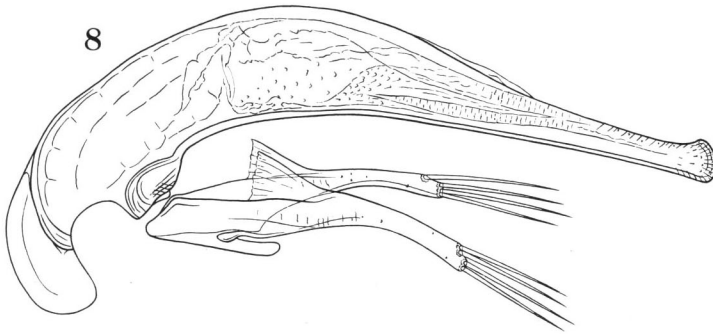
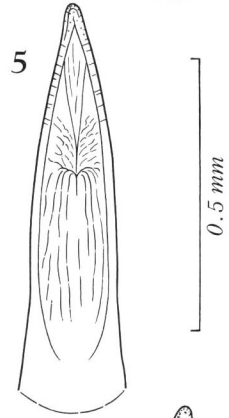
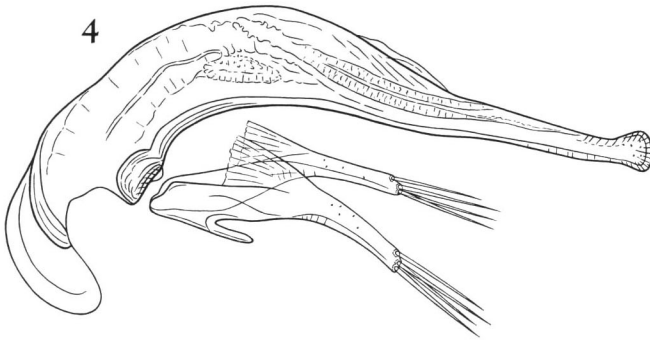
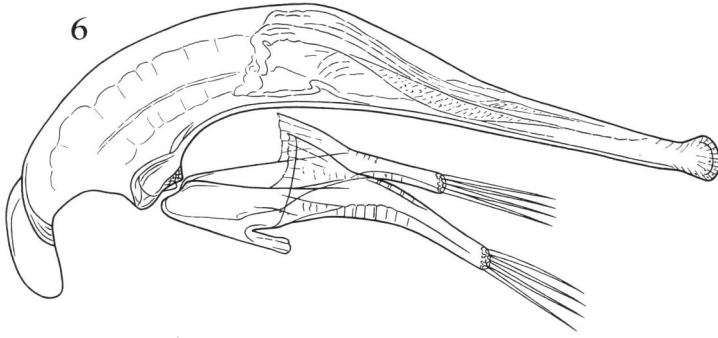
Type-series. Holotype: ♂, allotype: ♀, Mt. Muiné-yama, 1,250–1,400 m alt., 21–VII–1964, S. UÉNO, S. MIZUSHIMA & M. HASEGAWA leg. (NSMT). Paratypes: 3 ♂♂, 9 ♀♀, Mt. Muiné-yama, 720–1,400 m alt., 21–VII–1964, S. UÉNO, S. MIZUSHIMA & M. HASEGAWA leg. (NSMT).

Type-locality. Mt. Muiné-yama, of the Shiribeshi Mountains, in southwestern Hokkaido, northern Japan.

Notes. This new subspecies is interesting in combining characters from the nominate subspecies of *E. brevis* and *E. alligops*; it is closer to the former in external morphology, but is identical with the latter in genitalic features. It is for this reason that I have hesitated long in determining on the taxonomic status of this trechine. However, I have come to regard the Muiné-yama population as a geographical race of *E. brevis*, considering that the genitalic difference is by no means great between these forms.

Mt. Muiné-yama is one of the peaks at the southeastern part of the Shiribeshi Mountains, situated at about 25 km southwest of Sapporo, and is about 33 km distant to east by north from Mt. Nisekoan-nupuri, the nearest known locality of the nominate subspecies. Its highest point is 1,461 m above sea-level. The trechine beetle was taken on the eastern slope at various places above 700 m in altitude, but a majority of

Figs. 4–9. Male genitalia of *Epaphiopsis* (*Epaphiama*) spp.; left lateral view (4, 6 and 8), and apical part of aedeagus, dorsal view (5, 7 and 9). — 4–5. *E. (E.) brevis brevis* S. UÉNO, sp. et subsp. nov., from Mt. Chisé-nupuri of the Niseko Volcanoes. — 6–7. *E. (E.) brevis rectilobata* S. UÉNO, subsp. nov., from Mt. Muiné-yama of the Shiribeshi Mountains. — 8–9. *E. (E.) alligops* S. UÉNO, sp. nov., from Mt. Kariba-yama of the Kariba Mountains.



the specimens were obtained near the timber-line, from under dead leaves and stones in damp places.

Epaphiopsis (Epaphiama) alloligops S. UÉNO, sp. nov.

(Figs. 8–9)

Length: 3.65–4.25 mm (from apical margin of clypeus to apices of elytra).

Closely allied to *E. brevis* and especially similar to *E. brevis rectilobata* in many details, but distinguished at first sight from that subspecies by the degeneration of eyes. Besides, both the head and pronotum are less transverse in *E. alloligops* than in *E. brevis rectilobata*, the antennae are usually longer, and the elytra are a little more elongate.

Somewhat more elongate in body form than *E. brevis rectilobata*, though similar to the latter in general conformation and colour. Head a little less transverse than in *E. brevis rectilobata*; eyes vestigial, not distinctly faceted, being represented on each side by a small whitish patch which is four-ninths to three-fifths (usually about a half) as long as genae; genae gently and evenly convex, usually with a few hairs; microsculpture distinct, mostly consisting of isodiametric meshes; labrum with the anterior margin widely and moderately emarginate; palpi fairly slender, with penultimate segments gently dilated towards apices; antennae usually long and slender, filiform, reaching or almost reaching basal one-third of elytra, with segments 6–10 each subcylindrical and about 2.5 times as long as wide; in one of the paratypes (♀), the antennae are exceptionally short and submoniliform, only reaching basal one-fifth of elytra, with segments 6–10 each oval and less than twice as long as wide. Pronotum usually less transverse than in *E. brevis rectilobata*, widest at about five-eighths from base, and more strongly and rapidly contracted towards apex than towards base; PW/HW 1.38–1.48 (M 1.43), PW/PL 1.23–1.30 (M 1.27), PW/PA 1.45–1.57 (M 1.52), PW/PB 1.21–1.25 (M 1.24); sides moderately arcuate in front, less so behind, and either straight to hind angles or very slightly sinuate just before them; base evidently wider than apex, PB/PA 1.18–1.28 (M 1.23), with the lateral parts more or less oblique; front angles distinct though not protruding; hind angles always obtuse though distinctly marked. Elytra similar in shape to those of *E. brevis rectilobata*, though a little more elongate than the latter, with broad basal part; EW/PW 1.56–1.66 (M 1.62), EL/EW 1.44–1.53 (M 1.48); surface convex; shoulders effaced, humeral borders less strongly arcuate than in *E. brevis rectilobata*; sides feebly arcuate at middle and slightly emarginate before apices, which are rather narrowly rounded; striae moderately impressed on the disc and distinctly punctate, though becoming shallower at the side, stria 8 deeply impressed in apical half; scutellar and apical striae as in *E. brevis rectilobata*; stria 3 with two setiferous dorsal pores at about 1/6 and 2/5–1/2 (usually before 4/9) from base respectively, stria 5 with a single setiferous dorsal pore at 5/9–2/3 from base; preapical pore as in *E. brevis*. Legs somewhat slenderer than those in *E. brevis rectilobata*, though structurally similar to the latter.

Aedeagus very similar to that of *E. brevis rectilobata*, less strongly arcuate than that of *E. brevis brevis*; apical lobe long and straight as in *E. brevis rectilobata*, but relatively broad to near apex in dorsal view; sagittal aileron large; apical parts of styles very slender.

Type-series. Holotype: ♂, allotype: ♀, Mt. Kariba-yama, 1,350 m alt., 15–VII–1971, S. UÉNO leg. (NSMT). Paratypes: 4 ♂♂, 2 ♀♀, Mt. Kariba-yama, 1,100–1,350 m alt., 15–VII–1971, S. UÉNO leg. (NSMT).

Type-locality. Mt. Kariba-yama, of the Kariba Mountains, on the Japan Sea side of the Oshima Peninsula, in southwestern Hokkaido, northern Japan.

Notes. It is evident that this species and *E. brevis* have been derived from a common ancestor; this is clearly indicated by their striking similarity in both the external and genitalic features. The occurrence of an aberrant individual having unusually short stout antennae is also regarded as a proof that the present species is a derivative of *E. brevis*. This aberrant individual was taken at an elevation of 1,150 m, though no other specimens were found at the same spot. It is unfortunately a female, but apart from the antennal abnormality and relatively stout legs, it agrees perfectly with the other specimens of the Kariba-yama population. Perhaps an ancestral population of *E. brevis* that had colonized on the Kariba Mountains became differentiated under an isolated condition and adapted themselves to semiendogean environment; the eyes became degenerated and lost function, and the appendages, antennae in particular, became slenderer in compensation for the loss of sight. However, the speciation must have taken place rather recently and may not have been absolutely completed yet, so that individuals showing reversion in the length and thickness of antennae still appear in exceptional cases.

It is worth noting that the male genitalia of this species are almost identical with those of *E. brevis rectilobata* and different from those of *E. brevis brevis*, though its type-locality is much more distant from that of the former than from the known localities of the latter. The position of Mt. Kariba-yama is about 62 km west-southwest of Mt. Chisé-nupuri, the type-locality of *E. brevis brevis*, and about 98 km west by south of Mt. Muiné-yama, that of *E. brevis rectilobata*. Perhaps a parallel modification took place in the male genitalia of *E. brevis rectilobata* and *E. alloligops*, both of which have doubtless been derived from an ancestor similar to the nominate subspecies of *E. brevis*.

Mt Kariba-yama (1,520 m in height) is the highest point of the isolated group of volcanoes called the Kariba Mountains. They are separated from the Niseko Volcanoes by the Kuromatsunai Lowland and from the non-volcanic Oshima Mountains by the wide valley of the Tashibetsu-gawa. All the known specimens of *E. alloligops* were obtained in alpine meadows near the timber-line on the southern ridge of the main peak. There were snow patches in those meadows, from which narrow streams flowed out here and there. The trechines were found under large stones embedded in the soil along the borders of snow patches and streams. In an alpine meadow surrounded by shrubs at an elevation of about 1,100 m, two specimens of *E. alloligops* were found co-existing with a pair of the anophthalmic bembidiines, *Caecidium yasudai* S. UÉNO, under

a large stone deeply embedded in the damp ground at the lower edge of a snow patch (cf. UÉNO, 1972, p. 110).

Epaphiopsis (Epaphiama) oligops S. UÉNO, sp. nov.

(Figs. 10–12)

Length: 3.90–4.15 mm (from apical margin of clypeus to apices of elytra).

An oligophthalmic species related to *E. brevis* and *E. alloligops*, but recognized at first sight on its dark coloration, peculiarly shaped pronotum, very oblique humeral borders of elytra, deeply impressed elytral striae, and so on. Strikingly different from the two northern species in the shape of male genitalia.

Body relatively elongate; fore-body small and narrow, hind body large, oblong-ovate. Concolorously dark reddish brown on both the dorsal and ventral surfaces, shiny, very faintly iridescent on elytra; palpi, antennae, epipleura and legs light reddish brown.

Head small, transverse, and moderately depressed above; frons and supraorbital areas gently convex; frontal furrows deep, not angulate at middle, and gently divergent anteriad; microsculpture distinct, largely consisting of wide polygonal meshes though partially isodiametric; eyes degenerated, being represented on each side by a patch which is two-thirds to four-fifths as long as genae, ommatidia very imperfect though still perceptible as vestiges; genae moderately convex and provided with a few erect hairs; neck very wide, with the anterior constriction distinct at the sides though not very deep; labrum transverse, with the anterior margin widely emarginate though almost straight at the median part; mandibles stout though acute at apices, with a porrect premolar tooth on the right one; mentum tooth fairly broad, porrect, either truncated or slightly emarginate at the tip; palpi fairly slender, penultimate segments moderately dilated towards apices, apical segments elongated subconical; antennae usually short, subfiliform, reaching basal two-ninths of elytra or extending a little beyond that level, but in the holotype, they reach basal two-sevenths of elytra; antennal segment 2 about four-fifths as long as segment 3 and about as long as or slightly shorter than segment 4, segments 6–7 each subcylindrical and about 2.5 times long as wide, segments 8–10 each elongated suboval and more or less shorter than segment 7, terminal segment the longest though narrower than scape.

Pronotum relatively long though still wider than long, evidently wider than head, widest at about three-fifths from base, and strongly contracted towards apex, which is obviously narrower than base; PW/HW 1.45–1.47 (M 1.47); PW/PL 1.23–1.26 (M 1.24), PW/PA 1.58–1.66 (M 1.63), PW/PB 1.16–1.20 (M 1.18), PB/PA 1.34–1.41 (M 1.38); surface moderately convex though somewhat depressed on the disc; microsculpture composed of fine transverse lines, which are rather irregular, partially forming irregular meshes and partially obliterated; sides moderately reflexed, the borders becoming much narrower near front angles, rather strongly arcuate before the widest part, but either very feebly so or straight posteriad to hind angles, or vaguely sinuate before them;

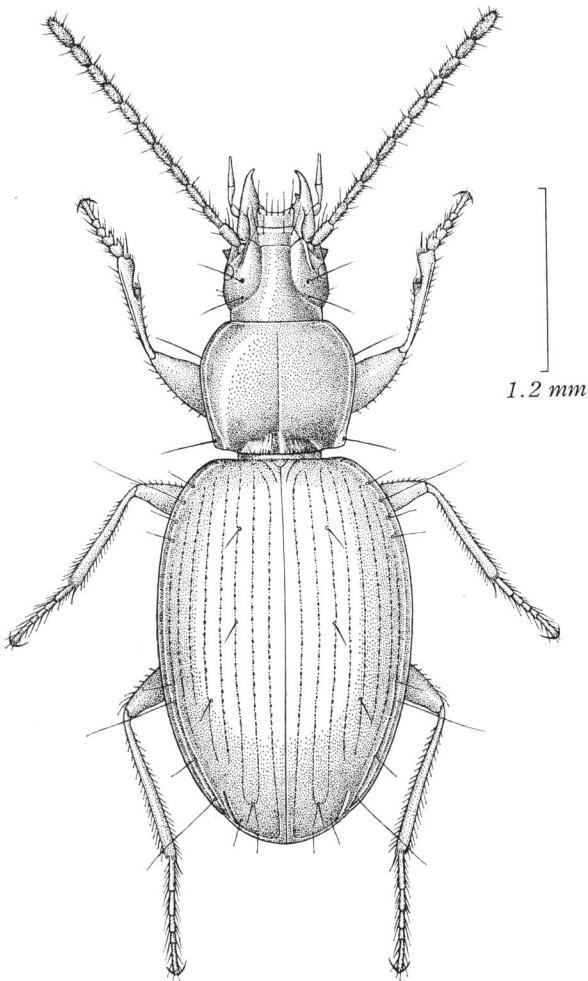


Fig. 10. *Epaphiopsis (Epaphiama) oligops* S. UÉNO, sp. nov., ♂, from Mt. Nakasengen-daké of the Sengen Mountains.

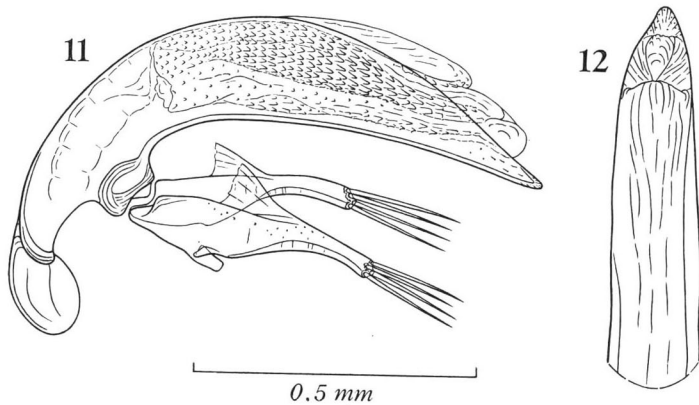
lateral setae normal, the posterior one being slightly before the angle; apex either straight or slightly emarginate, with front angles rounded and not protruding; base more or less arcuate as a whole, always obliquely arcuate on each side just inside hind angle, which is very obtuse and sometimes rounded off; median line distinct, somewhat widening near base; transverse impressions obsolete, basal foveae fairly large and deep, somewhat uneven; postangular carinae absent; basal area widely covered with coarse longitudinal striae.

Elytra oblong-ovate, well convex, much wider than prothorax, widest at about four-ninths from base, and more pointed at apices than at bases; EW/PW 1.59–1.64 (M 1.61),

EL/EW 1.43–1.49 (M 1.46); shoulders effaced, with humeral borders very oblique and feebly arcuate to the base of stria 5; sides widely reflexed, feebly arcuate from shoulders to the level of the apicalmost umbilicate pore, and hardly emarginate before apices, which are conjointly and rather narrowly rounded; striae deeply impressed throughout and coarsely punctate, stria 2 forming a complete anastomosis with the apical end of stria 3, stria 8 deeply impressed throughout and not particularly deepening in its apical part; scutellar striole distinct though sometimes short; apical striole short but deep, almost straight in front, free at the anterior end, and usually directed to stria 7 though rarely directed to stria 5 on one elytron; intervals smooth, gently convex even at the side; apical carina rather obtuse; stria 3 with two setiferous dorsal pores situated at about 1/5 from base or a little before that level and about 4/9 from base; stria 5 with a single setiferous dorsal pore at about 5/8 from base; preapical pore situated at the apical anastomosis of striae 2 and 3, being closer to apical striole than to suture and a little more distant from apex than from suture; microsculpture formed by fine transverse lines, though not very distinct and partially obsolete.

Ventral surface glabrous and smooth; each sternite provided with a single pair of setae along the posterior margin; anal sternite provided with a pair of sexual setae in ♂, with two pair of sexual setae in ♀. Legs fairly stout though not very short; each profemur distinctly denticulate at about basal one-fourth on the ventral face in ♂, obtusely angulate at that part in ♀; each protibia almost straight, moderately dilated towards apex, glabrous on the anterior face, and with a wide groove on the external face; tarsi fairly thin, segment 1 shorter than segments 2 and 3 together in mesotarsus, but longer than segments 2 and 3 together in metatarsus.

Male genital organ relatively small and rather lightly sclerotized. Aedeagus about three-eighths as long as elytra, arcuate, and not prolonged at the apical part, with the dorsal margin semicircularly rounded in profile; basal part small, either curved



Figs. 11–12. Male genitalia of *Epaphiopsis (Epaphiama) oligops* S. UÉNO, sp. nov., from Mt. Nakasengen-daké of the Sengen Mountains; left lateral view (11), and apical part of aedeagus, dorsal view (12).

or moderately bent, with a large elongate sagittal aileron; lateral sides of basal orifice deeply emarginate; viewed laterally, apical part simply tapering to pointed tip and not forming long apical lobe; viewed dorsally, apical lobe very short, subtriangular and blunt at the extremity; ventral margin moderately emarginate in front in lateral view but only slightly so behind middle. Inner sac wholly covered with a compact mat of small scales, which are moderately sclerotized throughout. Styles small and fairly short, though having narrow apical parts, each provided with four apical setae of moderate length.

Type-series. Holotype: ♂, allotype: ♀, paratypes: 2 ♂♂, Mt. Nakasengen-daké, 950 m alt., 18-VII-1971, S. UÉNO leg. (NSMT).

Type-locality. Mt. Nakasengen-daké of the Sengen Mountains on the Matsumaé Peninsula, at the southern end of Oshima in southwestern Hokkaido, northern Japan.

Notes. In the shape of aedeagus, this new species is evidently more primitive than the other species occurring in Hokkaido, though it is more advanced than the latter in having sclerotized scales in its inner sac. On the other hand, this may be the most specialized of all the *Epaphiama* species so far as the subterranean adaptation is concerned, though the eyes are reduced to a greater extent in *E. alloligops* than in the present species. Perhaps *E. oligops* has had a longer history of isolated semiendogean life than the others, and has preserved certain archaic characters possessed by the ancestral trechine.

The Sengen Mountains lie at the southern continuation of the Oshima Mountains, but are isolated from the latter by the valleys of the Ama-no-kawa and Kikonai-gawa Rivers. The highest point of the mountains is called Mt. Daisengen-daké, which is 1,072 m in height. The type-locality of the present species is situated at about 1 km to south-southeast from the main peak, and is about 115 km south by east of Mt. Kariba-yama, that of *E. alloligops*. Trechine beetles were found in the alpine zone at the sources of two steep gullies on both sides of the eastern ridge of Mt. Nakasengen-daké. The habitat condition was almost the same between the two spots, each of which yielded two specimens, in that they were damp being fed by small snow patches and were shaded by low alpine shrubs. The trechines were turned up from under large stones deeply embedded in the soil and were rather sluggish when exposed.

Zoogeographic Notes

As is shown on the accompanying sketch map (Fig. 1), there is a wide geographical gap between the distributional range of *Epaphiama* and those of the two other Japanese subgenera of *Epaphiopsis*. The subgenus *Pseudepaphius* stretches its distribution from the Island of Yaku-shima in the southwest to the Noto Peninsula of central Honshu in the northeast, whereas *Epaphiopsis* (s. str.) spreads along the Pacific coast of central Honshu. Neither of them extends its range into northeastern Honshu, where occur other groups of trechine beetles. Therefore, the Hokkaido species of *Epaphiama* cannot have reached their present habitats through northern Honshu. In all probabil-

ity, their ancestor must have invaded southwestern Hokkaido from Primorskiy Kray across the sea. The fact that all the Hokkaido species are interrelated also suggests transmarine dispersal of their ancestor. Perhaps only one ancestral species of *Epaphiama* was able to reach southwestern Hokkaido and successfully colonized in that part of the island. There is no way to ascertain when this immigration took place, but it may have been effected in rather a recent period, most probably in the late Pleistocene, since succeeding speciation occurred on such recent volcanoes as the Nisekos and the Karibas. At any rate, the original immigrant must have become differentiated first into two ancestral species, proto-*brevis* and prot-*oligops*, and later, the former accomplished further differentiation into three forms, now recognized as two species and a subspecies. This is probably why there is a distinct gap between *E. oligops* and the other Hokkaido species.

As compared with the derivation of the Japanese forms, it is much more difficult to elucidate the origin and route of dispersal of the Siberian representative of *Epaphiama* since our present knowledge is too inadequate about the trechine fauna of the wide area bordering on the northwestern side of the Japan Sea. The only known species, *E. semenovi*, occurs in the Iman District of Primorskiy Kray, but there should be other species of the same group in the extensive mountain range of that territory. To make the speculation more difficult, almost nothing has been known on the trechine beetles distributed in southeastern Manchuria and the Korean Peninsula, with the exception of a series of cave-dwelling forms, all of which belong to the *Trechoblemus* complex, occurring in the southern part of the peninsular country. Certain *Epaphiopsis*, possibly of the subgenus *Epaphiama*, should also occur there, especially in the mountains on the borders of Manchuria and Korea. Needless to say, this does not necessarily mean that the Korean Peninsula may have served as a route of dispersal of the ancestors of *Epaphiama*, nor that the ancestors of Japanese *Pseudepaphius* may have come from the Asian Continent through the peninsula, even if the above conjecture is confirmed. It is, however, of deep interest to find what kind of *Epaphiopsis* is distributed in Korea, since it may prove of considerable importance for an analysis of the past dispersal of this group of trechine beetles.

It was already pointed out that Taiwan is included in the distributional range of the genus *Epaphiopsis* (cf. UÉNO, 1962, p. 43). Though only a single species, *E. formosana* (JEDLIČKA) (= *Tasmanorites formosanus* JEDLIČKA, 1946, p. 2, pl. 2, fig. 12), has hitherto been described, there are actually several new forms to be reported from high mountains of Taiwan (UÉNO, in preparation). Though most of them look like members of *Epaphiopsis* (s. str.) in general appearance, all these Taiwanese species belong to a new subgenus endemic to the island, so that they do not bear any direct relationship with the species belonging to the Japanese and Siberian subgenera. Their ancestors seem to have invaded Taiwan from eastern China, which must be the native place of the whole genus. This inference is supported by the fact that a possible prototype of *Epaphiopsis* occurs on the Tien-mu Shan Mountains in eastern China. The archaic species in question is *Tienmutrechus dispersipunctis* SUENSON (1957, p. 91, pl. 1, lower

right), which has all the basic characters of *Epaphiopsis* with the exception of the striking supernumerary of pronotal lateral and elytral dorsal setae (cf. UÉNO, 1976). Like a majority of *Epaphiopsis*, this curious trechine is primarily humicolous, having been found from heaps of dead leaves in a temperate forest.

Having originated in the Chinese Continent, ancestors of *Epaphiopsis* somehow found their way to such fringing islands as Taiwan and Southwest Japan, and also to Primorskiy Kray probably through southern Manchuria. They have become differentiated into several subgenera in the process of dispersal, perhaps according to different routes of immigration. Once established in the Ussuri area, ancestral trechines, then differentiated into *Epaphiama*, extended their range further eastwards. One of them succeeded in crossing the northern part of the Japan Sea, most probably carried by wind, and settled a new colony in the southwestern part of Hokkaido. Since members of this subgenus have not been known in the main part of Hokkaido beyond the Ishikari Lowland nor in northern Honshu beyond the Tsugaru Straits, their ancestor cannot have come from those directions. As was already pointed out, the only plausible explanation for this strangely limited occurrence of the *Epaphiama* species seems to be that all of them have been derived from an ancestor that invaded southwestern Hokkaido from Primorskiy Kray by a sweepstakes dispersal at rather a recent time.

The discussion given above can be disputed on the ground that our knowledge is still very poor on the trechine fauna of the continental part of East Asia. This is unquestionably true, but under the present political situation, no single entomologists can undertake extensive collectings on either side of frontiers in the northern Far East. It is to be hoped that sufficient data on this subject will be obtained in future by local entomologists in China, Korea and the Soviet Union. Only when this is realized, we shall be able to analyse in full detail distributional patterns of *Epaphiopsis* and its relatives and to confirm my conjecture delineated in this paper.

Summary

The cryptozoic trechine beetles belonging to *Epaphiama* are enumerated. Based upon a re-examination of the type material of *E. semenovi*, the type-species, it is concluded that *Epaphiama* should be regarded as a subgenus of *Epaphiopsis*. Three new species and a new subspecies of the same group are described from the southwestern part of Hokkaido in northern Japan. They are *E. brevis* (with subsp. *rectilobata*), *E. alligops* and *E. oligops*, the latter two of which have lost functional eyes and are adapted to semiendogean habitats on high mountains. A brief discussion is devoted to their origin and dispersal, being concluded that they arose in the Chinese Continent as a part of *Epaphiopsis*, dispersed northeastwards to Primorskiy Kray in southeastern Siberia and became differentiated into *Epaphiama*, that one of the ancestral forms succeeded in crossing the Japan Sea by sweepstakes dispersal and established a new colony in southwestern Hokkaido, and that this ancestral trechine accomplished further differentiation into three species and a subspecies.

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