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Two New *Paratrechiama* from Kumamoto Prefecture in Kyushu[1)]

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On the western side of the main watershed of Kyushu, there is found rather a small number of limestone caves compared with the eastern side. All these caves are localized in the central and the southern parts of Kumamoto Prefecture. Many of them are either very small and dry or extremely oligotrophic, and do not harbour any of specialized troglobionts. Of the remaining several caves, which have the environments favourable for cave animals, only two have hitherto been known to be inhabited by cave trechids, one species to each. One of these caves is situated in the Midori-gawa drainage and the other in the Kuma-gawa drainage. These trechids, both belonging to the subgenus *Paratrechiama*, are clearly isolated from the others and also from one another, and may form within the subgenus the second and the third species-groups respectively. The descriptions of them will be given in the present paper.

The writer wishes herewith to express his deep gratitude to Prof. Kenji NAKAMURA for his kind supervision as well as to Prof. Jûjirô ISHIKAWA and Mr. Gentaro IMADATÉ for their kindness in giving the writer many useful information.

Rakantrechus (Paratrechiama) gracillimus S. UÉNO, sp. nov.

Length: 3.9–4.5 mm (from front margin of clypeus to anal end).

Body elongate and slender, glabrous on both dorsal and ventral surfaces. Colour reddish brown, translucent and shiny; palpi, apical segments of antennae, apical sternites and legs yellowish brown.

Head large, subquadrate, with frontal furrows deep throughout and not strongly curved at middle; both supraorbital areas and front moderately convex; microsculpture distinct, formed by reticulation; genae gently convex and pubescent; mandibles long and slender, slightly hooked at apices; mentum tooth elongate and more or less bifid at the tip; palpi slender, with apical segments thin in apical

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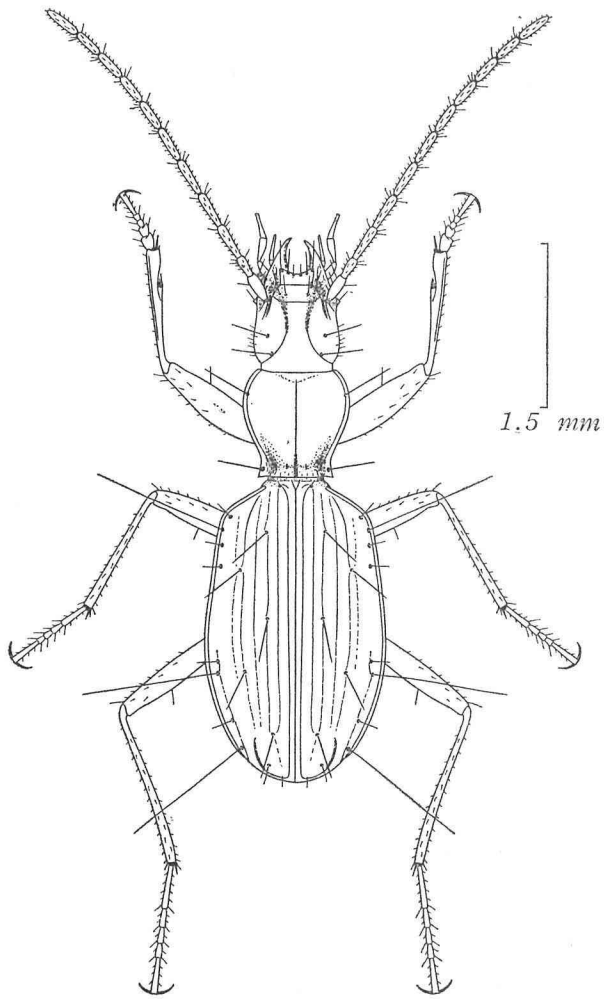

Fig. 1. *Rakantrechus* (*Paratrechiama*) *gracillimus* sp. nov., ♂, of Fûshin-dô Cave.

half; penultimate segment of maxillary palpus tumid in apical two-thirds; antennae long and slender, a little longer in ♂ than in ♀, reaching apical three-eighths of elytra in ♂, but reaching at most apical two-fifths of elytra in ♀; antennal segment 2 three-fifths as long as segment 3, which is nearly as long as segment 4.

Pronotum subcordate and convex, 1.22–1.30 times wider than head (mean 1.26), a little wider than long (range 1.01–1.09, mean 1.03), widest at about five-sevenths from base; the ratio of the greatest width to the width of apex ranging 1.37–1.41

(mean 1.39); lateral sides narrowly bordered and reflexed, with marginal gutters narrow throughout and close to the side borders, gently rounded in front and deeply sinuate at one-fifth to one-sixth from base; postangular seta removed forwards; apex nearly straight or slightly emarginate, usually a little wider than base but rarely as wide as the latter, the ratio of the width of apex to that of base 1.00–1.05 (mean 1.03); base nearly straight at middle and emarginate on each side just inside hind angle; front angles slightly advanced and rounded; hind angles sharp, projecting both outwards and backwards; median line deep, not reaching apex but joining base; apical transverse impression nearly obsolete; basal transverse impression rather shallow, with a distinct longitudinal fovea on each side of median line; basal foveae relatively small but deep, well extending anteriorly along the side borders; postangular carina absent; basal area more or less rugose; microsculpture composed of fine transverse lines. The expansion of the ventro-lateral sides of prothorax hardly visible from above.

Elytra oblong-ovate and convex, 1.63–1.70 times wider than pronotum (mean 1.66), 1.60–1.65 times longer than wide (mean 1.63), widest at about middle; shoulders prominent, prehumeral borders straight and not very oblique; lateral sides narrowly explanate and reflexed, nearly straight or slightly emarginate behind shoulders, then feebly rounded and slightly emarginate before apices, which are rounded; striae shallow but distinctly crenulate, striae 1–5 moderately impressed, stria 5 deepening near base, striae 6–7 nearly obliterated, stria 8 traceable only in apical part; scutellar striole vestigial, visible only by a small fovea; apical striole short, though fairly deep and moderately curved, suddenly interrupted at the end and directed to the termination of stria 5; intervals more or less convex on the disk but flat on the sides, interval 6 somewhat raised in basal part; apical carina salient; stria 3 with two setiferous dorsal pores placed at about one-seventh from base and basal two-fifths to a position a little before middle, stria 5 also with two dorsal pores at one-fourth to two-sevenths and about five-eighths from base respectively; preapical pore situated at the meeting point of striae 2 and 3, usually a little before the level of the termination of apical striole but sometimes on that level; the arrangement of humeral group of umbilicate pores similar to that in *R. kurosai*; microsculpture of fine transverse lines, but rather indistinct.

Anal sternite with one seta in ♂, two in ♀ on each side. Legs long and slender; each protibia with a shallow external groove and without pubescence on the anterior face of the apical part; tarsi thin, segment 4 with a long ventral apophysis in pro- and mesotarsi; in ♂ protarsal segments 1 and 2 widely dilated and well produced inwards at apices.

Male genital organ not so small, moderately chitinized. Aedeagus slender, arcuate and attenuated towards apex behind middle; basal part relatively elongate, with a small sagittal aileron; lateral sides of basal orifice not deeply emarginate; in profile, apical part produced into a narrow snout, which is narrowly rounded at the extremity; in dorsal aspect, apical part subtriangular, with the tip blunt; ventral side widely and rather deeply concave. Inner sac scaly, armed with a well developed copulatory

piece and three groups of large teeth; copulatory piece large and subtriangular, twisted from dorso-proximal to right apical, with the apical part wide and lamellar; of three groups of large teeth (two left lateral and one right lateral), only the basalmost one well chitinized; this group of teeth (basal group at the left lateral side) placed at about middle and at the left side of the concavity of copulatory piece; left apical group situated at a position just in front of the basalmost one; apicalmost group situated at the right side close to apical orifice. Styles fairly wide, left style distinctly longer than the right, each provided with four apical setae.

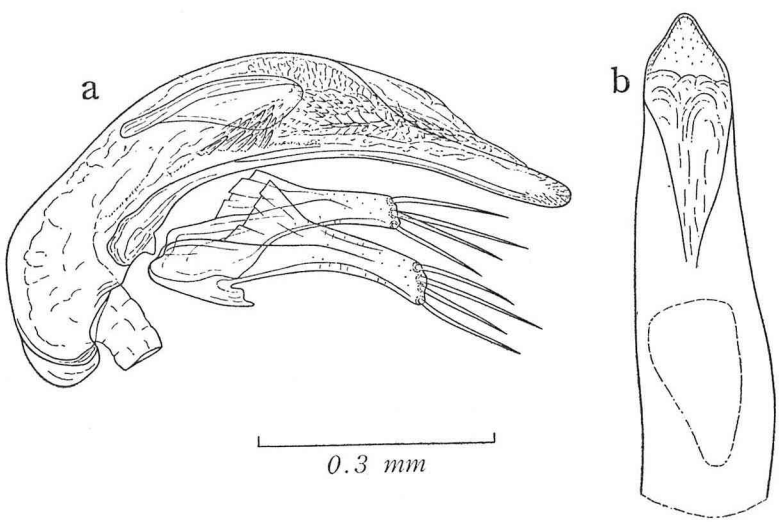

Fig. 2. Male genital organ of *Rakantrechus gracillimus* sp. nov., of Fûshin-dô Cave; left lateral view (a), and apical part of aedeagus, dorsal aspect (b).

Type-specimens: Holotype: ♂, allotype: ♀ (29–III–1955, collected by S. UÉNO). Paratypes: 1♀ (28–VII–1954, by J. ISHIKAWA); 8♂♂, 3♀♀ (29–III–1955, by S. UÉNO).

All the type-specimens are preserved in the writer's collection.

Type-locality: A limestone cave called "Fûshin-dô", at Gokasé of Mizukoshi, Takimizu, Mifuné-machi, in Kumamoto Prefecture, central Kyushu.

The present new species is greatly different from the members of the group of *R. kurosai* in its elongate body form and in the presence of a well developed copulatory piece. It may form a distinct species-group, which will be called the group of *R. gracillimus*. So far as has been known to the writer, this species is a unique representative of the species-group.

Fûshin-dô Cave is situated at about 23 km southeast of Kumamoto and at about 38 km west of Tsugenotaki-dô Cave in Takachiho-chô (the type-locality of *R. kurosai*).

One of the lava streams spouted from Aso Volcano has covered the eastern foot of a calcareous mountain called "Kôsa-daké" (753 m above the sea), and has been eroded by the valley of the Tsutsu-gawa, one of the branches of the Midori-gawa River, forming cliffs on both sides. The entrance of the cave is found on the right side of this valley, only several metres above the water. The altitude of this place is about 180 m. Although its mouth is found on the lava cliff, the main part of the cave system is developing in limestone formation. This is an unusual condition a cave has been formed, and the cave appears to be a unique example of this type in the Japanese Islands.

There are varieties of cave phenomena in Fûshin-dô Cave. Some rooms are formed by roof-fallings, while some others are the results of dissolution of the limestone. They are connected by narrow passages and shafts. There are neither pools nor streams near the entrance of the cave. An underground stream is, however, flowing through the depth and has deposited thick layers of clay on its banks. The trechid was found mainly on the banks, running on the clay or hiding itself under decayed logs.

Rakantrechus (Paratrechiama) tenellus S. UÉNO, sp. nov.

Length: 3.0–3.3 mm (from front margin of clypeus to anal end).

Body small in size and weakly chitinized, glabrous on both dorsal and ventral surfaces. Colour yellowish brown, translucent and shiny; palpi pale; antennae becoming paler towards apices; epipleura, apical sternites and legs pale yellowish brown.

Head large, subquadrate, with supraorbital areas and front moderately convex; frontal furrows deep especially before the level of hind supraorbital pore, moderately curved and not angulate at middle; microsculpture distinct, formed mostly by wide meshes; genae gently convex and sparsely pubescent; mandibles long and slender, slightly hooked at apices; mentum tooth wide and simply triangular, with the tip blunt; palpi slender, with apical segments subulate and very slender; in maxillary palpus, apical segment distinctly longer than penultimate segment, which is dilated towards apex; antennae not very long and fairly stout, a little longer in ♂ than in ♀, i.e., reaching the middle of elytra in ♂, extending slightly beyond basal four-ninths of elytra in ♀; antennal segment 2 about three-fourths as long as segment 3, which is slightly shorter than segment 4; antennal segment 5 the longest, excepting apical segment, and about 1.2 times longer than segment 3.

Pronotum subcordate and well convex, markedly different in shape from those in the species belonging to the group of *R. kurosai* and of *R. gracillimus*; 1.24 times wider than head, a little wider than long (1.07 times wider than long in the holotype, 1.03 times wider than long in the allotype), widest at about five-sevenths from base; the ratio of the greatest width to the width of base 1.51–1.52; lateral sides narrowly bordered and reflexed, with marginal gutters narrow throughout, rather strongly rounded in front, converging posteriorly in straight lines and sinuate

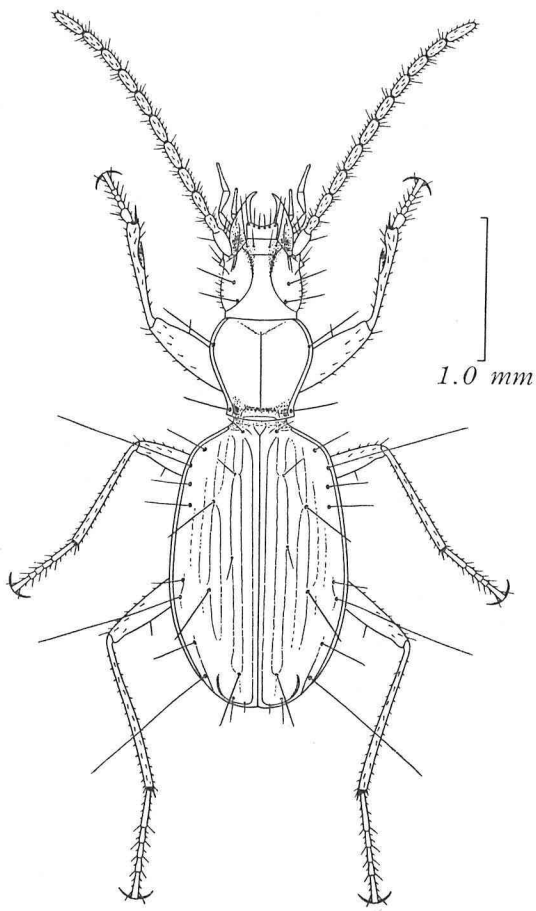

Fig. 3. *Rakantrechus* (*Paratrechiama*) *tenellus* sp. nov., ♀, of Takasawa-dô Cave.

just before hind angles; postangular seta placed near basal sinuation; apex slightly emarginate, continuing on each side into lateral border in a curve and leaving no advanced front angle between them, so that the accurate value of the width of apex could not be obtained, but it appears to be a little wider than base in the holotype and about as wide as the latter in the allotype; base nearly straight (in the holotype) or slightly produced backwards (in the allotype) at the median part and obliquely truncated on each side; hind angles obtuse; median line shallow though distinct, not reaching apex and nearly obliterated behind basal transverse impression; apical transverse impression shallow and more or less uneven; basal transverse impression continuous, fairly deep and uneven; basal foveae small but deep, extending anteriorly along the side borders; postangular carina absent; surface

smooth; microsculpture distinct, composed of transverse lines. The expansion of the ventro-lateral sides of prothorax hardly visible from above.

Elytra[2] oblong-oval and convex, 1.74 times wider than pronotum, 1.56 times longer than wide, widest at a little behind middle; shoulders widely rounded; prehumeral borders nearly straight and not very oblique; lateral sides narrowly explanate and reflexed, gently rounded at middle and hardly emarginate before apices, which are rounded; striae superficial and indistinctly crenulate, striae 1–2 deepening near base, striae 6–8 nearly obsolete; scutellar striole vestigial; apical striole distinct, short and well curved, suddenly interrupted at the extremity and directed to the site of stria 5; intervals smooth, moderately convex on the disk but flat at the sides; apical carina obtuse; stria 3 with two small setiferous dorsal pores at about one-sixth and three-sevenths from base respectively, stria 5 with two large setiferous dorsal pores at about two-sevenths and four-sevenths from base respectively; preapical pore situated on the level of the termination of apical striole; humeral group of umbilicate pores irregular, though the four pores ranged almost equidistantly, pore 1 somewhat distant from marginal gutter, pores 3 and 4 widely distant from the gutter, and the four pores more spaced than usual; microsculpture distinct, composed of transverse lines.

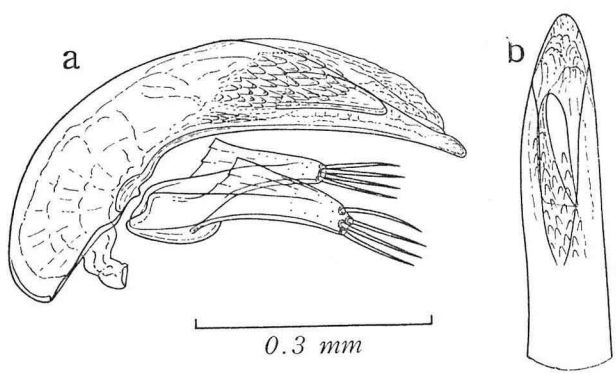

Fig. 4. Male genital organ of *Rakantrechus tenellus* sp. nov., of Takasawa-dô Cave; left lateral view (a), and apical part of aedeagus, dorsal aspect (b).

Anal sternite with one seta in ♂, two in ♀ on each side. Legs long and slender; protibiae not externally grooved and entirely pubescent; tarsi very slender, tarsal segment 4 with a long ventral apophysis in pro- and mesotarsi; in ♂, protarsal segments 1 and 2 widely dilated and well produced inwards at apices.

Male genital organ weakly chitinized. Aedeagus gently arcuate and tapering towards apex behind middle, with basal part only weakly bent towards the ventral

2) In the holotype, the elytra are somewhat deformed due to immaturity. The ratios given here are, therefore, limited to those in the allotype.

side; basal orifice large, with lateral sides hardly emarginate; sagittal aileron absent; apex produced into a short narrow snout in profile, narrowly rounded in dorsal aspect; ventral side slightly but widely concave. Inner sac armed with a well developed copulatory piece, which is spatulate and is placed inside the sac with the convex side facing the right wall; apex of the piece rounded; present also a sheet of large teeth, covering the basal part of copulatory piece. Styles relatively short and wide, left style evidently longer and wider than right style, each furnished with four setae at apex.

Type-specimens: Holotype: ♂, allotype: ♀ (31-III-1955, collected by S. UÉNO and preserved in his collection).

Type-locality: A limestone cave called "Takasawa-dô", at Takasawa of Kônosé, Kuma-mura, in Kumamoto Prefecture, central Kyushu.

This is an extremely peculiar species, bearing no direct relationship to any of the known species of the subgenus. Its pale colour of body, caused from a high grade of depigmentation, gives the species a great resemblance in appearance to the members of the subgenera *Rakantrechus* (s. str.) and *Yamautidius*. The shape of its pronotum and, in particular, the structure of pronotal hind angles are different from those in all the other species known up to the present. Most striking is, however, the pubescent protibiae, which have been reported only in the subgenus *Yamautidius*. This last feature may be worthy of establishing an independent subgenus upon *R. tenellus*. At present, however, the writer prefers to refrain from describing a new subgenus, leaving the problem for future studies.

Takasawa-dô Cave is situated at about 23 km south of Yatsushiro and at about 48 km southwest of Fûshin-dô Cave (the type-locality of *R. gracillimus*). The position is about 400 m above the sea and on the left side of the Nakazono-gawa that flows in the Kuma-gawa River at the right side. Further, this is the southernmost known locality of troglobiontic trechid in the Japanese Islands. There is no natural opening of the cave, and the present entrance was digged open when a playground was enlarged by Takasawa Primary School. Cave animals are, however, abundant irrespective of such an extreme condition. This is probably due to the existence of environmental conditions favourable for those animals. There is an underground stream flowing through the lowest level of the cave. On the higher levels, the cave floors are very wet and muddy. The trechid was found under rotten boards at a place about a half way up the slope from the stream to the uppermost horizontal gallery, coexisting with a polydesmid diplopod, a tomocerid springtail and a batrisine pselaphid.