

Studies on the Japanese Trechinae (II)¹⁾

(Coleoptera, Harpalidae)

By

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In the early summer of 1952, an interesting cavernicolous species of the Trechinae was found by the present writer in a limestone cave called "Ja-ana" that lies at about 10 km north-east of Toyohashi City. Another exploration by Prof. R. YOSII and his collaborators in 1953 made evident that the second species belonging to the same taxonomic group inhabited the two limestone caves, called "Ohsawa-no-kaza-ana" and "Gochigoé-no-yoko-ana" in the province of Isé. These discoveries are very important from the zoögeographical point of view, because, the Palaeozoic limestone formations, where there lie the caves under consideration, belong to the same system of stratum, though interrupted by the mouth of the Bay of Isé.

Recently, the writer was fortunate to have the opportunities to survey nearly all the known caves lying in these strata. The caves are distributed over three prefectures (fig. 1); the easternmost of them is a grotto called "Gansuiji-no-ana" in Shizuoka Pref., and the westernmost is "Shûrei-no-mizu-ana" in Mié Pref. The cave-dwelling Trechids were obtained from six caves, five in Mié Pref, and one in Aichi Pref., while they were not found in the caves as far east as in Shizuoka Pref.

The cavernicolous Trechids found in these areas are remarkable among the Japanese Trechinae in the point of having no dorsal pores on the third elytral stria. Up to late times the writer had supposed that such a group of Trechids was an independent genus to be related to *Trechus*. However, a number of recently found cave-dwelling species which belong to *Trechiana* show a great variability in chaetotaxy characteristic to that subgenus. This fact has led him to a conclusion that the group of beetles without dorsal pores on the third elytral stria

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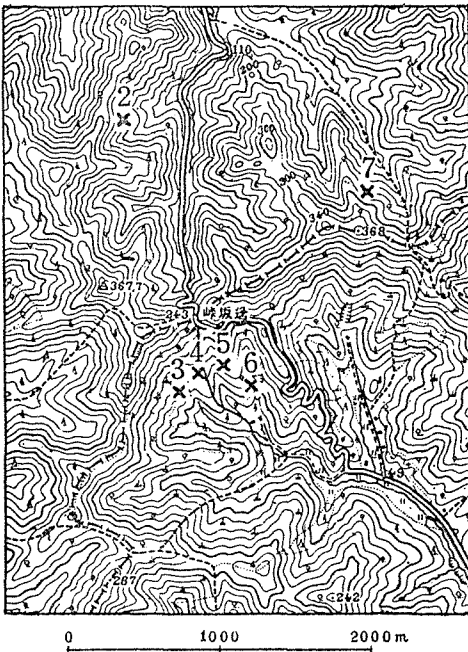
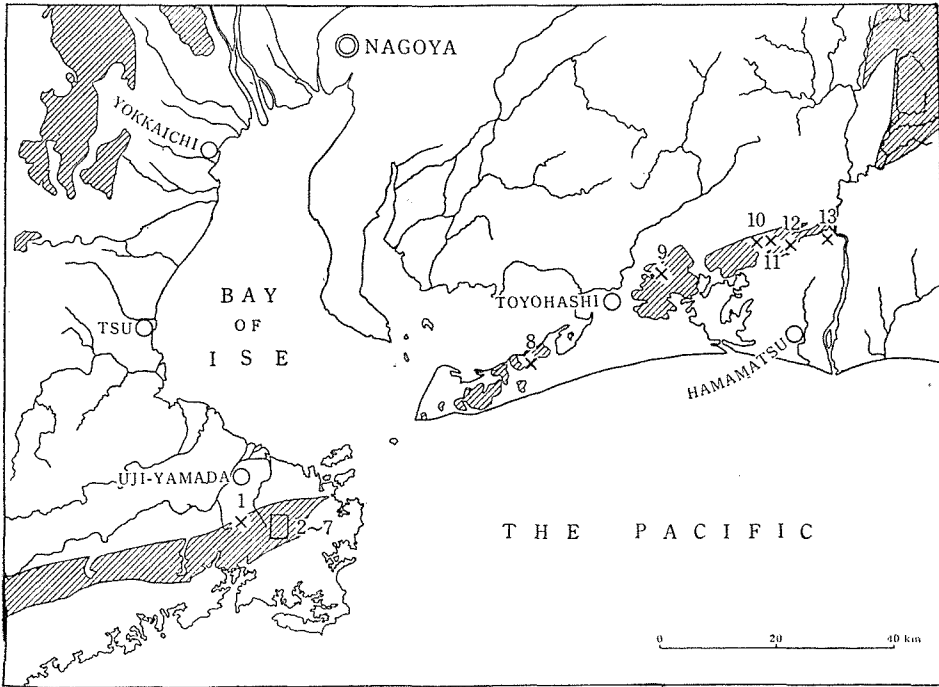


Fig. 1. Map showing the distribution of limestone caves; oblique lines present the Palaeozoic formations.

1, Shûrei-no-mizu-ana Cave; 2~7, enlarged in fig. 2; 8, Tahara-no-ana Cave (this grotto was destroyed by lime industry); 9, Ja-ana Cave; 10, Tabataké-no-ana Cave; 11, Tokkano-ana Cave; 12, Takizawa-no-ana Cave; 13, Gansuiji-no-ana Cave.

Fig. 2. Map showing the distribution of limestone caves at Shimajiyama.

2, Hiuchiishi-no-ana Cave; 3, Kuradani-no-ana Cave; 4, Ohsawa-no-mizu-ana Cave; 5, Ohsawa-no-kazana Cave; 6, Haigama-no-ana Cave; 7, Gochigoé-no-yoko-ana Cave.

may belong to an aberrant subgenus in the polytypic genus *Trechus* and not a special one. For this subgenus the writer wishes to give a new group name, *Pseudotrechiama*.

In the neighbouring areas of its range of distribution, *Pseudotrechiama* is replaced by *Ishidatrechus* (in litt.) and *Kurasawatrechus* in the limestone caves in the northern strata and by *Kusumia* in the western, outside of the areas here discussed. These three genera will be enumerated in three forthcoming papers.

The writer wishes to express his hearty thanks to Prof. Kenji NAKAMURA for his kind advice and encouragement during the course of this study. He is greatly indebted to the staff and students of Kyoto University, especially Messrs. Tadashige HABA, Gentaro IMADATE, Shunji SHIBANAI, Yoshito WADA and Riozo YOSII, for their kind assistance at field works. His gratitudes should also be expressed to Mr. Toshiharu IWATA of the Managing Office of the Isé Shrine, Mr. Kôhei SAKAGUTI of Osaka University and Mr. Masayoshi YOSHIDA of Shizuoka University, whose kind help made the writer's cave-exploration possible.

One of the new species described in this paper has been worked out in collaboration with Mr. Shunji SHIBANAI of our Institute.

Pseudotrechiama S. UÉNO, subgen. nov.

Type-species: *Trechus (Pseudotrechiama) habei* S. UÉNO, sp. nov.

Body glabrous, depigmented and shiny; metathoracic membranous wings absent.

Head with curved deep frontal furrows, which are complete and not angulate at middle; eyes vestige; genae moderately convex; mentum free, with a stout tooth on apical emargination, which is nearly truncated or slightly bifid at apex, submentum with three setae on each side; antennae long and stout.

Pronotum cordate; sides well rounded in front, distinctly sinuate behind, with one or two lateral setae; hind angles sharp and more or less projected.

Elytra oval, striate; two dorsal pores present on stria 5 but absent on stria 3, apical pore present on the meeting point of striae 2 and 3; series of umbilicate pores regular.

Anal sternite with a seta in ♂, two in ♀ on each side.

Legs moderately long; protibiae externally grooved and glabrous even at apex; protarsi in ♂ with two proximal segments dilated, inwardly produced at apices and furnished beneath with sexual adhesive hairs.

Aedeagus *Trechus*-type; inner sac armed with a well developed copulatory piece in both known species.

Closely allied to *Trechiamia* JEANNEL, but distinguished from the latter subgenus by the absence of dorsal pores on the third elytral stria.

Key to species and subspecies

- 1 (2) Pronotum with a pre-postangular seta; elytral striae only indistinctly crenulate; aedeagus robust, tapering suddenly near apex, basal part strongly arcuate and without sagittal aileron; inner sac armed with a large copulatory piece and two groups of large teeth*T. habei* S. UÉNO, sp. nov.
- 2 (1) Pronotum without pre-postangular seta; elytral striae distinctly crenulate; aedeagus elongate, with apex rounded, basal part much less arcuate and with a sagittal aileron; inner sac armed with a small copulatory piece and without group of teeth. (*T. imadatei* S. UÉNO et SHIBANAI, sp. nov.).
- 3 (4) Pronotum wider, sides strongly rounded in front, and base distinctly wider than apex; shoulders of elytra obvious though rounded; aedeagus moderately arcuate, with apical part wide*T. imadatei imadatei* s. str.
- 4 (3) Pronotum narrower, sides less rounded in front, and base only slightly wider than apex; shoulders of elytra effaced; aedeagus hardly arcuate behind middle, with apical part narrow *T. imadatei iwatai* S. UÉNO, subsp. nov.

***Trechus (Pseudotrechiana) habei* S. UÉNO, sp. nov.**

Pseudotrechiana habei S. UÉNO, 1953 (in litt.), Shin Konchû, Tokyo, 6, (11), p. 44.

Length: 4.9~5.5 mm (from front margin of clypeus to anal end).

Colour reddish brown, shiny, translucent when alive, basal segment of antennae and legs somewhat paler; palpi pale reddish brown.

Head quadrate, with deep frontal furrows, diverging both in front and behind; trace of eyes small, quite flat; genae moderately convex; mandibles slender; antennae long, extending beyond the middle of elytra; microsculpture formed by distinct reticulation.

Pronotum cordate, moderately convex, fully 1.4 times wider than head, fully 1.1 times wider than long, widest at about five-sevenths from base; sides well rounded in front, rather sharply sinuate behind, side-border nearly straight before hind angle; two lateral setae present, of which hind one is inserted at a portion a little before angle which is sharp and projecting both laterally and basally, front angles rounded and a little produced forwards; base reduced at the middle and slightly wider than apex which is widely emarginate; median line deep, especially near base, reaching basal border but not apex; front transverse impression slight, basal one shallow and with an evident elongate pore on each side of median line; basal foveae large and deep, apical part of each fovea becomes shallower but extends anteriorly along side-gutter; disk with slight transverse striations; microsculpture consisted of transverse lines.

Elytra oval, convex, fully 1.7 times wider than pronotum, about 1.45 times

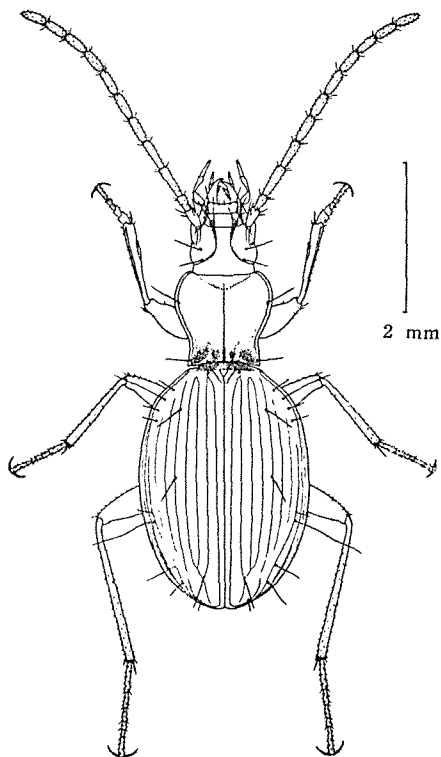


Fig. 3. *Trechus (Pseudotrechiama) habei* S. UENO, subgen. et sp. nov., ♂, of Ja-ana Cave.

longer than wide, widest at about middle; sides widely rounded at shoulder and slightly sinuate before apex; striae entire and indistinctly crenulate, fairly deep on disk but faint at the sides; scutellary striae short, both apical stria and apical carina distinct; intervals fairly convex on disk; stria 5 with two dorsal pores, located at about one-sixth and a little before middle respectively; microsculpture formed by transverse lines though indistinct.

Male genital organ fairly large and well chitinized. Aedeagus robust, large and wide at base and middle, rather suddenly tapering near apex which is blunt at the tip; ventral side convex; basal part strongly arcuate and without sagittal aileron. Inner sac armed with a very large triangular copulatory piece and two groups of large teeth; the former is a little twisted toward apex so as to approach the level; an apical group of large teeth arranged in a row and placed at the right dorsal side of

the large piece, a basal group placed at the left ventral side of the piece. Left style a little longer than right, each provided with four apical setae; left style rarely with five apical setae according to individuals.

Type-locality; Ja-ana Cave at Susé, Ishimaki-mura, Aichi Prefecture, on the Pacific Coast of Central Japan.

Holotype: ♂; allotype: ♀; paratypes: 14 ♂♂, 5 ♀♀ (15—VI—1952, collected by S. UENO).

The holotype and the allotype are deposited in the writer's collection. The paratypes are distributed to the collections of the following museums and specialists: the present writer, Mr. Akinobu HABU of the National Institute of Agricultural Sciences (Tokyo), Entomological Laboratory of Kyushu University (Fukuoka), Museum of Comparative Zoölogy (Cambridge, Mass.), Mr. Henri COIFFAIT of Faculté des Sciences (Toulouse), and Muséum National d'Histoire Naturelle (Paris).

Remarks: The limestone cave "Ja-ana" lies in the Permian formation and is one of eutrophic caves in Japan. The cave-floor, where the present new species was found, is very wet and rich in organic matters, *i. e.*, deposits of bats' excre-

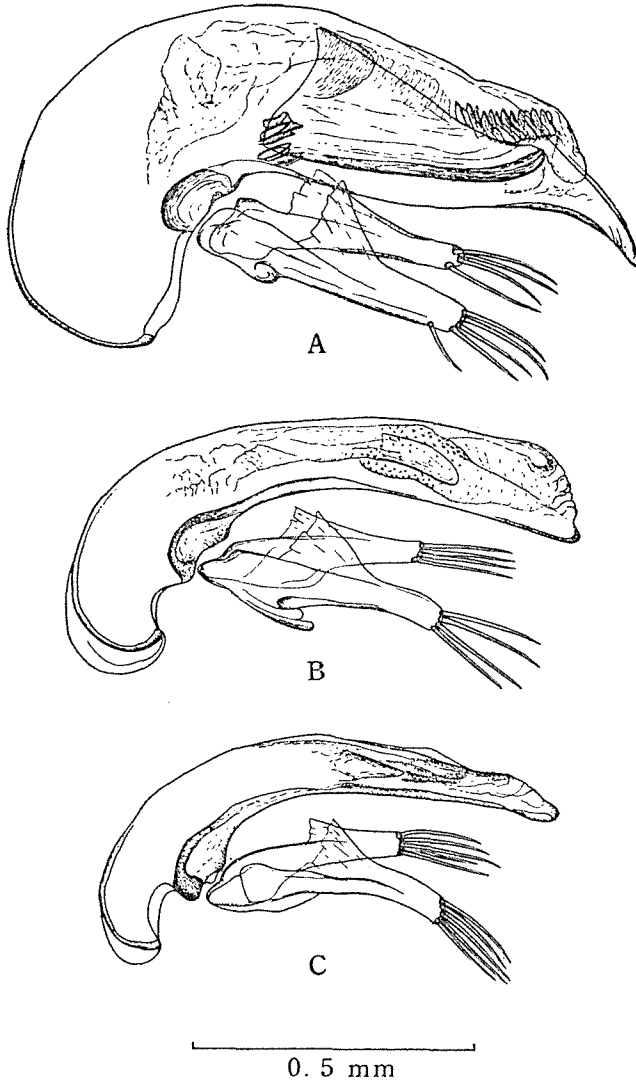


Fig. 4. Male genital organ; viewed from left lateral side.

A, *T. habei* S. UÉNO, sp. nov., of Ja-ana Cave.

B, *T. imadatei* S. UÉNO et SHIBANAI, sp. nov., of Ohsawa-no-kaza-ana Cave.

C, *T. imadatei iwatai* S. UÉNO, subsp. nov., of Shûrei-no-mizu-ana Cave.

ment and decayed woods brought into there by the visitors. The beetle was found under or among the stones and woods, in company with *Jujiroa*, *Grylloblatta*, *Epanerchodus* (these three are new to science) and so on. This habitat of *T. habei* forms a contrast with those of the genera belonging to either *Ryugadous*-group or *Kurasawatrechus*-group, both of which are usually rare and inhabit the areas where there are poor in organic matters.

***Trechus (Pseudotrechiana) imadatei* S. UÉNO et SHIBANAI, sp. nov.**

Pseudotrechiana imadatei S. UÉNO et SHIBANAI, 1953 (in litt.), Shin Konchû, Tokyo, 6, (11), p.44.

Length: 4.5~5.7mm (from front margin of clypeus to anal end).

Closely allied to *T. habei*.

Colour somewhat paler, proximal two segments of antennae and legs paler reddish brown.

Head similar to *T. habei*, but with eyes, though very small, a little more prominent, and the neck constriction rather deeper.

Pronotum quite similar in general structure to *T. habei*, but different markedly in shape from that of the latter and having no hind lateral seta; transverse cordate, moderately convex, fully 1.5 times wider than head, fully 1.1 times wider than long, widest at about two-thirds from base; sides widely rounded in front, widely sinuate behind; hind angles slightly less sharp; apex evidently narrower than base, about six-sevenths as wide as the latter.

Elytra of similar features to *T. habei*; about 1.65 times wider than pronotum, 1.4~1.5 times longer than wide according to individuals; shoulders less obvious; striae distinctly crenulate, deeper than *T. habei* and moderately impressed even at the sides.

Male genital organ greatly different in shape and structure from that of *T. habei*. Aedeagus elongate, moderately arcuate, a little narrowed at the middle and slightly dilated towards apical part, ventral side concave; sagittal aileron well developed; apex rounded. Inner sac armed on right side with a lamellar piece, which is more or less rounded at apex; sac-membrane surrounding the piece being covered with numerous scales. Left style a little longer than right, each provided with four apical setae, but, according to individuals, there are five setae on left style and four on right one, or even five setae present on both styles.

Type-localities: Ohsawa-no-kaza-ana Cave, Gochigoé-no-yoko-ana Cave, Kuradani-no-ana Cave, and Hiuchiishi-no-ana Cave; these four limestone caves are located at Shimajiriama, on the way from Uji-Yamada to Isobé, Mié Prefecture, on the Pacific Coast of Central Japan.

Holotype: ♂; allotype: ♀ (Ohsawa-no-kaza-ana Cave, 4-V-1954, collected by S. UÉNO). Paratypes: 26 ♂♂, 14 ♀♀ (Ohsawa-no-kaza-ana Cave, 4-V-1954, by S. UÉNO, S. SHIBANAI and Y. WADA); 5 ♂♂, 2 ♀♀ (Ohsawa-no-

kaza-ana Cave, 10—VI—1953, by S. SHIBANAI, R. YOSII and G. IMADATE); 9 ♂♂, 1 ♀ (Gochigoé-no-yoko-ana Cave, 3—V—1954, by S. UÉNO, S. SHIBANAI and Y. WADA); 1 ♂ (Gochigoé-no-yoko-ana Cave, 10—VI—1953, by R. YOSII); 1 ♂ (Kuradani-no-ana Cave, 4—V—1954, by S. UÉNO); 1 ♀ (Hiuchiishi-no-ana Cave, 4—V—1954, by S. UÉNO).

The holotype and the allotype are deposited in UÉNO's collection. The paratypes are distributed to the collections of the following museums and specialists: the present writers, Mr. Akinobu HABU of the National Institute of Agricultural Sciences (Tokyo), Entomological Laboratory of Kyushu University (Fukuoka), Museum of Comparative Zoölogy (Cambridge, Mass.), Mr. Henri COIFFAIT of Faculté des Sciences (Toulouse), and Muséum National d'Histoire Naturelle (Paris).

Remarks: All the six caves at Shimajiyama are in the Permian limestone. Ohsawa-no-kaza-ana Cave is the largest among them.

There is an underground river running through the cave "Ohsawa-no-kaza-ana" and are also subterranean river-beds without water. *T. imadatei* was found there under pebbles and fragments of rocks, in association with *Jujiroa* and *Epanerchodus* (both are new to science but are different species from those of Ja-ana Cave). The Trechid was more frequently discovered at the innermost part of the cave, running to and fro on the enormous deposits of bats' guano. It seemed that the place was not preferred by the other cavernicolous animals, and the present new species may probably be a guanobie.

The Gochigoé-no-yoko-ana Cave is another deep grotto at Shimajiyama, but is oligotrophic. The floor of almost all the parts is covered with fragments of rocks, under which the Trechid was found together with *Jujiroa*.

The Kuradani-no-ana Cave is an assemblage of narrow passages, and was formed by both erosion and rockfalling. There are no rivers and pools in the inner areas of the cave, though a subterranean rapid flows through the first part from the entrance. The cave animals are very few in individual numbers but rather rich in the number of species. Besides the present Trechid, of which only a single specimen was found running on the cave-floor at the innermost, there are discovered an anchomenid (*Jujiroa*), a catopid, a liodid (the first troglobic species of the family in the world!), flies, a flea (an ectoparasite of racoon-dog, *Nyctereutes procyonoides viverrinus*), a notopterid (*Grylloblatta*), a springtail, arachnids, a diplopod (*Epanerchodus*), and so on.

The Hiuchiishi-no-ana Cave is a beautiful stalactite cave and is a typical oligotrophic grotto. The cave-dwellers are poor in the numbers of both species and individuals. The animals obtained are the Trechid, a catopid, a springtail, arachnids and a diplopod.

In the other two caves, "Ohsawa-no-mizu-ana" and "Haigama-no-ana", no cave-dwelling Trechid has been obtained.

Trechus (Pseudotrechiana) imadatei iwatai S. UENO, subsp. nov.

Length: 4.9 mm (from front margin of clypeus to anal end).

Distinguished from the typical form by the following combination of morphological features:

Frontal furrows a little deeper, so that genae a little more convex, especially on dorsal surface.

Pronotum obviously narrower; about 1.4 times wider than head, a little wider than long, widest at about two-thirds from base; sides less rounded in front, a little more strongly sinuate behind; front angles less produced; base only slightly wider than apex.

Elytra a little more elongate; about 1.7 times wider than pronotum, fully 1.5 times longer than wide; sides less rounded, with shoulders effaced, so that elytra present a more regular elliptic; front end of apical stria suddenly terminated, not joining with stria 5.

Aedeagus narrower; moderately arcuate at basal part but hardly so at apical half, gradually attenuated towards apex which is rounded; sagittal aileron smaller than the typical form. Copulatory piece rather smaller and much narrowed at apex. Styles, each provided with five apical setae.

Type-locality: Shûrei-no-mizu-ana Cave at Shimomura, Numaki-mura, Mié Prefecture, on the Pacific Coast of Central Japan.

Holotype: ♂; allotype: ♀ (2—V—1954, collected by S. UENO). The type-specimens are preserved in the writer's collection.

Remarks: The limestone cave "Shûrei-no-mizu-ana" that lies in the Permian formation is rather complicated. An underground river runs through the cave, and there are rich in variety of habitats, *i. e.*, pools, water-fall, silty floor, dry areas, rockfallings and deposits of guano at the inner parts. The Trechid was obtained under pebbles on the subterranean river-bed, mingled with a catopid. It is noted that four individuals of *Pseudocrangonyx*, a blind crustacean, were discovered under large wet stones remote from the pools or streams.