

New Species and Records of Blind Trechine Beetles of the Genus *Ishikawatrechus* (Coleoptera: Trechinae) from the Ishizuchi Mountains, Southwest Japan

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Abstract Blind beetles of the trechine genus *Ishikawatrechus* from the Ishizuchi Mountains are dealt with. Six new species are described under the names *I. taichii*, *I. tuberculatus*, *I. septemtrionalis*, *I. caurus*, *I. orientalis* and *I. aquilonius*. *Ishikawatrechus masazii* S. UÉNO is downgraded to a subspecies of *I. pubithoracis* and is called *Ishikawatrechus pubithoracis masazii* S. UÉNO. All the additional specimens from new localities recently found out on the Ishizuchi Mountains and adjacent hills are recorded with detailed collecting data.

Key words: Coleoptera, Trechinae, *Ishikawatrechus*, new species, new taxonomical status, new records.

The trechine genus *Ishikawatrechus* is the second largest group of blind beetles in the Island of Shikoku, Southwest Japan. It consists of twenty-three taxa hitherto described and half a dozen forms still awaiting proper descriptions, which are mainly distributed in the central part of the island and particularly concentrated on the Ishizuchi Mountains and adjacent hills stretching from west to east parallel to the northern coast of the island. With the recent progress of technique of locating upper hypogean populations, known localities of *Ishikawatrechus* have rapidly increased in number, and we are now aware of more than fifty sites harbouring members of the genus.

With the exception of the species occurring at the southern and southwestern parts of the generic range of distribution, these trechine beetles are always so similar to one another in external morphology, that their systematic status cannot be readily determined without careful examination of their male genitalia. Even the species belonging to different lineages

often exhibit close resemblance in facies and are not distinguishable with confidence by external features alone.

Fortunately, I have been able to obtain male specimens from almost all the known populations, and though some of them have been known from very small number of specimens, I have come to the conclusion that they should be classified into fourteen species, one of which is divided into two subspecies. In the present paper, I am going to describe six new species, to downgrade one from a full species to a subspecies, and to record new localities for previously described species. Four known species, *I. kusamai* S. UÉNO (1999 a, p. 81, figs 1–3) from Ryûgû-dô Cave, *I. hayashii* S. UÉNO (1999 b, p. 104, figs. 1–3) from Ryû'ô Mine, *I. murakamii* S. UÉNO (1997, p. 2, figs. 1–3) from Hinooku-kô Adit, and *I. robustior* S. UÉNO (1997, p.10, figs. 6–7) from a prospecting adit at Nagano, are excluded, since no supplementary data are available for this study. The abbreviations employed are the same as those explained in previous papers of mine.

Before going into further details, I wish to express my heartfelt thanks to the following friends of mine for submitting invaluable material to me for taxonomic study and/or for giving me important data on the habitats or mode of life of the trechines to be dealt with in the present paper: Dr. Yoshiaki NISHIKAWA, Dr. Kazuo ISHIKAWA, Messrs. Yoshiyuki ITÔ, Hiroshi MIYAMA, Toshiki MOHRI and Takao NAITÔ.

This paper is dedicated to the memory of the late Mr. Taichi SHIBATA, who helped my study on the Trechinae at the early stage of my career by supplying various trechine specimens from West Japan, including the types of *Nesiotrechus convexiusculus* (S. UÉNO, 1975), *Trechima kawanoi* S. UÉNO, 1975, and *Epaphiopsis hayashii* S. UÉNO, 1977.

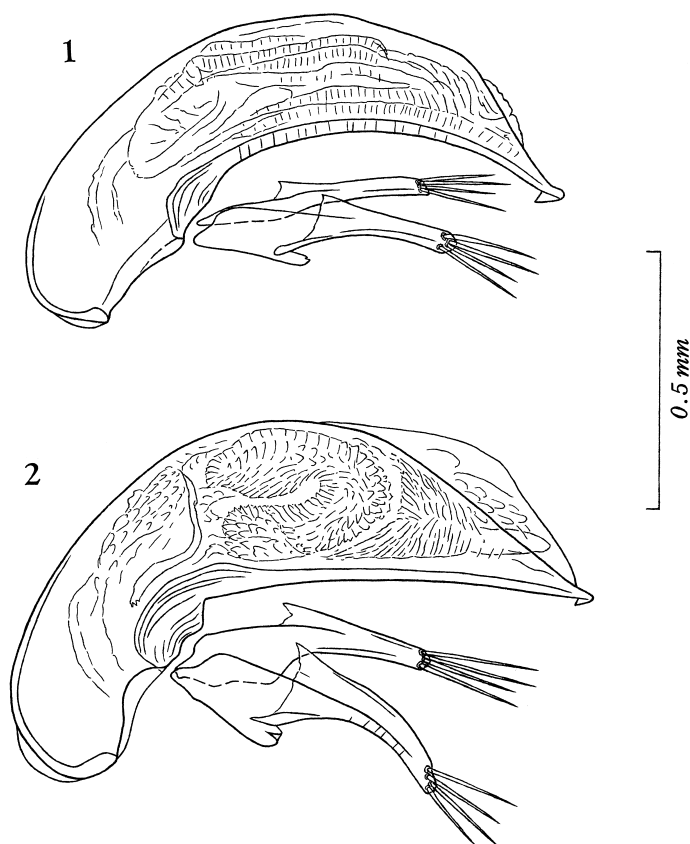
***Ishikawatrechus taichii* S. UÉNO, sp. nov.**

(Fig. 1)

Length: 4.40–4.70 mm (from apical margin of clypeus to apices of elytra).

Closely similar to *I. ishiharai* S. UÉNO, 1994 in external morphology, but the head is a little smaller and the prothorax and elytra are a little more elongate. Also different in configuration of aedeagus, which is more regularly arcuate, higher to apical part, and abruptly tapered to apex in lateral view, with differently formed scale-patch inside the inner sac.

Colour light reddish brown, evidently lighter than in *I. ishiharai*, with paler appendages; elytra weakly iridescent in basal areas. Head subquadrate as in *I. ishiharai*, though a little smaller on an average; genae glabrous; antennae reaching basal five-ninths of elytra in ♂, slightly shorter than that in ♀. Pronotum wider than head and slightly longer than wide, widest at about four-fifths from base, and contracted more at base than at apex; PW/HW 1.33–1.36 (M 1.35), PW/PL 0.91– 0.96 (M 0.94), PW/PA 1.36–1.38 (M 1.37), PW/PB 1.44–1.51 (M 1.47), PB/PA 0.92–0.96 (M 0.94) [PA/PB 1.04–1.09 (M 1.07)]; sides moderately arcuate in apical two-fifths, almost straightly convergent posteriad, lightly sinuate at about basal sixth, and then slightly and straightly divergent towards hind angles, which are



Figs. 1–2. Male genitalia of *Ishikawatrechus* spp. nov.; left lateral view. — 1. *I. taichii* S. UÉNO, sp. nov., from a prospecting adit at Ohnaru in Omogo-mura. — 2. *I. tuberculatus* S. UÉNO, sp. nov., from the Ohmori-gawa Valley on Okuminagawa-yama in Ino-chô.

sharp and protrudent more posteriorly than laterally; front angles obtuse and only slightly advanced.

Elytra relatively elongate, much longer than wide, widest at about middle, and equally narrowed towards bases and towards apices; EW/PW 1.70–1.72 (M 1.71), EL/PL 2.58–2.71 (M 2.63), EL/EW 1.59–1.66 (M 1.64); sides gently arcuate from behind shoulders to near apices, which are conjointly and rather narrowly rounded; humeral angles obtuse, hardly tuberculate, prehumeral borders oblique, slightly emarginate, diminishing anteriorly but barely reaching basal carinae; dorsum gently convex, longitudinally depressed on the disc, and roundly impressed in basal areas between obtuse basal carinae formed by the proximal portions of interval 5; striae entire, clearly impressed on the disc but becoming shallower at the side; chaetotaxy as in *I. ishiharai*. Legs somewhat longer and slenderer

than in *I. ishiharai*.

Male genital organ basically similar to that of *I. ishiharai*, but the aedeagus is more regularly arcuate from the level of parameral articulation to near apex, about three-eighths as long as elytra, and in lateral view, lateral walls high to apical orifice, and then rapidly tapered towards apex in apical part; sagittal aileron vestigial. Inner sac scaly, the scales forming tape-like pattern along the longitudinal folds of sac membrane, but not forming sigmoidally curved patch. Styles as in *I. ishiharai*, though less slender.

Type series. Holotype: ♂, 24. XII. 1977, H. MIYAMA leg. Allotype: ♀, paratype: 1 ♂, 15. IV. 1978, H. MIYAMA leg. (found in baited traps set by S. UÉNO on 17. III. 1978). All deposited in the collection of the Department of Zoology, National Museum of Nature and Science, Tokyo.

Type locality. Prospecting adit at Ohnaru, 900 m in altitude, in Omogo-mura (now included in Kumakôgen-chô) at the central part of Ehime Prefecture, central Shikoku, Southwest Japan.

Notes. This new species belongs to the same lineage as *I. ishiharai* S. UÉNO (1994, p. 339, figs. 1–3) and *I. kusamai* S. UÉNO (1999 a, p. 81, figs. 1–3), and is doubtless closer to the former than to the latter. This affinity is amply proved by the fact that *I. taichii* shares the glabrous genae, nearly complete prehumeral borders of the elytra, and obviously arcuate aedeagus with the former species, but not with the latter. Also geographically, the type locality of *I. taichii*, the prospecting adit at Ohnaru (alt. 900 m), is nearer to that of the former, Iwaguro-yama (alt. 1,420 m), which is 9.6 km distant to the northeast in a beeline beyond the Omogo-kei Valley, than to that of the latter, Ryûgû-dô Cave (alt. 400 m), which is 13.2 km distant to the southwest in a beeline.

The prospecting adit at Ohnaru lies on the right side of a small branch valley above the left side of the Sakasé-gawa, a tributary of the Omogo-gawa River. It is wide and shallow, and the sunshine penetrates to its farthest corners. In spite of such an unfavourable condition, the first specimen of this trechine beetle was found out by MIYAMA from beneath a large stone lying on the moist floor only several metres removed from the entrance. Two additional specimens were caught by baited traps set by myself near drippings from the ceiling.

Etymology. The present species is dedicated to the memory of my old friend, the late Mr. Taichi SHIBATA, who was an excellent coleopterist and trained many young persons as students of coleopterology.

Ishikawatrechus ishiharai S. UÉNO, 1994

Ishikawatrechus ishiharai S. UÉNO, 1994, Trans. Shikoku ent. Soc., Matsuyama, **20**, p. 339, figs. 1–3; type locality: Iwaguro-yama on the Ishizuchi Mts.

This species seems restricted to the higher places of the western part of the Ishizuchi

Mountains. In addition to the collecting sites previously recorded, one more locality was later found out, as recorded below:

Specimens examined from a new locality. 1♂, 1♀, Tebako-yama, 1,200 m alt., Tera-gawa, Hongawa-mura, Kôchi Pref., 8. VIII. 1998, Y. Itô leg. (NSMT).

Notes. Tebako-yama (1,806 m in height) lies on a short branch ridge extending southwards from Iwaguro-yama towards Tsutsujô-zan and then eastwards for 1.7 km. The specimens recorded above were taken on its northeastern slope 3.1 km east-southeast from Iwaguro-yama in a beeline and about 2 km south by west from Shiraidani-kô Adit of Komochi Mine, the lowest known locality of *I. ishiharai* lying at an altitude of 870 m.

***Ishikawatrechus tuberculatus* S. UÉNO, sp. nov.**

(Figs. 2–3)

Length: 4.50–5.35 mm (from apical margin of clypeus to apices of elytra).

Related to *I. ishiharai* and accordant with it in many respects inclusive of standard ratios, but the elytra are more strongly convex on dorsum, obviously tuberculate at the shoulders, and more shallowly striate, especially at the side. Also different from *I. ishiharai* in configuration of aedeagus, which is bolder and hardly arcuate except for ventrally bent basal part.

Colour generally darker than in *I. ishiharai*, dark reddish brown, shiny, weakly iridescent in basal areas of elytra. Head similar to that of *I. ishiharai*, though the genae are a little more distinctly convex in posterior parts and usually bear a few short hairs; antennae slender, usually reaching five-ninths from the bases of elytra. Pronotum obviously wider than head, about as wide as long, widest at about four-fifths from base, almost straightly narrowed posteriad, and more or less narrower at base than at apex; PW/HW 1.37–1.44 (M 1.39), PW/PL 0.95–1.05 (M 0.99), PW/PA 1.33–1.46 (M 1.39), PW/PB 1.37–1.53 (M 1.47), PA/PB 1.01–1.13 (M 1.06); sides briefly but moderately arcuate in front, shallowly, sometimes almost invisibly, sinuate at about basal sixth, and then more or less divergent towards hind angles (very exceptionally subparallel); front angles broad, anteriorly rounded; hind angles sharp, usually protrudent postero-laterad.

Elytra obviously different in configuration from those of *I. ishiharai*, much wider than pronotum, evidently longer than wide, widest at the middle, and a little more gradually narrowed towards apices than towards bases, with shoulders distinctly tuberculate and with sides slightly emarginate behind humeral tubercles; EW/PW 1.61–1.76 (M 1.71), EL/PL 2.63–2.76 (M 2.68), EL/EW 1.54–1.62 (M 1.59); prehumeral borders oblique, distinctly emarginate, diminishing anteriorly and nearly reaching basal carinae; sides gently arcuate at middle, less so posteriorly, and conjointly, rather widely rounded at apices; dorsum evenly convex, rather steeply declivous at the lateral parts and in apical area, distinctly foveate in basal areas between basal carinae formed by proximal portions of interval 5; striae clearly impressed and finely crenulate on the disc, becoming shallower laterad, stria 7 vestigial,

stria 8 deeply impressed in apical half; chaetotaxy as in *I. ishiharai*. Ventral surface and legs as in *I. ishiharai*.

Male genital organ basically similar in conformation to that of *I. ishiharai*, bearing similarly formed aedeagal inner armature, but the aedeagus is relatively large and much thicker, with the dorsal margin semicircularly rounded in profile except for apical part; aedeagus about four-ninths as long as elytra, high at middle, and rather rapidly and straightly tapered towards apex in lateral view; basal part fairly elongate, rather abruptly curved ventrad, with relatively small basal orifice, whose sides are more or less emarginate; sagittal aileron small and very narrow; apex blunt, more pointed in profile, with a small triangular hook on the ventral side; ventral margin very slightly arcuate in profile. Inner armature as in *I. ishiharai*, though the scales are more heavily sclerotised in most parts. A narrow hyaline piece with narrowly rounded apex is observed at the ventral side near the apical end of apical orifice, but it is difficult to determine if this is an imperfect stage of a copulatory piece or not. Styles as in *I. ishiharai*.

Type series. Holotype: ♂, (970–990 m alt.), 23. IX. 1986, Y. Itô leg. Allotype: ♀, (1,030 m alt.), 25. XI. 1986, S. UÉNO leg. Paratypes: 1 ♂, 1 ♀ (somewhat teneral), (1,030 m alt.), 25. XI. 1986, S. UÉNO & K. ISHIKAWA leg.; 3 ♂♂, 1 ♀ (teneral), (970 m), 31. X. 1987, Y. Itô leg.; 1 ♀, (1,010 m alt.), 17. VII. 1989, Y. Itô leg.; 2 ♂♂, 3 ♀♀, (1,020 m alt.), 11. XI. 2006, Y. Itô leg. (in baited traps set by Y. Itô on 18. X. 2006); 1 ♀, (1,020 m alt.), 9. X. 2007, Y. Itô leg.; 2 ♀♀, (1,020 m alt.), 7. VIII. 2007, Y. Itô leg. (in baited traps set by Y. Itô on 24. VII. 2007).

Type locality. Okuminagawa-yama, Ohmori-gawa Valley, 970–1,030 m in altitude, in Ino-chô of Kôchi Prefecture, at the central part of Shikoku, Southwest Japan.

Notes. This new species is closely allied to *I. ishiharai* as is clearly indicated by the close similarity in conformation of the aedeagal inner armature, though it is discriminated at first sight from the latter by the decisive difference in configuration of the elytra. It is localized on a range of hills continued southeastwards from Tsutsujô-zan to between the main stream of the Yoshino-gawa River and its tributary, the Ohmori-gawa River. This means that *I. tuberculatus* occurs at the southeastern continuation of the distributional range of *I. ishiharai*, and almost meets at the other end with the south-southwestern periphery of that of *I. pubithoracis*.

Etymology. This new species is named after the peculiarly tuberculate humeral parts of its elytra, the most pronounced peculiarity of its external morphology.

***Ishikawatrechus pubithoracis pubithoracis* S. UÉNO, stat. nov.**

Ishikawatrechus pubithoracis S. UÉNO, 2002, J. speleol. Soc. Japan, **27**, p. 6, figs. 4–5; type locality: Kanmuri-yama on the Ishizuchi Mts.

The taxon *pubithoracis* was described as a close relative of *Ishikawatrechus masazii*

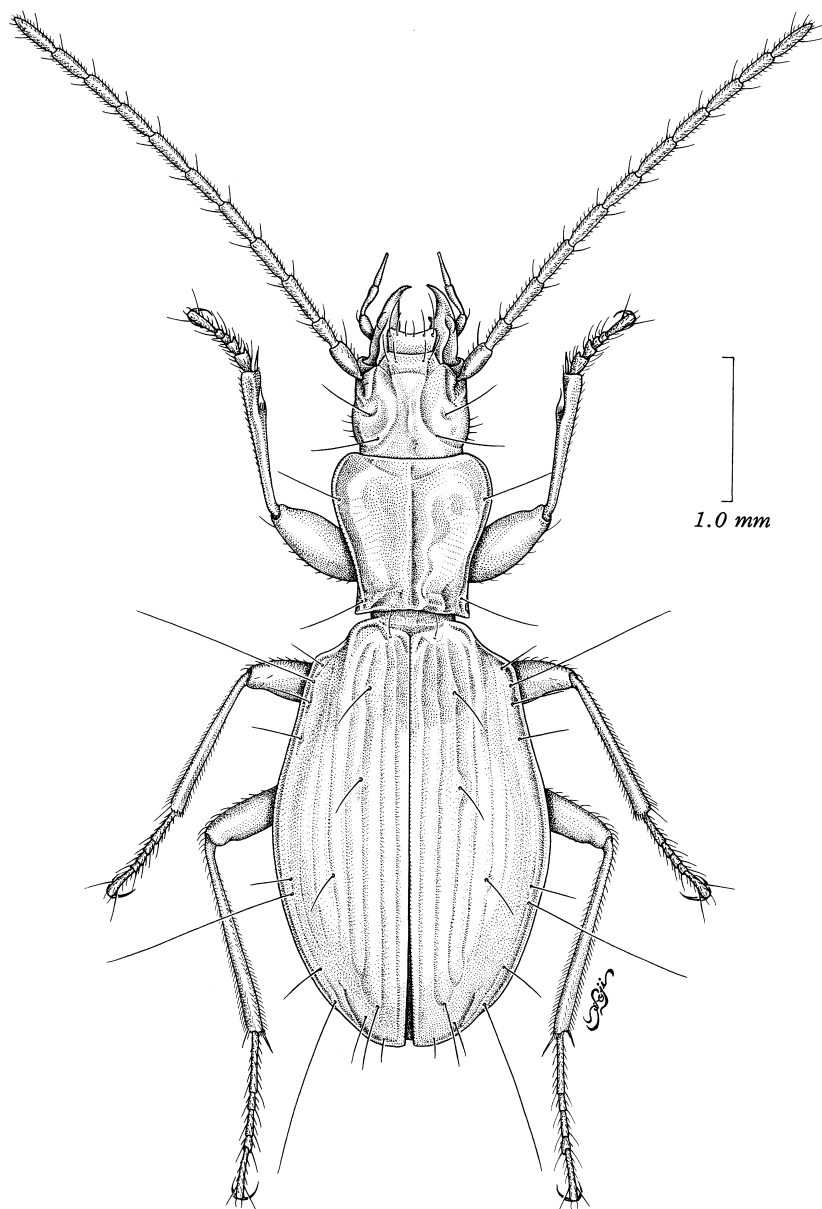


Fig. 3. *Ishikawatrechus tuberculatus* S. UENO, sp. nov., ? , from the Ohmori-gawa Valley on Okuminagawa-yama in Ino-chô.

S. UÉNO (2002, *op. cit.*, p. 3, figs. 1–3), which is endemic to the limestone cave called Anadori-dô at Kuzu of Gohoku-mura (now included in Ino-chô). Later discoveries of four new upper hypogean habitats of *pubithoracis* have clarified that the trechine beetle is rather widely distributed in the uppermost drainage area of the Yoshino-gawa River that flows eastwards and empties into the Kii Channel. It is somewhat variable in external morphology but can be regarded as a whole as the northern subspecies of *I. masazii*, whose type locality is isolated in the upper drainage of a branch stream of the Niyodo-gawa River that flows southwards and empties into the Pacific.

The taxon *masazii* has the page precedence over *pubithoracis*, but anyway both were described in the same paper published in 2002. As the first reviser, I prefer to call the species *pubithoracis* in view of the fact that the name neatly exhibits the peculiarity of the species. The cavernicolous subspecies should be called *Ishikawatrechus pubithoracis masazii* S. UÉNO, stat. nov.

Specimens examined from new localities. 2♂♂, 1♀, Nefuji, 720 m alt., Wakino-yama, Ino-chô, Kôchi Pref., 20. XI. 2007, Y. Itô leg. (found in baited traps set by Y. Itô on 13. XI. 2007); 4♂♂, 1♀, Tochû, 820 m alt., Ino-chô, Kôchi Pref., 20. XI. 2007, Y. Itô leg. (found in baited traps set by Y. Itô on 13. XI. 2007); 1♂, 2♀♀, Tsubuté-ga-taki, 980 m alt., Ohmori, Hongawa-mura (now included in Ino-chô), Kôchi Pref., 30. V. 1984, Y. NISHIKAWA & T. MOHRI leg.; 2♂♂, Ohmori, Okuminagawa-rindô, 720 m alt., Ino-chô, Kôchi Pref., 20. XI. 2007, Y. Itô leg. (found in baited traps set by Y. Itô on 12. XI. 2007); 3♂♂, 1♀, same collecting data but 750 m in altitude. All deposited in NSMT.

Notes. All the four new localities of *Ishikawatrechus pubithoracis pubithoracis* lie on the right side of the main stream of the Yoshino-gawa River, and Nefuji and Tochû are not far from the ponding surface of the Ôhashi Reservoir. The former locality is 5.3 km distant to the south-southeast from the collecting site of the type series on Kanmuri-yama, and the latter is 3.3 km further south from there. The remaining two localities are not near to the main stream of the Yoshino-gawa River, Tsubuté-ga-taki being 5 km distant to the west-southwest from Tochû and Okuminagawa-rindô extending along the right side of the Ohmori-gawa Valley 3 km south of Tsubuté-ga-taki. The area of its distribution is adjacent to the southeastern side of that of *I. squamosus*.

Ishikawatrechus squamosus S. UÉNO, 1997

Ishikawatrechus squamosus S. UÉNO, 1997, J. speleol. Soc. Japan, **22**, p. 6, figs. 4–5; type locality: Komi Mine at Tsuchiyama-dani in Niihama-shi. — S. UÉNO & M. MORI, 2004, Elytra, Tokyo, **32**, p. 28.

This remarkable species is characterised by the large tubular aedeagus with an elongate apical hook and unusually elongated teeth-patch inside the inner sac. It was first discovered in an abandoned adit of a copper mine, and later collected from the upper

hypogean zone on either side of the same mountain, into which was excavated the mine adit.

Four more localities of trechine beetles seemingly belonging to this species or its close relatives have been found by later investigations, but their proper records have been postponed mainly because of the difficulty in determining true taxonomic status of respective populations. They are closely similar to one another in external morphology, but more or less vary in configuration of the male genitalia according to their localities. Thanks to NAITÔ's discoveries of two new populations of this lineage at the northern foot of the Ishizuchi Mountains, I was able to observe range of variations more closely and to have drawn the conclusion that the two populations occurring at the eastern side of the central part of the Ishizuchi Mountains belong to *I. squamosus* itself, but that the other two populations from the northern foot of the mountain range are specifically different from those of the higher places of the same mountains. The latter two will be described as two new species after the new records of *I. squamosus*.

Specimens examined from new localities. 2♂♂, 2♀♀, Takanosu-yama, 1,840 m alt. on N slope, Hongawa-mura, Kôchi Pref., 8. IX. 1986, Y. ITÔ leg.; 1♂, Ohdaru, 1,020 m alt., Teragawa, Hongawa-mura, Kôchi Pref., 19. V. 1984, Y. NISHIKAWA leg.; 1♂, 1♀, entrance to Ohdaru-shita-kô Mine, 970 m alt., Teragawa, Hongawa-mura, Kôchi Pref., 19. V. 1984, S. UÉNO leg. All deposited in NSMT.

Notes. As was already noted (UÉNO & MORI, 2004), *Ishikawatrechus squamosus* is variable in size, configuration of prothorax and elytra, and even in the thickness of the aedeagus. In the Takanosu-yama specimens recorded above (4.65–5.05 mm in body length), standard ratios of body parts are as follows: PW/HW 1.42–1.46 (M 1.44), PW/PL 0.98–1.00 (M 1.00), PW/PA 1.37–1.41 (M 1.40), PW/PB 1.50–1.53 (M 1.51), PB/PA 0.89–0.94 (M 0.92) [PA/PB 1.06–1.12 (M 1.08)], EW/PW 1.67–1.74 (M 1.71), EL/PL 2.49–2.69 (M 2.57), EL/EW 1.49–1.55 (M 1.52). In the Ohdaru specimens (4.65–4.70 mm in body length), standard ratios are: PW/HW 1.33–1.40 (M 1.37), PW/PL 0.95–0.99 (M 0.96), PW/PA 1.35–1.39 (M 1.37), PW/PB 1.47–1.49 (M 1.48), PB/PA 0.91–0.94 (M 0.93) [PA/PB 1.06–1.10 (M 1.08)], EW/PW 1.65–1.72 (M 1.70), EL/PL 2.55–2.71 (M 2.61), EL/EW 1.56–1.66 (M 1.60). This means that the head is broader in the Ohdaru specimens than in the Takanosu-yama ones and that the elytra are more elongate in the former than in the latter.

In the Takanosu-yama specimens, the aedeagus is a little thicker and more feebly, though regularly, arcuate than in the type series, with somewhat larger basal part devoid of sagittal aileron; the inner armature and the ventral hook at the aedeagal apex are almost identical with those of the latter, though the copulatory piece is hardly sclerotised, very thin and hyaline. In the Ohdaru specimens, the aedeagus is still more feebly arcuate, especially in apical half, and bears a very narrow sagittal aileron, but the inner armature and the apico-ventral hook are identical with those of the Takanosu-yama specimens. Takanosu-yama lies on the watershed ridge of the Ishizuchi Mountains, 7.3 km distant to the south-southwest in

a beeline from Komi Mine on Sasa-ga-miné, the type locality of *I. squamosus*, and 11.2 km distant to the east-northeast in a beeline from Iwaguro-yama, the type locality of *I. ishiharai*. Ohdaru Mine lies 7.1 km west-southwest of Takanosu-yama, and only 1.3 km distant to the east by south from Shiraidani-kô Adit of Komochi Mine, the easternmost known locality of *I. ishiharai*, though these mine adits are located on the opposite sides of the Shirai-dani Valley. As will be shown on a succeeding page, the teeth-patch inside the aedeagal inner sac is much less developed in a species recently found at the northern foot of the Ishizuchi Mountains, and makes a key character to discriminate it specifically from the high altitude specimens with fully extended teeth-patch.

***Ishikawatrechus septemtrionalis* S. UÉNO, sp. nov.**

(Fig. 4)

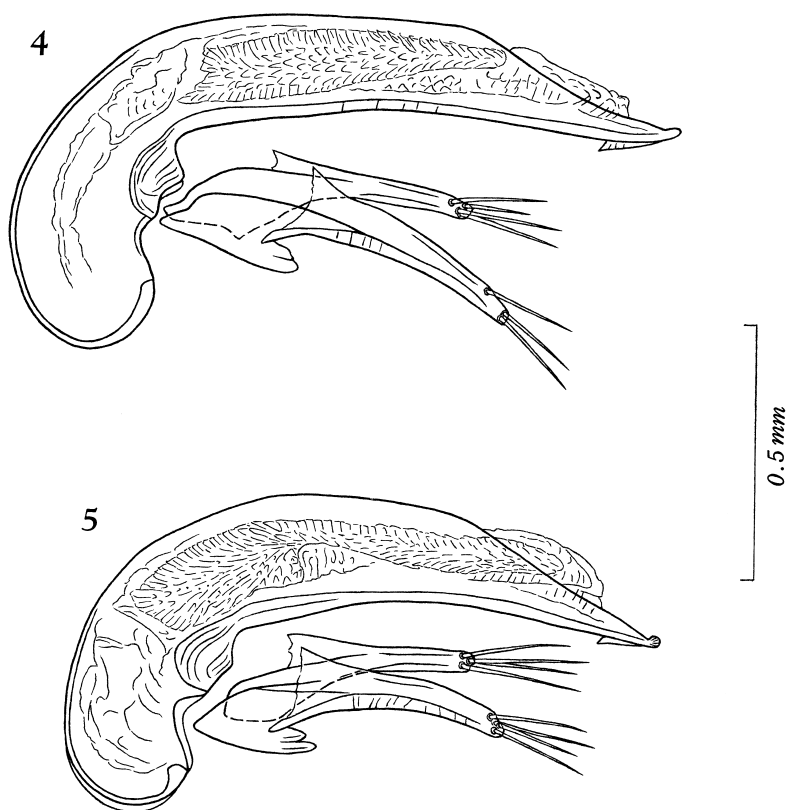
Length: 4.05–4.90 mm (from apical margin of clypeus to apices of elytra).

Closely similar to *I. squamosus* in external morphology, only differing from the latter in minor details of elytra, which are somewhat broader on an average, with narrower basal parts and more oblique prehumeral borders, the borders diminishing anteriorly and leaving wider space before reaching basal carina. Obviously different from *I. squamosus* in configuration of aedeagus, which is shorter, hardly arcuate in apical two-thirds, and bearing evidently shorter teeth-patch inside the inner sac.

Colour darker than in *I. squamosus*, particularly in fore body and elytra, and usually with relatively dark femora. Head and prothorax almost identical with those of *I. squamosus*; antennae reaching apical two-fifths of elytra, sometimes shorter than that in ♀; standard ratios as follows: PW/HW 1.37–1.49 (M 1.43), PW/PL 0.90–1.05 (M 0.98), PW/PA 1.35–1.47 (M 1.41), PW/PB 1.39–1.57 (M 1.50), PB/PA 0.91–1.00 (M 0.94) [PA/PB 1.00–1.09 (M 1.06)].

Elytra relatively broad on an average, widest at about middle, almost equally narrowed towards bases and apices, and more widely and conjointly rounded at apices than in *I. squamosus*; EW/PW 1.59–1.72 (M 1.65), EL/PL 2.31–2.67 (M 2.48), EL/EW 1.48–1.60 (M 1.54); humeral angles gently arcuate, hardly tuberculate, prehumeral borders moderately oblique and straight at the posterior parts, then more or less distinctly emarginate, and very oblique briefly at the anteriormost portions, the borders diminishing anteriorly and becoming evanescent at the bottom of each emargination; sides more regularly arcuate than in *I. squamosus*; striae more or less shallower at the side than in *I. squamosus*; stria 3 with two setiferous dorsal pores at 1/6–1/5 and 3/10–2/5 from base, respectively; stria 5 with a single setiferous dorsal pore at 1/2–3/5 from base.

Male genital organ of the same type as that of *I. squamosus*, but the aedeagus is shorter and thicker, a little less than four-ninths as long as elytra, parallel-sided at middle in lateral view, and not regularly arcuate in apical two-thirds; apical part relatively large, with apical lobe very slightly reflexed in terminal portion, and bearing an elongate ventral hook



Figs. 4–5. Male genitalia of *Ishikawatrechus* spp. nov.; left lateral view. — 4. *I. septentrionalis* S. UÉNO, sp. nov., from Uzui-gawa at Oojōin in Niihama-shi. — 5. *I. caurus* S. UÉNO, sp. nov., from Nagosé of Nishinokawa in Saijō-shi.

as in *I. squamosus*; basal part abruptly bent ventrad, with small basal orifice deeply emarginate at the sides, and devoid of sagittal aileron; ventral margin very slightly emarginate at middle in profile. Inner sac largely covered with heavily sclerotised teeth and scales similarly to that of *I. squamosus*, but the teeth-patch is obviously shorter, though broader at the proximal part. Styles narrow, each bearing three or four short setae at the apex.

Type series. Holotype: ♂, allotype: ♀, paratypes: 11 ♂♂, 7 ♀♀, 20. X. 2007, T. NAITÔ leg. All deposited in the collection of the Department of Zoology, National Museum of Nature and Science, Tokyo.

Type locality. Uzui-gawa, 120 m in altitude, at Oojōin of Niihama-shi, near the coast of the Inland Sea of Seto-naikai, in the eastern part of Ehime Prefecture, northern Shikoku, Southwest Japan.

Notes. Judging from the higher modification of the male genitalia, *I. squamosus* can be considered more derivative than *I. septemtrionalis*. The former occurs in deciduous broadleaved forests usually above 1,000 m in elevation, though its type locality, an abandoned adit of a copper mine, lies at an altitude of 720 m. Most unexpectedly, *I. septemtrionalis* was discovered from a scree deposited on the right side of the Uzui-gawa River at an altitude of only 120 m, or 600 m lower than the lowest known locality of *I. squamosus*. It is only 6 km apart from the seashore, and is 6.2 km distant in a beeline from the abandoned mine adit.

***Ishikawatrechus caurus* S. UÉNO, sp. nov.**

(Fig. 5)

Length: 4.70–4.80 mm (from apical margin of clypeus to apices of elytra).

Very closely similar to *I. septemtrionalis* in external morphology including standard ratios of body parts, and not confidently discriminated from it without examination of male genitalia. Aedeagus markedly different in configuration from that of *I. septemtrionalis*, higher before the middle, and gradually tapered towards apex, with the dorsal margin semi-circularly rounded in proximal two-thirds in profile.

Colour as in *I. septemtrionalis*, dark reddish brown, though weakly iridescent in the basal halves of elytra. Head and prothorax as in *I. septemtrionalis*; PW/HW 1.46 in ♂ (holotype), 1.41 in ♀ (allotype), PW/PL 1.00 in ♂, 0.91 in ♀, PW/PA 1.42 in ♂, 1.38 in ♀, PW/PB 1.47 in both ♂ and ♀, PB/PA 0.97 in ♂, 0.94 in ♀ [PA/PB 1.03 in ♂, 1.06 in ♀]. Elytra also similar to those of *I. septemtrionalis*, but more deeply impressed in basal parts as a transverse fovea and more deeply striated in it; EW/PW 1.66 in ♂, 1.67 in ♀, EL/PL 2.43 in ♂, 2.39 in ♀, EL/EW 1.46 in ♂, 1.57 in ♀; prehumeral parts similar to those of *I. septemtrionalis*, but the diminishing borders extend antero-ventrally to the antero-external sides of basal carinae, which are well developed though obtuse; striation and chaetotaxy as in *I. septemtrionalis*.

Male genital organ basically identical in conformation with that of *I. septemtrionalis*, but markedly different from it in the shape of aedeagus, which is a little smaller and shorter, about two-fifths as long as elytra, higher before the middle, and with larger basal part obviously thicker at the level of parameral articulation; basal orifice small, with the sides deeply emarginate; sagittal aileron present, though very narrow and hyaline; viewed laterally, apical part of aedeagus gradually tapered towards apex and minutely denticulate dorsad at the extremity, with an elongate ventro-apical hook, which is exceptionally very low; ventral margin slightly but widely arcuate at middle in profile. Inner sac largely covered with heavily sclerotised teeth, aciculae and scales, which are more or less fused together in apical three-fifths and form a tube-like structure, but the teeth-patch is rather loose in proximal two-fifths and widened out. Styles, the left one in particular, a little less slender than in *I. septemtrionalis*, each bearing four setae at the apex.

Type series. Holotype: ♂, allotype: ♀, 20. X. 2007, T. NAITÔ leg. Deposited in the collection of the Department of Zoology, National Museum of Nature and Science, Tokyo.

Type locality. Nagosé, 550 m in altitude, in Nishinokawa of Saijô-shi, in the eastern part of Ehime Prefecture, northern Shikoku, Southwest Japan.

Notes. Though very closely similar to *I. septemtrionalis* in external morphology, the trechine beetle discovered at the northeastern foot of the main peak of the Ishizuchi Mountains is very peculiar in configuration of its male genitalia, and is doubtless discriminated from it as an independent species. It belongs to the *squamosus* complex beyond all doubt in view of the characteristically elongated ventro-apical hook and the unusually elongated teeth-patch covering the inner sac, but it closely resembles certain members of the *ishiharai* complex in general appearance of its aedeagal tube and in this respect it is considerably different from the other two known species of the *squamosus* complex. It is also characterised by seemingly very elongate teeth-patch, which appears proportionally longer than that of *I. squamosus*, though this is due to the shortness of aedeagus.

Only a pair of specimens of this new species were taken by digging a scree deposited on the right side of the Nagosé-dani, one of the upper courses of the Kôguchi-dani Valley, which is a branch of the Kamo-gawa River emptying into the Inland Sea of Seto-naikai. The collecting site is 16 km distant to the southwest in a beeline from the Uzui-gawa, the type locality of *I. septemtrionalis*, but is only 3.8 km north of Iwaguro-yama, the type locality of *I. ishiharai* even though it is 870 m lower in altitude than the latter. It is most probable that *I. caurus* of the *squamosus* lineage may have had a history of dispersal different from that of *I. ishiharai* of the *ishiharai* lineage, which is restricted to higher places at the westernmost part of the Ishizuchi Mountains.

Etymology. The new specific name *Caurus* is a Latin noun meaning the northwest wind. It is derived from the situation of the type habitat lying at an upper part of the Kôguchi-dani Valley, which runs down and opens to the northwest and receives wind from that direction.

***Ishikawatrechus orientalis* S. UÉNO, sp. nov.**

(Figs. 6–8)

Length: 4.10–4.40 mm (from apical margin of clypeus to apices of elytra).

Related to *I. robustior* S. UÉNO (1997, p. 10, figs. 6–7) from a prospecting adit at Nagano in Kinsha-chô, but the genae are a little more convex in posterior halves and with several short hairs, the pronotum is smaller, obviously narrower at the base, and with hind angles less protrudent laterad, the elytra are narrower, a little more elongate, and with shallower striation, and the legs are somewhat slenderer. Markedly different from *I. robustior* in configuration of aedeagus, which is not asymmetrical, with much reduced ventro-apical hook at the tip, and the inner sac largely covered with various scales.

Colour a little lighter than in *I. robustior*, reddish brown with somewhat darker fore body and lighter appendages. Head subquadrate, about as wide as or slightly wider than long; genae straight in front and very slightly convergent anteriad, gently convex near neck constriction and bearing four or five short hairs; antennae barely reaching the middle of elytra.

Pronotum relatively narrow though evidently wider than head, as wide as long, widest at about four-fifths from base, and more contracted at base than at apex; PW/HW 1.36–1.41 (M 1.39), PW/PL 1.00, PW/PA 1.30–1.40 (M 1.35), PW/PB 1.47–1.54 (M 1.50), PB/PA 0.88–0.94 (M 0.90) [PA/PB 1.06–1.13 (M 1.10)]; sides moderately arcuate near front angles, nearly straight at middle, feebly but widely sinuate at basal seventh to sixth, and then either subparallel or slightly divergent towards hind angles, which are sharp and more protrudent posteriad than laterad; front angles obtuse, a little produced forwards.

Elytra ovate, much wider than pronotum, evidently longer than wide, widest at about middle, and equally narrowed towards bases and apices; EW/PW 1.69–1.70 (M 1.69), EL/PL 2.52–2.79 (M 2.68), EL/EW 1.50–1.65 (M 1.58); sides gently arcuate at about middle, less so in front and behind, and conjointly but rather narrowly rounded at apices; shoulders obtuse, not tuberculate; prehumeral borders moderately oblique, slightly emarginate near basal peduncle, diminishing anteriorly and evanescent before reaching basal carinae; dorsum less convex than in *I. robustior*, and steeply declivous only in antero-lateral parts; striae superficial, evanescent at the side; chaetotaxy as in *I. robustior*. Legs somewhat slenderer than in *I. robustior*.

Male genital organ relatively small though moderately sclerotised. Aedeagus relatively short, almost symmetrical, about one-third as long as elytra, about as high as broad at middle, and feebly arcuate; basal part abruptly bent ventrad, fairly elongate, with small basal orifice deeply emarginate at the sides; sagittal aileron vestigial; viewed laterally, apical part gradually tapered towards apex, which is minutely tuberculate and bears an extremely small triangular hook on the ventral side; viewed dorsally, apical part slightly inclined to the left and narrowly rounded at the extremity; ventral margin slightly arcuate behind middle in profile. Inner sac largely covered with scales and teeth of various degree of sclerotisation. Styles slender, left style obviously longer than the right, each bearing four apical setae of unequal length.

Type series. Holotype: ♂, allotype: ♀, paratype: 1 ♀, 21. VI. 2006, Y. Itô leg. All deposited in the collection of the Department of Zoology, National Museum of Nature and Science, Tokyo.

Type locality. Sakasé, 960 m in altitude, in Motoyama-chô of Kôchi Prefecture, northern Shikoku, Southwest Japan.

Further specimen examined. 1 ♀, Ohgoya-yama, 1,100 m alt., Uryûno, Motoyama-chô, Kôchi Pref., 14. V. 2006, Y. Itô leg. (NSMT).

Notes. This and the succeeding new species seem to belong to the *robustior* lineage, though their mutual relationship is not necessarily clear, as will be discussed in the Notes

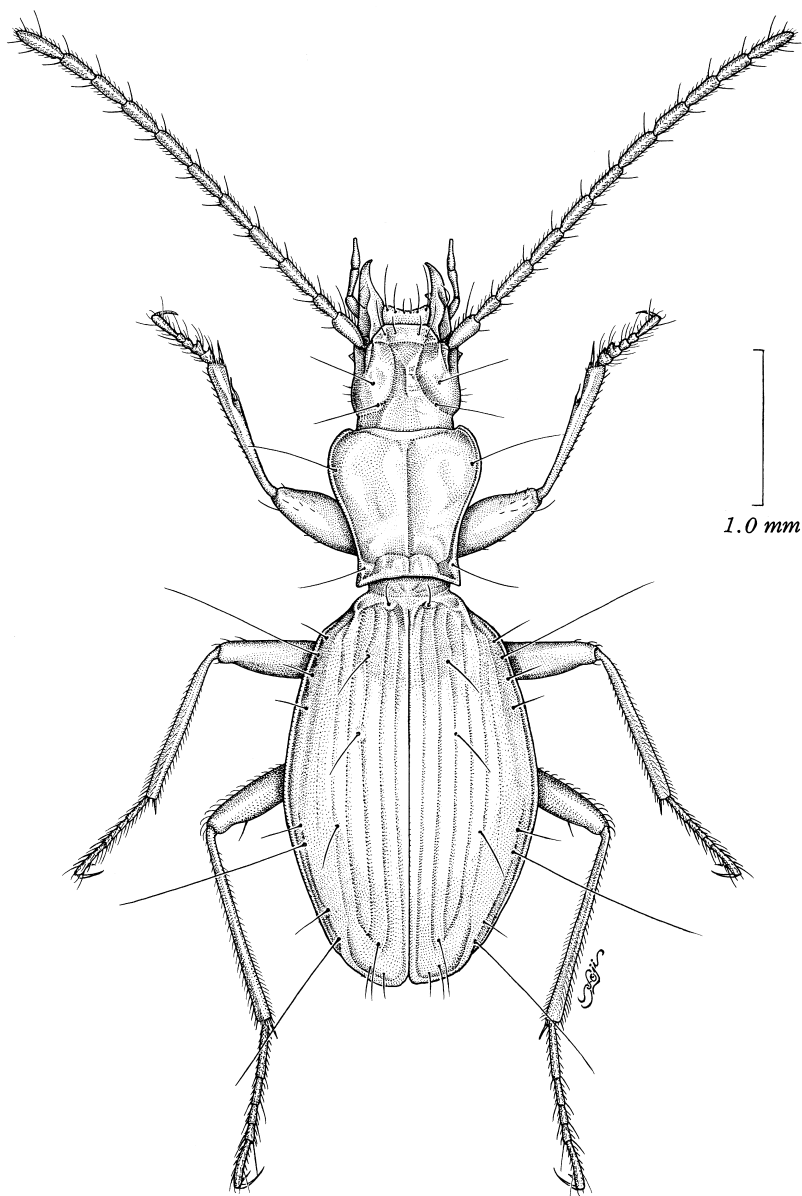


Fig. 6. *Ishikawatrechus orientalis* S. UENO, sp. nov., ? , from Sakasé of Motoyama-chô.

following the description of the next species.

The three specimens of the type series of *I. orientalis* were dug out from a scree deposited in a gully at the southern foot of Sazareo-yama (1,404 m in height), a head on the watershed ridge near the eastern end of the Ishizuchis. The collecting site is 6.8 km distant to the south-southeast in a beeline from the prospecting adit at Nagano in Kinsha-chô, the type locality of *I. robustior*.

The single female specimen of *Ishikawatrechus* (4.40 mm in the length of body) taken at a higher part of Ohgoya-yama (1,262 m in height), 6.2 km distant to the south-southwest from the type locality of *I. orientalis*, is tentatively regarded as belonging to *I. orientalis*. It agrees with the type series in most external character states with the exception of the pronotal base, which is obviously less contracted than in the type material. The standard ratios in this specimen are as follows: PW/HW 1.36, PW/PL 1.01, PW/PA 1.36, PW/PB 1.36, PB/PA 1.00 [PA/PB 1.00], EW/PW 1.70, EL/PL 2.61, EL/EW 1.54.

On the way from Sakasé to Ohgoya-yama, only 2.9 km south by west from the former, there is an abandoned mine adit called Ryû'ô Mine, which is inhabited by *I. hayashii* S. UÉNO (1999 b, p. 104, figs. 1–3). This species belongs to the *ishiharai* lineage, and is clearly different from *I. orientalis*.

Etymology. The specific name of this new species is derived from a Latin adjective meaning eastern, denoting the geographical situation of its type locality which lies near the eastern end of the Ishizuchi Mountains.

***Ishikawatrechus aquilonius* S. UÉNO, sp. nov.**

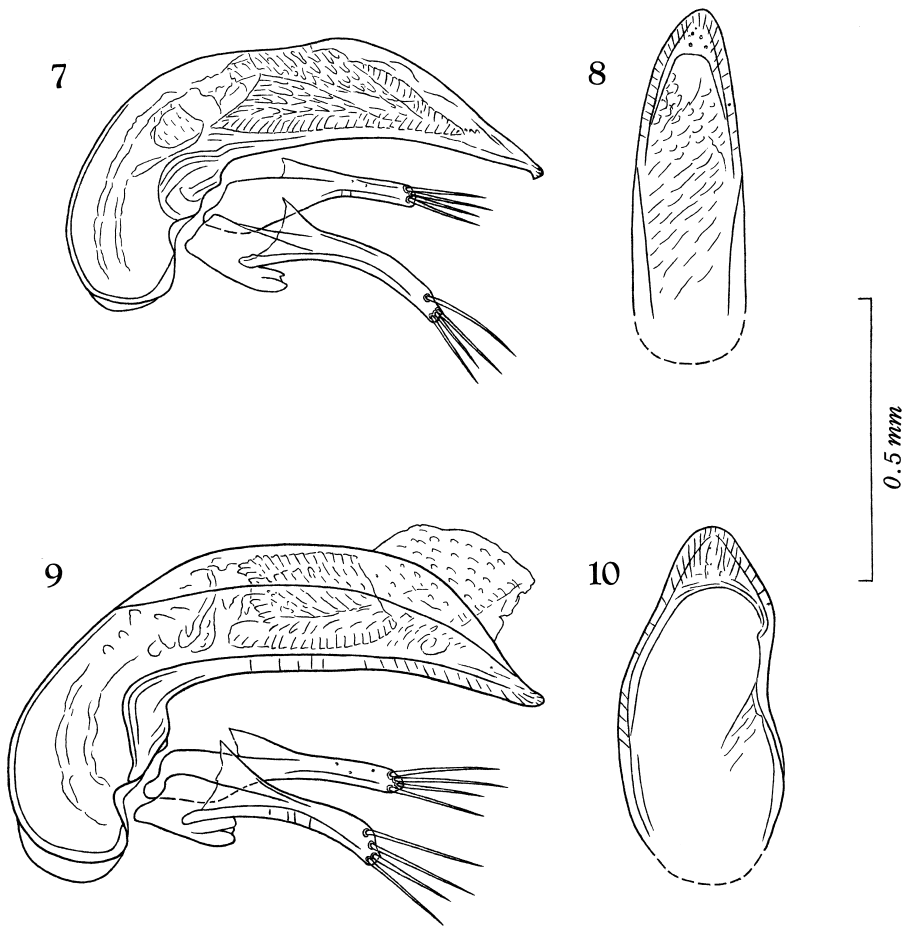
(Figs. 9–10)

Length: 4.45 mm (from apical margin of clypeus to apices of elytra).

Closely similar to *I. robustior* S. UÉNO in external morphology, only differing from the latter in the narrower pronotal base and a little narrower elytra. Recognised at first sight by utterly different configuration of the aedeagus.

Colour dark reddish brown, somewhat darker than in *I. robustior*. Head as in *I. robustior*, with completely glabrous genae; antennae reaching apical two-fifths of elytra. Pronotum a little smaller than in *I. robustior*, obviously wider than head, about as long as wide, widest at four-fifths from base, and straightly narrowed posteriad towards basal area; PW/HW 1.48, PW/PL 0.99, PW/PA 1.41, PW/PB 1.44, PB/PA 0.98 [PA/PB 1.02]; sides rather briefly arcuate from front angles, gradually convergent posteriad, slightly sinuate at about basal sixth, and then very slightly divergent towards sharp hind angles, which are mainly protrudent posteriad; front angles rounded though slightly produced forwards; base relatively narrow.

Elytra relatively narrow, widest at about middle, and almost equally narrowed towards bases and towards apices; EW/PW 1.75, EL/PL 2.65, EL/EW 1.53; humeral parts as in *I. robustior*, prehumeral borders very slightly emarginate, diminishing anteriorly, and



Figs. 7–10. Male genitalia of *Ishikawatrechus* spp. nov.; left lateral view (7, 9), and apical part of aedeagus, dorso-apical view (8, 10). — 7–8. *I. orientalis* S. UÉNO, sp. nov., from Sakasé of Motoyama-chô. — 9–10. *I. aquilonius* S. UÉNO, sp. nov., from Nakao of Toyosaka in Iyo-Mishima.

evanescent just before reaching basal carinae; dorsum convex as in *I. robustior*, with similar striation and chaetotaxy, though external striae are shallower than in the latter.

Male genital organ heavily sclerotised. Aedeagus a little less than three-eighths as long as elytra, feebly arcuate, broader than high, widely membranous on dorsum, and asymmetrical, with the left wall reduced and evidently lower than the right; viewed laterally, dorsal margin of right wall semicircularly arcuate from behind the level of parameral articulation to near the base of apical lobe, which is short, straight, blunt at the tip, and devoid of ventro-apical hook; viewed dorsally, left wall deeply sinuate at the side of apical

orifice, right wall moderately arcuate, apical lobe wide at the base, and rapidly narrowed apicad, though the apex is broad and widely and feebly rounded; basal part strongly curved ventrad, relatively narrow behind the level of parameral articulation, with small basal orifice, whose sides are deeply emarginate; sagittal aileron fairly large though hyaline; ventral margin slightly emarginate behind middle in profile. Inner sac largely covered with scales and teeth as in *I. orientalis*, which are fairly compact at middle. Styles less slender than in *I. orientalis*, with relatively short left one, each bearing four setae at the apex.

Female unknown.

Type specimen. Holotype: ♂, 10. VI. 2006, Y. Itô leg. Deposited in the collection of the Department of Zoology, National Museum of Nature and Science, Tokyo.

Type locality. Nakao, 390 m in altitude, in Toyosaka of Tomisato-chô, Iyo-Mishima, at the northeastern part of Ehime Prefecture, northern Shikoku, Southwest Japan.

Notes. This new species seems directly related to *I. robustior* in view of the close similarity in external morphology and of the asymmetrical aedeagus. It is, however, definitively different from *I. robustior* in a little longer aedeagal apical lobe completely devoid of ventro-apical hook at the extremity, the presence of a fairly large sagittal aileron, and much more developed teeth-patch inside the inner sac. Since the presence of the ventro-apical hook at the aedeagal apex is a diagnostic character state of *Ishikawatrechus*, its absence in *I. aquilonius* is quite exceptional within the genus. The hook is also reduced in *I. orientalis*, but its remnant is still observable in this eastern species. Besides, the aedeagus is almost symmetrical in *I. orientalis*, which seems to indicate that this species is the most isolated one of the three known species of the *robustior* lineage.

The three known species of the *robustior* group occur in the upper drainage of the Dôzan-gawa River and its close proximity, or in other words, at the easternmost part of the Ishizuchi Mountains and the southern side of the Hôsei Mountains, the latter of which is the northeastward branch ridge of the Ishizuchis. A single known specimen of *I. aquilonius* was dug out from a thin colluvium deposited on a slant shale bed at the southeastern foot of Akaboshi-yama (1,453 m in height), a head at the central part of the Hôsei Mountains. The collecting site is about 6 km distant to the west-southwest in a beeline from the type locality of *I. robustior*, and 7.7 km distant to the west-northwest in a beeline from that of *I. orientalis*.

Etymology. The new specific name *aquilonius* is a Latin word meaning northern, denoting the northern habitat of the new species.

***Ishikawatrechus satoi* S. UÉNO, 2003**

Ishikawatrechus satoi S. UÉNO, 2003, Spec. Bull. Jpn. Soc. Coleopterol., Tokyo, (6), p. 64, figs. 1–3; type locality: Nôji-no-ana Cave in Tosa-chô.

Specimen examined from a new locality. 1 ♂, Kôzokawa, 370 m alt., Tosa-chô, Kôchi

Pref., 16. V. 2006, Y. Itô leg. (NSMT).

Notes. It is most unexpected that an *Ishikawatrechus* most probably referable to *I. satoi* occurs at the southern foot of the Ishizuchi Mountains on the left side of the main stream of the Yoshino-gawa River. The collecting site of the Kôzukawa specimen recorded above is 6.2 km distant to the north-northeast in a beeline from Nôji-no-ana Cave, the type locality of *I. satoi*, and the single specimen now known from this population (4.65 mm in the length of body) perfectly accords with the type series both externally and genitally, though the male genitalia are more heavily sclerotised. The standard ratios in this specimen are as follows: PW/HW 1.41, PW/PL 0.94, PW/PA 1.40, PW/PB 1.46, PB/PA 0.96 [PA/PB 1.04], EW/PW 1.63, EL/PL 2.38, EL/EW 1.55.

Ishikawatrechus satoi belongs to the *ishikawai* group, whose known members are mostly distributed along the southern periphery of the generic range of distribution. This and the following species are therefore exceptional in this regard, invading northwards into the distributional area of the members of the *ishiharai* group.

Ishikawatrechus saxatilis S. UÉNO, 2003

Ishikawatrechus saxatilis S. UÉNO, 2003, Spec. Bull. Jpn. Soc. Coleopterol., Tokyo, (6), p. 68, figs. 4–5; type locality: Nishiishiwara-no-ana Cave at Jizôji in Tosa-chô.

Specimen examined from a new locality. 1♂, Kuishi-yama, Ishiwara-rindô, 910 m alt., Jizôji, Tosa-chô, Kôchi Pref., 19. IX. 2007, Y. Itô leg. (NSMT).

Notes. Though unknown from the Ishizuchi Mountains, a new locality of this rare species is recorded herewith for the sake of convenience. It belongs to the *ishikawai* group and is closely related to *I. satoi* recorded above. It has been known from only a few specimens collected in two small limestone caves lying on either side of a tributary of the Jizôji-gawa that empties into the Yoshino-gawa River. Its new locality discovered on the northern slope of Kuishi-yama is 4.6 km distant to the east-southeast in a beeline from the type locality, Nishiishiwara-no-ana Cave, and belongs to the Jizôji-gawa drainage. It is therefore not surprising that the same species occurs on Kuishi-yama. However, it seems worth noting that the blind trechine beetle dwells in the upper hypogean zone beside caves.

要 約

上野 俊一：石鎚山地におけるツヤメクラチビゴミムシ属甲虫類の新種と新記録。
 —— ツヤメクラチビゴミムシ属 *Ishikawatrechus* は、メクラチビゴミムシ類の分化が国内でもっともいちじるしい四国の中でも二番目に大きい属で、四国の中央部に広い分布域をもち、とくに広義の石鎚山脈とその近接地域で極端な種分化を遂げている。しかし、外部形態の酷似したものが多く、雄交尾器の形態からみて明らかに別系統だと考えられる 2 種が、外部

形態では識別できないという場合さえあって、正しく分類するのが容易ではない。しかも最近になって、地下浅層性の種類の生息場所を突き止める方法が進歩した結果、ツヤメクラチビゴミムシ類の新しい生息地が数多く発見され、これまでの知見を全面的に見直す必要が急激に大きくなった。2007年10月だけで2新種が発見された、という事実からみても、既存の資料に基づく知識が、ツヤメクラチビゴミムシ類の分布や分化の実態を十分に表しているとはとても思えないが、既知の生息地のほとんどすべてから雄標本が得られている現時点で一度、見直しておくのも、無駄ではないように思われる。この研究では、石鎚山系の32地点で採集されたツヤメクラチビゴミムシ類を詳しく検討して、それらが14種1亜種に分類されるという結論が得られた。14種のうちの4種については新しい知見がないので本論文から除外し、6種を新種として記載、1種を2亜種に分け、残りの3種については新しい生息地を記録した。新たに記載した6新種は下記のとおり。

Ishikawatrechus taichii S. UÉNO タイチメクラチビゴミムシ

Ishikawatrechus tuberculatus S. UÉNO オオモリメクラチビゴミムシ

Ishikawatrechus septemtrionalis S. UÉNO ウズイメクラチビゴミムシ

Ishikawatrechus caurus S. UÉNO コウグチダニメクラチビゴミムシ

Ishikawatrechus orientalis S. UÉNO サザレオメクラチビゴミムシ

Ishikawatrechus aquilonius S. UÉNO アカボシメクラチビゴミムシ

ツヤメクラチビゴミムシ属にはなお、属の分布域の南西部にいくつかの未記載種が残されているが、これらについては別の論文で公表する。

この論文は、昨年(2007)の5月20日に、享年80歳で逝去された、故芝田太一氏に捧げたものである。チビゴミムシ類に関する著者の研究が、ようやく緒に就いたところに、芝田氏から貴重な資料の支援を受けたことに対する感謝の意が込められている。

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