

Two New Trechine Beetles from Mine Adits in Northwestern Shikoku, Japan¹⁾

By

Shun-Ichi UÉNO

Department of Zoology, National Science Museum, Tokyo

After realizing the occurrence of troglobiontic animals in mine adits several years ago (cf. UÉNO, 1977), we have discovered new anophthalmic trechine beetles in the areas lacking in natural caves. Most of them serve for filling in blanks in our knowledge of the distributions of genera or species-groups already known from calcareous and lava areas, but there are some species whose direct relatives have never been found in natural cavities.

The Island of Shikoku in Southwest Japan is one of the areas which are noted for the remarkable speciation of anophthalmic trechines. However, almost all the hitherto known species have been found in limestone caves, narrowly distributed from east to west along the long axis of the island. With the exception of several endogean forms (cf. UÉNO, 1975, 1976), no anophthalmic trechines have been met with in non-calcareous areas north and south of the limestone strata.

These blanks have been filled to some extent by recent investigations of mine adits; more than half a dozen new species of troglobiontic trechines have been discovered in the northwestern and southwestern parts of Shikoku. They are distributed to *Ishikawatrechus*, *Yuadorgus*, *Yamautidius*, and the new group to be dealt with in the present paper. This new taxon comprises two new species, both localized in the Takanawa Peninsula in northwestern Shikoku, which is widely distant from limestone areas. It seems to have been derived from *Yamautidius*, and can be regarded as a new subgenus of the latter.

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.

The new species to be described in this paper were discovered primarily by the enthusiastic investigations of Mr. Hiroshi MIYAMA, to whom I wish to thank in the first place. I am also greatly indebted to Messrs. Kazuo ISHIKAWA and Yutaka NOTSU for their kind aid extended to me in the course of the present study.

1) This study is supported by the Grant-in-aid for Scientific Research from the Ministry of Education, No. 154258.

Subgenus *Miyamaidius* S. UÉNO, nov.

Type-species: *Yamautidius aenigmaticus* S. UÉNO, sp. nov.

Similar in many details to the nominate subgenus but distinguished by the absence of the posterior dorsal pore on elytral stria 3 and the presence of a row of pubescence on each elytral interval.

Body more or less pubescent on both the dorsal and ventral surfaces.

Head fairly large, with entire frontal furrows; eyes absent; supraorbital pores as usual, being situated on lines slightly convergent posteriad; genae convex and pubescent; mentum imperfectly fused with submentum, labial suture vanished for the large part though visible at the sides as vestiges; mentum tooth broad and deeply cleft at the tip; submentum sexsetose; ligula triangularly produced, octosetose at the apical part; palpi fairly slender, penultimate segments moderately dilated towards apices, shorter than apical segment and perfectly glabrous in maxillary palpus, about as long as apical segment and quadrisetose in labial palpus, apical segments elongated subconical; antennae filiform, long and fairly stout.

Pronotum cordate, strongly contracted behind, with brief ante-basal sinuation on each side; sides narrowly bordered throughout, with two pair of lateral setae, the posterior one of which is distant from hind angles; base truncated, with a sharp hind angle on each side; postangular carinae absent; disc rather densely covered with fairly long, suberect hairs; median line distinct though not widening near base; basal transverse impression continuous though more or less irregular, with a foveole on each side of median line, and laterally merging into basal foveae, which are small but distinct.

Elytra elongated oval, without transverse furrow on basal peduncle for the reception of pronotal base; sides narrowly bordered, the borders narrowly extending antieriad to basal peduncle though hardly visible from above at the basal parts; striae superficial, more or less obliterated at the side; scutellar striole absent; apical striole very short, shallow, moderately curved, and directed to the site of stria 5; intervals flat, each with a row of short suberect pubescence, which is rather dense in *Y. aenigmaticus* but sparse in *Y. anaulax*; apical carina obtuse; stria 3 with a single setiferous dorsal pore near base, stria 5 also with a single setiferous dorsal pore behind middle; preapical pore situated at the apical anastomosis of striae 2 and 3, usually on the level of the terminus of apical striole; marginal umbilicate pores not perfectly aggregated, 2nd to 4th pores of the humeral set being rather widely spaced and nearly equidistant, while the 1st pore is evidently, though not much, distant from marginal gutter and close to the 2nd.

Ventral surface sparsely pubescent at the median part of each sternum and sternite; anal sternite provided with a pair of sexual setae in ♂, with two pair of the setae in ♀. Legs fairly slender; protibiae almost straight or slightly bowed, moderately dilated towards apices, either entirely pubescent and not externally grooved (*Y. anaulax*) or almost glabrous on the anterior face in apical part and longitudinally grooved on

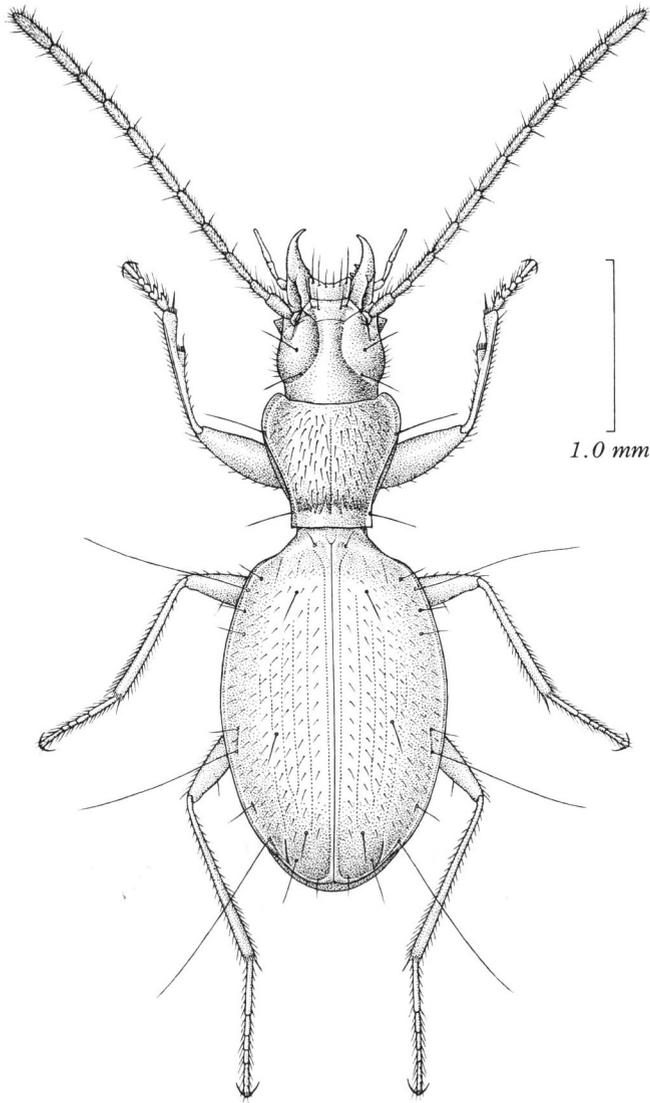


Fig. 1. *Yamautidius (Miyamaidius) aenigmaticus* S. UÉNO, subgen. et sp. nov., ♂, from Chihara-higashi-kô Mine in Tanbara-chô.

the external face (*Y. aenigmaticus*); tarsi fairly thin, segment 4 with a long ventral apophysis in pro- and mesotarsi; in ♂, two proximal segments of each protarsus widely dilated, inwardly denticulate at apices and furnished beneath with sexual adhesive hairs.

Aedeagus rather small, lightly sclerotized, and more or less arcuate, with a

distinct central tubercle at the apical extremity; basal part with small basal orifice and narrow sagittal aileron; inner sac more or less scaly and armed with a large anisotropic copulatory piece; each style usually provided with three apical setae, but an additional seta is sometimes present on one of them.

Range. Takanawa Peninsula in northwestern Shikoku, Southwest Japan.

Notes. The type-species of this new subgenus is a very strange trechine, whose systematic position had not been clarified till the second species of the same group was discovered. It is similar in many details to the members of *Yamautidius* (s. str.) (UÉNO, 1957, pp. 184, 187, 1960, pp. 73–74; JEANNEL, 1962, pp. 202, 207), but is identical in protibial structure with *Rakantrechus* (s. str.) (UÉNO, 1951, p. 88, 1957, pp. 184, 187; JEANNEL, 1962, pp. 202, 205). On the other hand, the second species, *Y. anaulax* sp. nov., is, so far as the protibial structure is concerned, perfectly identical with *Yamautidius* (s. str.) and radically different from *Y. aenigmaticus*.

In the trechine taxonomy, the difference of this kind is usually adopted for discriminating genera or subgenera, or at least species-groups. It is, however, useless attempting to classify *Y. aenigmaticus* and *Y. anaulax* into two separate groups, considering their extreme similarity in all the other external features and the basic structure of male genitalia. These two species must have been derived from a common ancestor, which in turn became differentiated from typical *Yamautidius*, after being isolated in the subterranean domain of the Takanawa Peninsula. One of them (*Y. aenigmaticus*) somehow acquired the advanced protibial character, and in this respect, became exceptional within the genus *Yamautidius*.

The new subgenus and the two new species included in it will be recognized by the key given below.

Key to the Subgenera and the *Miyamaidius* Species

- 1 (2) Elytra glabrous, with two setiferous dorsal pores on stria 3
..... Subgenus *Yamautidius* s. str.
- 2 (1) Elytra more or less pubescent, with a single setiferous dorsal pore on stria 3
..... Subgenus *Miyamaidius* S. UÉNO, nov. (3, 4).
- 3 (4) Protibia externally grooved and almost glabrous on the anterior face in apical
part; pronotal base wider; elytra rather densely pubescent; aedeagus more
elongate and more strongly arcuate, with thicker apical part and larger
apical tubercle; styles longer and narrower; (Chihara-higashi-kô Mine)
..... *Y. (M.) aenigmaticus* S. UÉNO, sp. nov.
- 4 (3) Protibia entirely pubescent and not externally grooved; pronotal base narrower;
elytra very sparsely pubescent; aedeagus shorter and only feebly arcuate,
with thinner apical part and compressed apical tubercle; styles shorter and
broader; (prospecting adit at Aonami)
..... *Y. (M.) anaulax* S. UÉNO, sp. nov.

Yamautidius (Miyamaidius) aenigmaticus S. UÉNO, sp. nov.

[Japanese name: Miyama-mekura-chibigomimushi]

(Figs. 1–3)

Length: 3.40–3.60 mm (from apical margin of clypeus to apices of elytra).

Body small and weak, strongly constricted between prothorax and hind body; fore body fairly large. Colour light reddish brown, shiny, translucent when alive; palpi, apical half of antennae, ventral surface of hind body, and legs yellowish brown, always paler than the rest of body.

Head subquadrate, depressed above, with deep entire frontal furrows which are moderately curved and not angulate at middle; frons and supraorbital areas gently convex, vertex glabrous; microsculpture distinct, consisting of polygonal meshes which are more or less wide for the large part; genae moderately and regularly convex; neck very wide, with the anterior constriction not deep though clearly marked at the sides; labrum transverse, widely emarginate at apex; mandibles fairly stout though sharply hooked at apices; antennae long and fairly stout, reaching apical four-ninths of elytra, with segment 2 about five-sevenths as long as segment 3 or 4, segments 8–10 cylindrical, each about three times long as wide, terminal segment the longest though obviously narrower than scape.

Pronotum cordate, distinctly wider than head, a little wider than long, widest at about six-sevenths from base, and strongly contracted towards base; PW/HW 1.31–1.35 (M 1.33), PW/PL 1.13–1.15 (M 1.14), PW/PA 1.30–1.35 (M 1.32), PW/PB 1.77–1.83 (M 1.80); surface gently convex on the disc, more strongly so at the sides, and rather densely covered with fairly long, suberect hairs; microsculpture irregular, consisting of transverse lines and polygonal meshes; sides narrowly but strongly arcuate in front, almost straight or slightly emarginate at middle, and shallowly sinuate at about one-seventh from base or a little behind that level; apex slightly but widely emarginate, much wider than base, PA/PB 1.36–1.38 (M 1.37), the latter being straight though slightly emarginate just inside each hind angle; front angles porrect though rounded; hind angles sharp, more or less projecting postero-laterad; apical transverse impression vague, sometimes obsolete; basal area narrow, usually smooth. Ventro-lateral sides of prothorax distinctly visible from above.

Elytra elongated oval, widest at about middle, and more regularly contracted towards apices than towards bases; EW/PW 1.59–1.65 (M 1.62), EL/EW 1.52–1.56 (M 1.54); surface moderately convex though rather depressed on the disc; microsculpture irregular, consisting of transverse lines which partially form polygonal meshes; shoulders rounded though obvious; prehumeral borders distinctly sinuate, running down to the ventro-lateral sides of basal peduncle and becoming almost invisible from above at the oblique basal parts; sides gently arcuate from behind shoulders to near apices, with very slight preapical emarginations; apices almost conjointly rounded, though having a small re-entrant angle at suture; striae very shallow, either indistinctly crenulate or almost smooth, 1–3 almost entire, 4–5 usually traceable

on the disc, 5 more or less deepening near base, 6–7 usually obliterated though rarely perceptible at middle, 8 fragmentary though moderately impressed around the umbilicate pores of the middle and apical sets; intervals flat, each bearing a rather dense row of short suberect pubescence; setiferous dorsal pore on stria 3 situated at $1/7-1/6$ from base, that on stria 5 at $5/9-3/5$ from base.

Legs fairly slender; each protibia longitudinally grooved on the external face and almost glabrous on the anterior face in apical part; tarsi thin.

Male genital organ rather small though elongate; lightly sclerotized. Aedeagus slender, two-fifths as long as elytra, feebly arcuate in basal half, more strongly so behind middle, and slightly reflexed in apical part; basal part small, strongly bent ventrad, and bearing narrow sagittal aileron; basal orifice small, turning caudad, with the sides hardly emarginate; viewed laterally, aedeagus thickest at about two-fifths from apex, and then gradually narrowed towards blunt extremity; viewed dorsally, apical part almost parallel-sided to rounded extremity, which bears a large central tubercle; ventral side widely emarginate in profile. Inner sac scaly, but the scales are rather poorly sclerotized, mainly covering the right side of copulatory piece; copulatory piece large, spatulate, very broad at base, gently twisted in apical part, and rounded at apex. Styles narrow, left style being longer than the right; apical setae relatively short and fine; in the holotype, left style provided with three apical setae, while the right bears four.

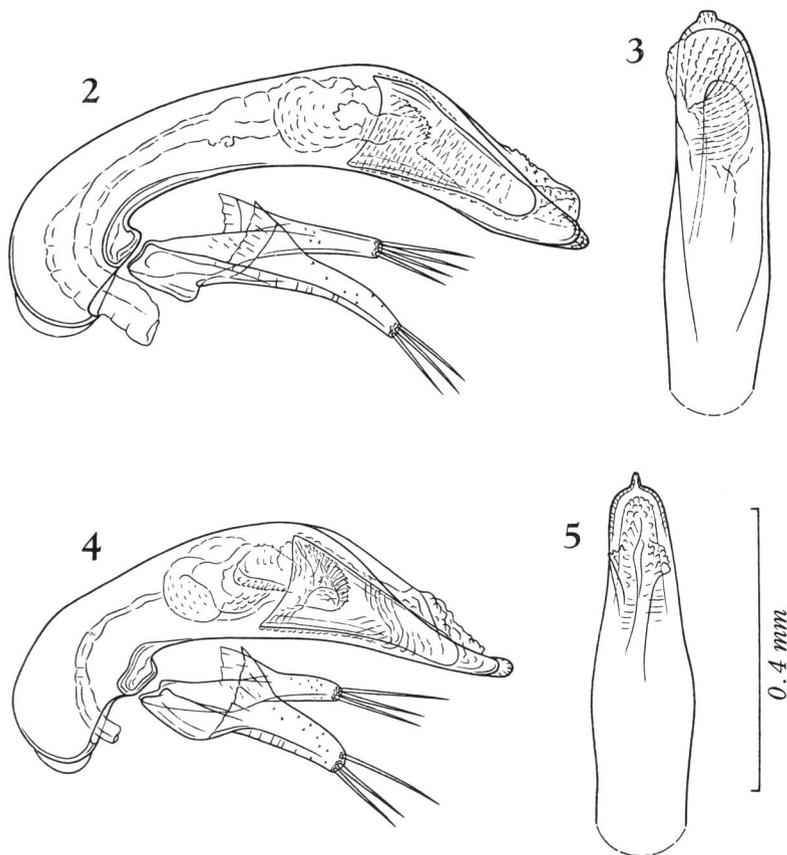
Type-series. Holotype: ♂, allotype: ♀, 4–XII–1977, H. MIYAMA leg. Paratypes: 1 ♀, 15–I–1978, H. MIYAMA leg. (found in a baited trap set by H. MIYAMA on 11–XII–1977); 1 ♀ (teneral), 16–III–1978, H. MIYAMA leg.

All the specimens of the type-series are deposited in the collection of the National Science Museum (Nat. Hist.), Tokyo.

Type-locality. Abandoned adit of Chihara-higashi-kô Mine, at Chihara of Tanbara-chô, in Ehimé Prefecture, northwestern Shikoku, Southwest Japan.

Notes. The type-locality of this interesting new trechine is one of the abandoned adits of an old copper mine situated at the base of the Takanawa Peninsula about 18 km east of the City of Matsuyama. There is a main adit of the mine on either side of the valley of the Nakayama-gawa River; only the eastern adit called Chihara-higashi-kô has yielded the trechine beetle.

This adit opens under a cliff on the right side of the valley several metres above the water, and gradually slants up from the entrance to the innermost. It is dug through chlorite schist and has many side passages, one of which, dug into muscovite-quartz schist, harbours troglomorphic animals including the trechine beetle. The floor of this side passage is thickly covered with rubble, beneath which are shallow pools of water here and there. The beetle dwells under the rubble, especially in muddy spots, but appears to be rare. Of the four specimens now known, three were taken by hand as isolated individuals and the remaining one was found in a baited trap. I myself visited the mine adit twice but failed in finding any specimen of the trechine.



Figs. 2-5. Male genitalia of *Yamautidius* (*Miyamaidius*) spp.; left lateral view (2, 4), and apical part of aedeagus, dorsal view (3, 5).—2-3. *Y. (M.) aenigmaticus* S. UÉNO, sp. nov., from Chihara-higashi-kô Mine in Tanbara-chô. —4-5. *Y. (M.) anaulax* S. UÉNO, sp. nov., from a prospecting adit at Aonami in Matsuyama-shi.

Yamautidius (*Miyamaidius*) *anaulax* S. UÉNO, sp. nov.

[Japanese name: Aonami-mekura-chibigomimushi]

(Figs. 4-5)

Length: 3.30-3.65 mm (from apical margin of clypeus to apices of elytra).

Very closely allied to *Y. aenigmaticus* and according with the latter in every detail with the exception of obviously narrower pronotal base, much sparser pubescence on elytral intervals, the structure of protibiae which are entirely pubescent and not externally grooved, and the shape of male genitalia which are smaller and shorter, having differently shaped aedeagal apical part and styles.

Colour and cephalic features as in *Y. aenigmaticus*, but the labrum is shallowly

emarginate at apex and the antennae are a little longer, reaching or extending a little beyond basal three-fifths of elytra. Pronotum cordate, widest at five-sixths from base, and more strongly contracted behind than in *Y. aenigmaticus*, with obviously narrower base; PW/HW 1.33 in the holotype and 1.38 in the paratype, PW/PL 1.12 and 1.18, PW/PA 1.30 and 1.32, PW/PB 1.91 and 1.88; sides briefly sinuate just before hind angles, which form sharp denticles; base much narrower than apex, PA/PB 1.47 in the holotype and 1.42 in the paratype; basal area very narrow and more or less uneven. Elytra as in *Y. aenigmaticus*, but the pubescence is much sparser, especially on inner intervals; EW/PW 1.59 in the holotype and 1.57 in the paratype, EL/EW 1.54 and 1.55; stria 8 moderately impressed and almost continuous in apical half. Legs somewhat stouter than in *Y. aenigmaticus*; protibiae entirely pubescent and not externally grooved; tarsi relatively thick.

Male genital organ smaller and shorter than in *Y. aenigmaticus*. Aedeagus only a little more than one-third as long as elytra, moderately compressed, and only feebly arcuate, being thickest just behind middle; apical part flattened and slightly reflexed, rapidly narrowed towards narrowly produced extremity in lateral view, gradually narrowed towards narrowly rounded extremity in dorsal view, with the apical central tubercle compressed and protruding; basal part relatively elongate, less strongly bent ventrad than in *Y. aenigmaticus*, with basal orifice shallowly emarginate at the sides; sagittal aileron very small and narrow; ventral side only slightly emarginate behind middle in profile. Inner sac as in *Y. aenigmaticus*, but the copulatory piece is proportionally large and elongate, and the scales are a little more heavily sclerotized, especially at the left side of the basal part of copulatory piece. Styles short and broad, left style obviously larger than the right, each provided with three, fairly long setae at apex; in the paratype, the left style bears four setae instead of three.

Female unknown.

Type-series. Holotype: ♂, 9-IV-1978, H. MIYAMA leg. Paratype: 1 ♂, 31-I-1978, Y. NOTSU leg. Both deposited in the collection of the National Science Museum (Nat. Hist.), Tokyo.

Type-locality. A prospecting adit (nameless) at Aonami of Matsuyama-shi, in Ehime Prefecture, northwestern Shikoku, Southwest Japan.

Notes. It is most surprising that the present species is radically different from *Y. aenigmaticus* in the structure of protibiae. As was already pointed out, however, it is extremely similar to the latter species in all the other external features and the fundamental structure of male genitalia, and is doubtless related to it.

The type-locality of *Y. anaulax* is a prospecting adit of a manganese mine, which is dug into fine-grained sandstone on the right bank of a gully about 600 m south of the village of Aonami. Its location is about 7 km ENE of Dôgo Hot Spring at the northeastern corner of the City of Matsuyama and a little more than 13 km WNW of Chihara-higashi-kô Mine, the type-locality of *Y. aenigmaticus*. The adit is horizontal and only 12 m deep, but the floor is always damp and thickly covered with rubble, harbouring various cavernicoles. One of the most striking of them is the

present trechine, which seems very rare and restricted to a small spot near the end of the adit. Trappings have been repeatedly attempted but so far fruitless; the two known specimens were taken by hand from a heap of muddy stones under the innermost wall.

References

- JEANNEL, R., 1962. Les Trechini de l'Extrême-Orient. *Rev. fr. Ent.*, **29**: 171–207.
- UÉNO, S.-I., 1951. Carabid-beetles found in limestone caves of Japan. *Ent. Rev. Japan, Osaka*, **5**: 83–89, pl. 4.
- 1957. Studies on the Japanese Trechinae (VI) (Coleoptera, Harpalidae). *Mem. Coll. Sci. Univ. Kyoto*, (B), **24**: 179–218, pl. 1.
- 1960. Occurrence of *Yamautidius* in two limestone caves of western Shikoku (Coleoptera: Harpalidae). *Trans. Shikoku ent. Soc.*, **6**: 67–75.
- 1975. Two new *Trechiana* (Coleoptera, Trechinae) from eastern Shikoku, Japan. *Bull. Natn. Sci. Mus., Tokyo*, (A), **1**: 203–212.
- 1976. Occurrence of *Stygiotrechus* (Coleoptera, Trechinae) in the Island of Shikoku, Japan. *Ibid.*, **2**: 277–284.
- 1977. The biospeleological importance of non-calcareous caves. *Proc. 7th Int. Speleol. Congr., Sheffield 1977*, pp. 407–408.
- & N. KASHIMA, 1978. An Introduction to Speleology. Exploring the Underground World in Darkness. *Blue Backs*, B-361. 233 pp. Tokyo, Kodansha. (In Japanese.)

