

## Three New Blind Trechines of the Genus *Stygiotrechus* (Coleoptera, Carabidae, Trechinae) from Western Japan

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**Abstract** Three new species of the genus *Stygiotrechus* S. UÉNO are described under the names: *Stygiotrechus ikiensis* sp. nov., *S. lampros* sp. nov. and *S. costicollis* sp. nov. from western Japan.

### Introduction

The genus *Stygiotrechus* S. UÉNO, 1958 is composed of small- to very small-sized trechine beetles of pubescent and more or less parallel-sided body, all depigmented, apterous, and completely anophthalmic (S. UÉNO, 1958). This genus comprises 20 species and two subspecies hitherto described, in which the smallest species of Japanese Trechini is included, and is classified into highly morphologically diversified seven species-groups: *ohtanii* group, *parvulus* group, *unidentatus* group, *esakii* group, *kubotai* group, *pachys* group, and *morimotoi* group (S. UÉNO, 1969, 1970, 1973). The distribution of the genus is extending from the Gotô Islands off the western coast of Kyushu in the west to the Kii Peninsula of central Honshu in the east. However, considerable numbers of newly discovered populations are still await proper taxonomic treatment.

In this paper, I am going to describe three new *Stygiotrechus* of both taxonomical and zoogeographical interests. The first species was discovered from the northwestern periphery of the generic distribution. The type locality of this new species, the northernmost area of Iki Island off northern coast of Kyushu, is situated about 50 km distant to the south beyond the Tsushima Strait from Tsushima Island, where the two relative genera of *Stygiotrechus*, *Coreoblemus* S. UÉNO, 1969 and *Daiconotrechus* (*Tsuiblemus*) S. UÉNO, 2007 inhabit (S. UÉNO, 1969, 2007). Thus, the presence of this new species sharply illustrates the effect of the Tsushima Strait on the dispersal of blind trechine beetles. The second species to be described seems to bear no direct relationship to any of the previously known congeners, but somewhat tentatively placed in the *pachys* group in view of its broad body form and other characteristics explained in the relevant section of this paper. Most striking is the third species, whose pronotal dorsal surface is provided with a distinct longitudinal carina on each side: a peculiar structure which reminds us of the pronotum found in certain groups of Cucujoidea such as Laemophloeidae — undoubtedly shows the highest degree of development of the pronotal postangular carinae within the whole Trechini as far as I am aware.

To facilitate a better understanding of the descriptions of three new taxa on later pages, a delineation of somewhat updated generic diagnostic characteristics will be given at the beginning of Taxonomy part.

Abbreviations used in this paper are as follows: HL — length of head, measured from the apical margin of clypeus to neck constriction along the mid-line; 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; SC — width of scutellum; JP — distance between the right and left juxta scutellar pores; EB — width of elytral bases, measured between the first pores of marginal umbilicate series; EW — greatest width of elytra; EL — greatest length of elytra; M —

arithmetic mean; NSMT — National Museum of Nature and Science, Tsukuba (type depository).

Descriptions concerning certain character states which are found in common within the members of the genus *Stygiotrechus* are frequently omitted in the accounts of new taxa treated in this paper.

## Taxonomy

### Genus *Stygiotrechus* S. UÉNO, 1958

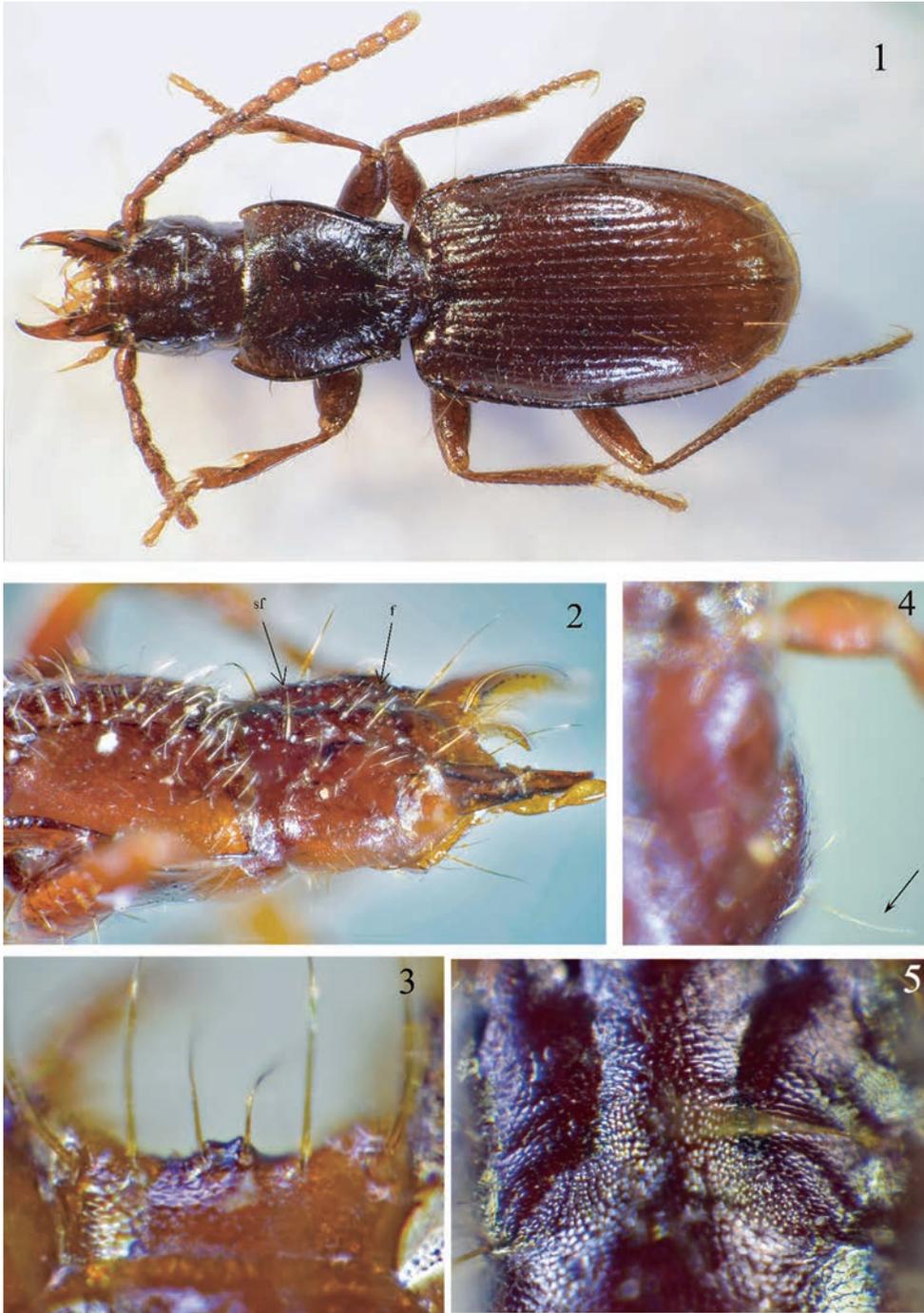
*Stygiotrechus* S. UÉNO, 1958: 123 (type species: *Stygiotrechus kubotai* S. UÉNO, 1958); S. UÉNO, 1969: 486 (redescription).  
*Kurasawatrechus* subgen. *Stygiotrechus* JEANNEL, 1962: 199.

Small-sized trechine beetles of the *Trechoblemus* phyletic series (JEANNEL, 1928, pp. 22, 99, 1962, p. 197; cf. S. UÉNO, 1999, p. 35); surface almost wholly pubescent.

Head transverse, usually subquadrate, with a pair of suprafrontal and two pairs of supraorbital setae (in *morimotoi* group, a pair of frontal setae is present instead of suprafrontal ones, besides, *S. miyamae* S. UÉNO, 2009, *S. izumonis* S. UÉNO, 2008, *S. sasajii* S. UÉNO et NAITÔ, 2007, and several populations of the Kii Peninsula belonging to *ohtanii* group possess both frontal and suprafrontal setae); frontal furrows in various condition: entirely deep and distinct in few species, usually at least partially shallow or indistinct, and in certain species interrupted behind middle; eyes absent; temporal setae rarely present; right mandible tridentate, with well isolated premolar tooth and bicuspid retinaculum, left mandible bidentate; labrum transverse, sexsetose with anterior margin slightly emarginate; clypeus quadrisetose; labium seemingly articulated, with labial suture visible throughout except for the members of *morimotoi* group in which the suture is sometimes only partially visible; mentum with a pair of setae and a pair of small sensory pits; mentum tooth usually with bifid tip but sometimes emarginate, truncated, or simple (in *S. parvulus*) at the apex; submentum with a transverse row of seven to ten setae; ligula octosetose, usually subpentagonal without remarkable protuberance at apex; penultimate segments of both labial and maxillary palpi strongly dilated distally, quadrisetose in labial, pubescent with several short hairs in maxillary palpi, ultimate segments elongated subconical, obviously shorter in labial, slightly longer (or subequal in length) in maxillary palpi than the preceding ones.

Pronotum subcordate to subquadrate, ciliated throughout at lateral margins, with two pairs of lateral and two or three pairs of discal setae, but in some species (e.g. *S. kadanus* S. UÉNO, 2001 and *S. miyamae*) discal setae are masked by long pubescent hairs; base more or less lobed. Scutellum visible though small.

Elytra elongate to ovate, ciliated throughout at lateral margins, with basal peduncle devoid of a transverse furrow for the reception of pronotal base; humeral borders each provided with either a single large tooth (in *unidentatus* and *morimotoi* groups) or several small serrae, in the former case anterior margin of large tooth is extremely minutely serrulated (but in *unidentatus* group anterior margin sometimes nearly smooth); striae more or less impressed at least on disc, but in *S. unidentatus* evanescent except stria 1; scutellar striole usually present except in *unidentatus* group and *S. kitayamai* of *morimotoi* group (S. UÉNO, 2001); apical recurrent striole usually joining or directed to stria 5, but in certain species sometimes or often (in *S. kadanus*) directed to stria 6 or 7, in *S. iyonis* S. UÉNO et ASHIDA, 2003 usually joining stria 7; two discal setae on stria 3; preapical pore positioned on apical anastomosis of striae 2 and 3; two apical setae present; humeral set of marginal umbilicate pores not completely aggregated, the first pore slightly removed from the other three, and two posterior pores somewhat inwardly displaced from the marginal gutter (in *unidentatus* and *morimotoi* groups the first pore rather widely dislocated antero-laterad), two pores of middle set close to each other and widely removed from the anterior set.



Figs. 1–5. *Stygiotrechus* spp. — 1 & 5, *S. ikiensis* NAITÔ, sp. nov.; 2–4, *S. izumonis* S. UÉNO. — 1, Habitus (holotype); 2, fore-body, right lateral view (sf, suprafrontal setae; f, frontal setae); 3, labrum, dorsal view; 4, right gena, dorsal view (arrow indicates a long temporal seta); 5, head, dorsal view, showing the disordered state of frontal furrows.

Protibiae entirely pubescent, without distinct external longitudinal groove except in *S. pachys*; male protarsi variable in its secondary sexual character, usually proximal two segments moderately dilated and inwardly spured at apices, but in *S. parvulus* two proximal segments only feebly dilated and inwardly spured, in *S. esakii* with no dilated segment, in *S. miyamai* proximal two segments only weakly angulate inwards.

Aedeagus usually tubular, inner sac of which provided with a large anisotropic copulatory piece.

*Stygiotrechus ikiensis* NAITÔ, sp. nov.

(Figs. 1 & 5–6)

Length: 2.68–2.85 mm (from apical margin of clypeus to apices of elytra).

Medium-sized species of fairly elongate, parallel-sided body form. Probably belonging to the *ohtanii* group with which it agrees in most of the basic characteristics, though the true affinity is not certain. Judging from the similarity in the external features including the genitalic ones, most closely allied to *S. izumonis* S. UENO (2008, p. 2, figs. 1–2) from Sagi-dôzan of the Shimané Peninsula whose affinity is, however, also uncertain. Despite the close similarity between them, *S. izumonis* is different from *S. ikiensis* in the following points: frontal furrows normally impressed (disordered behind middle in *S. ikiensis* (Fig. 5); anterior margin of labrum provided with a distinct central tubercle (Fig. 3) which is formed by the fusion of two smaller tubercles, making the labrum somewhat trilobed (in *S. ikiensis*, and also in *S. sasajii*, anterior margin nearly smooth or only slightly bituberculate); genae well convex particularly in posterior parts, widest at a little before the neck constriction and rather strongly narrowed anteriorly, with a fairly long distinct temporal seta (Fig. 4) at the widest point (genae only weakly convex and gently narrowed anteriorly, without distinct temporal seta in *S. ikiensis*); three frontal and a pair of suprafrontal setae discernible on frontal to vertexal area (Fig. 2) in addition to the short pubescence (only a pair of suprafrontal setae are present except for the pubescent hairs in *S. ikiensis*); pronotal dorsal pubescence much longer, denser, and dorsal setae are mingled with long pubescent hairs (pubescence short, and dorsal setae are clearly differentiated in *S. ikiensis*); elytra less convex with humeral areas more widely depressed, and striation shallower, intervals flatter; aedeagus of male genitalia shorter, though the peculiar configuration of it is strikingly similar to that of *S. ikiensis*. *Stygiotrechus ikiensis* is also similar to *S. sasajii* S. UENO et NAITÔ (2007, p. 13, figs. 1–3) from Gôtsu, however, the latter is easily recognizable by: much lighter body colour especially in appendages (all appendages of *S. sasajii* are yellowish brown); presence of a pair of frontal setae in addition to the suprafrontal ones; longer, denser pubescence on head and pronotum; more transverse pronotum with acutely produced front angles; and above all, differently shaped aedeagus which is short and symmetric.

Colour darker than in *S. izumonis*, concolorously dark reddish brown, only palpi yellowish brown, other appendages hardly lighter than dorsum as in *S. izumonis*. Body surface well shining but bears coarse microsculpture, besides, short shallow transverse wrinkles are formed here and there particularly on pronotum (in the paratype specimen, however, surface is rather smooth).

Head subquadrate, a little less transverse than in *S. izumonis*; HW/HL 1.11–1.15 (M 1.13) [1.22, in *S. izumonis*]; frons and supraorbital areas weakly convex, and sparsely covered with short pubescence, without distinct frontal setae; vertex with a pair of suprafrontal setae in addition to few pubescence; frontal furrows distinct though lightly and unevenly impressed, gently arcuate in front, then subangulate a little behind the level of the anterior supraorbital pores, and disordered and interrupted by mal-defined oblique wrinkles and by an oblique lunate depression existing on each outer side of the furrows between the level of the anterior and the posterior pairs of the supraorbital pores, then su-

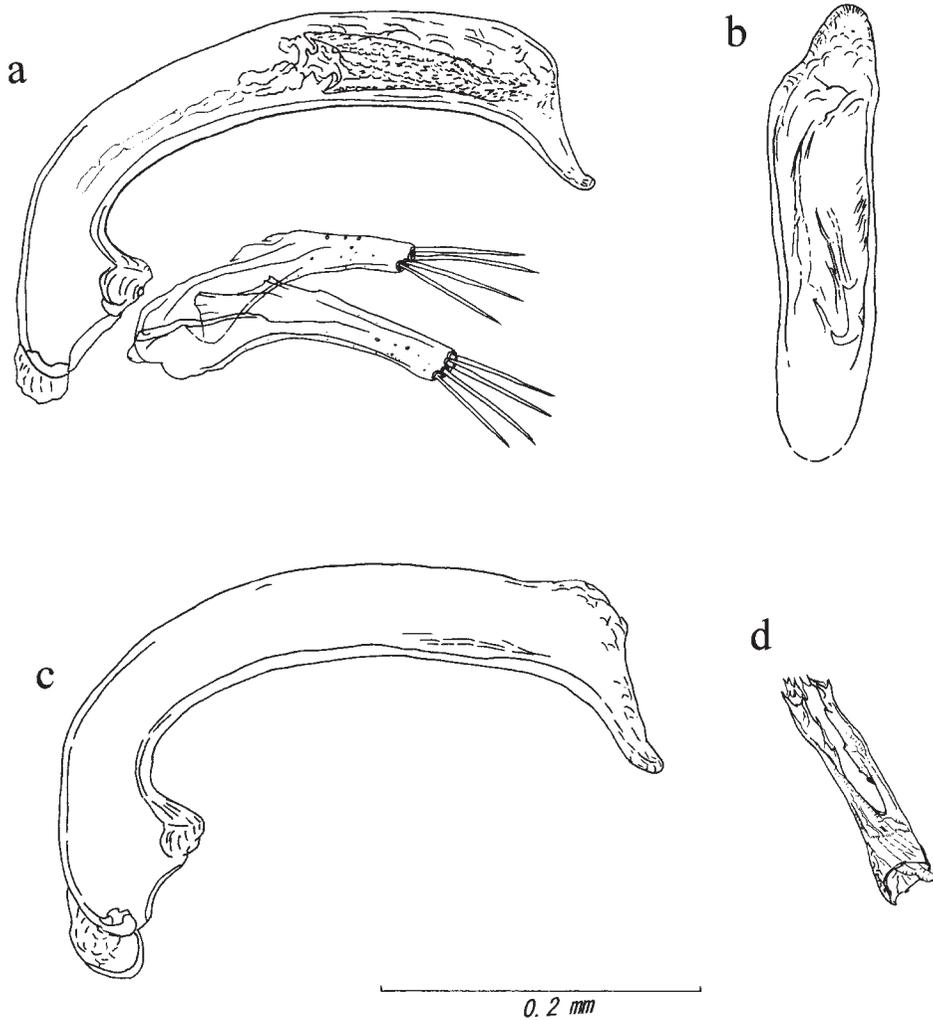


Fig. 6. Male genital organ of *Stygiotrechus ikiensis* NAITÔ, sp. nov. — a & b, Holotype; c & d, paratype. — a & c, Left lateral view; b, dorsal view of apical portio; d, copulatory piece, right lateral view.

perforically continuing posteriad towards neck constriction<sup>1)</sup>; genae more gently convex than in *S. izumonis*, sparsely covered with short erect hairs, without distinct temporal seta; neck wide with shallow neck constriction; mandibles relatively gently incurved though hooked at acute apices, two retinacular denticles of right mandible rather well fused together; labrum transverse whose anterior margin slightly sinuate and without distinct protuberance at middle; mentum tooth somewhat stouter than in *S. izumonis* and bifid at apex; submentum with a row of seven or eight setae; antennae shorter than in *S. izumonis*, stout and rather weakly dilated apicad, hardly reaching basal two-sevenths of elytra in ♂, slightly exceeding basal three-tenths of elytra in ♀, antennal segment 2 a little more than twice as long

<sup>1)</sup> Similar conditions of frontal furrows are also found in other species of *Stygiotrechus* (e.g. *S. ohtanii* and *S. esakii*) in lesser degrees.

as wide, but segments 3–4 less than twice as long as wide (in *S. izumonis* segments 2–4 amply more than twice as long as wide); relative lengths of antennal segments as follows: II : III : IV : VIII : IX : X : XI  $\cong$  1 : 1.09 : 1.02 : 0.99 : 1.01 : 1.00 : 1.45 [in *S. izumonis*; 1 : 1.16 : 1.17 : 0.90 : 0.96 : 0.98 : 1.24]. Microsculpture of head somewhat irregular, with meshes fine transverse on clypeus, large polygonal on neck, oblique large and oblique transverse on supraorbital areas, but on frontal to vertexal areas mostly composed of isodiametric to transverse meshes in anterior portion, becoming granular posteriad, especially so along the frontal furrows.

Pronotum very similar in configuration to that of *S. izumonis*, though a little more transverse on an average; PW/PL 1.10–1.20 (M 1.14) [1.11 in *S. izumonis*], subcordate, wider than head, widest at about 7/10–5/7 from base, more strongly contracted basad than apicad; PW/HW 1.26–1.28 (M 1.27), PW/PL 1.10–1.20 (M 1.14), PW/PA 1.23–1.25 (M 1.24), PW/PB 1.30–1.37 (M 1.34), PA/PB 1.06–1.11 (M 1.08), [PB/PA 0.84–0.94 (M 0.90)]; sides narrowly bordered and sparsely ciliated, gently arcuate in front and only subtly sinuate at about 1/5–2/9 from base, then obviously contracted basad, rather minutely indented in basal two-ninths; both anterior and posterior pairs of lateral setae present, the former inserted a little before the widest part, the latter positioned slightly before the hind angle; apex apparently wider than base, nearly straight or slightly emarginate, front angles similar in shape to that of *S. izumonis* but a little more strongly protrudent; base only slightly bilobed at middle, shallowly and briefly sinuate just inside hind angles on each side, hind angles a little more acute than in *S. izumonis* and minutely denticulate at the tip; disc moderately convex, rather sparsely covered with short erect pubescence, and provided with three pairs of dorsal setae on each side of median line; microsculpture more deeply impressed than in *S. izumonis*, chiefly composed of wide meshes; median line distinct and deepened behind middle, not reaching apex, almost reaching base; apical transverse impression nearly obliterated though apical area is minutely longitudinally wrinkled, basal transverse impression distinct and continuous, arcuately reaching the basal margin on each side; basal foveae oval, slightly extending anteriad; basal area narrow, rather rugose and longitudinally strigose, basal margin indented at middle; postangular carinae absent. Scutellum fairly reduced though distinct

Elytra very similar in shape to those of *S. izumonis*, but a little less elongate; EL/EW 1.57–1.60 (M 1.59) [1.61 in *S. izumonis*], widest at about 3/7–4/9 from base; EW/PW 1.30–1.36 (M 1.33), EL/PL 2.41–2.50 (M 2.45); shoulders square; humeral margin each provided with four or five distinct serrae which are preceded by two minute denticles and followed by two to zero very obtuse serra(e); pre-humeral borders slightly oblique or almost perpendicular to the mid-line; sides narrowly bordered and sparsely ciliated, borders becoming finer apicad, only slightly divergent from behind shoulders to near the widest part, then feebly arcuate to the level of the eighth pore of the umbilicate series; apices widely, conjointly rounded; dorsum well convex, rather steeply declivous in marginal area, transverse depression in basal area weaker than in *S. izumonis*, humeral area more narrowly explanate and devoid of the irregularly granulate surfaces which are found in the gently depressed humeral parts of *S. izumonis*; microsculpture mostly composed of fine irregular meshes; striae remarkably distinct, though obliterated at the sides, striae 1–5 distinct, almost entire, more or less deepened near base, stria 6 distinct at middle but sometimes fragmented in front, stria 7 faintly and only fragmentarily impressed before middle, stria 8 either obsolete or irregularly, partially visible, but sometimes continuous behind middle; scutellar striole short, relatively wide, but not clearly defined; apical striole rather shallow, shortly arcuate, and directed to or joining to stria 5; intervals moderately convex on disc, more or less so even near sides, each with a row of suberect pubescence; apical carina slightly recognizable; stria 3 with two setiferous dorsal pores at 1/5–2/9 and 1/2–5/9 from base, respectively; preapical pore located at the meeting point of striae 2 and 3, obviously more distant from apex than from suture; other chaetotaxy ordinary for the genus.

Ventral surface as in *S. izumonis*, sparsely pubescent, ventrites 4–6 with a pair of paramedian setae, ventrite 7 with a pair of setae in ♂, two pairs of setae in ♀ along the apical margin. Legs stouter and a little shorter than in *S. izumonis*, proximal two segments of male protarsi moderately dilated, inwardly denticulated at apices and provided beneath with adhesive appendages.

Male genital organ very small, though moderately sclerotized, aedeagus of the holotype specimen very similar in configuration to that of *S. izumonis*, but a little longer and obviously slenderer than in *S. izumonis*, besides, slightly sigmoidally curved in dorsal view as in the species of the *ohtanii* group (not sigmoidally curved in *S. izumonis*). Aedeagus<sup>2)</sup> about one-fourth as long as elytra; basal part strongly curved ventrad, sides of basal orifice moderately emarginate; sagittal aileron less extensively but more strongly protrudent ventro-proximad than in *S. izumonis*; viewed laterally, aedeagal tube gradually dilated from behind the parameral articulation to the sides of apical orifice, with ventral margin much more shallowly emarginate than in *S. izumonis*; in lateral view, apical part more steeply bent ventrad than in *S. izumonis*, side walls of apical orifice semicircularly expanded dorsad as in *S. izumonis*, apical lobe strongly narrowed towards the slightly reflexed blunt extremity; in dorsal view, apical part somewhat slenderer than in *S. izumonis*, and faintly sigmoidally twisted, apical lobe more gradually narrowed apicad and more widely rounded at the extremity than in *S. izumonis*. Styles slenderer than in *S. izumonis*, left style a little longer than the right, each bearing four apical setae. Inner sac armed with a relatively slender copulatory piece, length of which proportionally shorter than that of *S. izumonis* (1/3 as long as aedeagus while 3/8 in *S. izumonis*), apical portion of the piece split into numerous spinules.

Male genital organ of the paratype specimen seems to be rather different from that of the holotype in the configuration of aedeagus. Substantial differences in the aedeagus of the paratype specimen from that of the holotype are as follows: apparently larger; middle portion of aedeagal tube hardly dilated apicad, and more strongly twisted; sagittal aileron larger; apical part more strongly decurved in profile; dorsal margin of apical orifice more irregularly produced in profile; dorsal margin of apical lobe less strongly sinuate in profile, though the terminal portion is slightly reflexed as in the holotype. Viewed dorsally, apical part very similar to that of the holotype.

*Type series.* Holotype: ♂, paratypes (allotype: ♀; 1 ♂), 26.IV.2015, T. NAITÔ leg. The holotype will be deposited in NSMT.

*Type locality.* Kushiyama, 10 m alt. Higashi-furê in Katsumoto-chô in Iki Island, Nagasaki Prefecture, off the northern coast of Kyushu, western Japan.

*Notes.* Differences in the details of aedeagal features between the holotype and paratype specimens do not seem to be easily overlooked. However, I prefer to interpret these differences as the deformation (or aberrancy) occurred in the aedeagus of the paratype specimen, at least for the time being.

Kushiyama, the type locality of *S. ikiensis*, situates at the northernmost coastal area of Iki Island facing the Tsushima Strait. This site is about 61 km distant to the south-southeast beyond the Tsushima Strait from Shirataké (in Tsushima Island), the type locality of both *Daiconotrechus (Tsuiblemus) breviculus* S. UÉNO, 2007 and *Coreoblemus sejimai* S. UÉNO, 2007; about 66.5 km distant to the northwest beyond the Iki Strait from the Mizunashi-dô Cave, the type locality of *S. esakii* S. UÉNO, 1969 (S. UÉNO, 1969, 2007); about 323.8 km distant to the southwest beyond the wide water gap of Japan Sea from Sagi-dôzan of the Shmané Peninsula, the type locality of *S. izumonis*, about 266.8 km (274.6 km) distant to the southwest from Shimojô site (from Hongô site) in Gôtsu-shi, the type localities of *S. sasajii*. From the geographic point of view, and considering that the relationship between *S.*

<sup>2)</sup>Description below is solely based on the aedeagal features of the holotype specimen.

*ikiensis* and *S. izumonis* is apparently closer than that between *S. ikiensis* and *S. sasajii*, it seems plausible that the ancestor of *S. izumonis* was derived from some immigrant population of the ancestor of *S. ikiensis* which has been carried away northeastwards by the agency of the Tsushima Current from Iki Island, and has been washed up on the shore of the Shimané Peninsula in a rather recent geological period. Because the information on this is, however, still only limited, this problem is left open to future investigations.

The exact habitat of *S. ikiensis* is embraced in the large outcrop of mudstone and sandstone located just behind the sandy beach. This outcrop is largely covered with the shrubberies of creeping conifer, *Juniperus chinensis* var. *procumbens* ENDL., but devoid of the cover of tall tree. All specimens collected were found under the stones embedded in the soil near the source of a very narrow stream of fresh water in coexistence with abundant small isopods.

*Etymology.* This new species is named after the island on which the type locality lies.

***Stygiotrechus lampros* NAITÔ, sp. nov.**

(Figs. 7 & 8)

Length: 2.88–3.29 mm (from apical margin of clypeus to apices of elytra).

Medium to large species of *Kurasawatrechus*-like body form. Considered to be related to *S. pachys* S. UÉNO (1970, p. 606, figs. 2–3) from the Gotô Islands chiefly on the basis of the combination of following features: wide body with ample elytra and proportionally small head; mode of elytral humeral serrulation which is extremely obtuse and thick (humeral serrulation of *S. pachys* is very thick and obtuse); presence of longitudinal groove on the external face of each protibia, though the groove is only vestigial; mode of pronotal microsculpture which is predominantly composed of strongly transverse fine meshes (meshes seem to be fitted in transversely undulating fine lines)<sup>3</sup>; similarity of male genital organs between these two species. From *S. pachys* this new species is easily discriminated by much lighter coloration, narrower pronotal base, more rounded elytra with less salient humeral parts and shallower striation, more narrowly produced apical lobe of aedeagus.

Colour reddish brown, very shiny; palpi yellowish brown; apical halves of antennae, apical four-ninths of elytra, ventral side of hind body, and legs lighter than the other parts of body.

Head proportionally small and relatively short, widest at a little behind the middle of genae; HW/HL 1.37–1.43 (M 1.40); neck somewhat narrower than in *S. pachys* with distinct neck constriction; frontal furrows entire, deep and well outcurved in front, not angulate at middle then widely divergent posteriad; frons and supraorbital areas well convex, sparsely pubescent; two pairs of supraorbital setae present on lines convergent posteriad; vertex with a pair of suprafrontal setae in addition to few pubescence; microsculpture mostly composed of isodiametric meshes but partially of wide meshes; eyes totally absent; genae not distinctly angulate unlike *S. pachys*, more evenly and more strongly convex than in *S. pachys*, sparsely covered with erect hairs of various length; labrum transverse, anterior margin of which shallowly emarginate and hardly or only slightly bituberculate at middle; mandibles relatively slender, proximal retinacular denticule rather reduced on right mandible; mentum tooth relatively stout and bifid at the tip; submentum with a transverse row of seven to nine (eight in two specimens) setae; labial suture finely visible throughout; antennae usually reaching basal two-fifths of elytra, with segment 2 slightly shorter than segment 3 which is a little longer than segment 4; segments 8–10 suboval and more than 1.5 times as long as wide, apical segment the largest.

<sup>3</sup> This feature is not accentuated in the original description of *S. pachys*, but distinct on both pronotum and elytra in *S. pachys*.



Fig. 7. *Stygiotrechus lampros* NAITÔ, sp. nov. (holotype).

Pronotum subcordate, widest at about apical one-fourth, more strongly contracted posteriad than anteriad, basal part less ample than in *S. pachys*; PW/HW 1.23–1.29 (M 1.26), PW/PL 1.15–1.25 (M 1.18), PW/PA 1.27–1.28 (M 1.27), PW/PB 1.21–1.27 (M 1.25), PA/PB 0.94–1.00 (M 0.98), PB/PA 0.94–1.06 (M 1.02); disc well convex, sparsely pubescent and provided with two or three discal setae on each side of median line; microsculpture dominantly consisted of fine transverse meshes in fine transversely undulating lines, though partially of isodiametric meshes in apical and basal areas; sides distinctly bordered and sparsely ciliated throughout, more strongly rounded in front than in *S. pachys*, and rather distinctly sinuate at about one-fourth to two-sevenths from base, then slightly divergent basad and becoming subparallel before hind angles; basal one-fourth of lateral sides only faintly indented; anterior pair of lateral setae inserted near the widest parts, posterior pair positioned a little before hind angles, which are subrectangular; apex nearly straight or slightly arcuate; front angles more porrect but less sharp than in *S. pachys*; base wider than apex on an average, slightly arcuate and slightly bilobed at middle, then slightly sinuate inside hind angle on each side; median line distinct at middle becoming shallower in front, deepened near base, and usually reaching basal border; apical transverse impression obsolete; basal transverse impression continuous but not sharply outlined, largely included on each side into large oval basal foveae whose bottoms are gently slanting towards the deepest point; apical area even; basal area broad, somewhat uneven, shallowly strigulate both transversally and longitudinally; basal margin indented at middle; postangular carinae very obtuse or absent. Scutellum ordinary for the genus, not exceedingly small.

Elytra large oval, well convex though slightly depressed on the disc, widest at about four-ninths from base, a little more strongly narrowed basad than apicad; EW/PW 1.42–1.47 (M 1.45), EL/EW 1.48–1.52 (M 1.50), EL/PL 2.48–2.56 (M 2.51); prehumeral borders almost perpendicular to the midline; anterior end of marginal gutter usually reaching near the base of stria 5; shoulders less salient and a little more strongly rounded than in *S. pachys*; humeral borders each provided with five to seven very obtuse small denticles, of which the middle (or posterior) two or three are larger than the others

and sometimes more or less angulate at the tips, remainings are nearly tubercles; sides more strongly arcuate than in *S. pachys*, narrowly bordered and sparsely ciliated throughout, moderately arcuate from behind shoulders to near apices through the slight preapical emargination; apices separately rounded with a very obtuse re-entrant angle at suture; striae superficial, becoming shallower apicad and evanescent at the sides, striae 1–4 nearly entire and somewhat deepened near base, stria 5 rather faintly impressed, somewhat abbreviated apically, seemingly deepened near base due to the raised basal portion of interval 5, stria 6 either obsolete or faintly visible at middle, stria 7 vanished, stria 8 usually slightly detectable behind middle; scutellar striole shallow but fairly long and deepened near the basal termination; apical striole shallow, directed to the site of stria 5; intervals fairly wide, and flat even near suture, though inner ones are more or less raised just behind prehumeral borders, each bearing a row of short erect pubescence; apical carina short, obtuse; stria 3 with two setiferous dorsal pores at 2/9–1/4 and 1/2–5/9 from base, respectively; preapical pore located at the apical anastomosis of striae 2 and 3, much more distant from apex than from suture, and closer to apical striole than to suture; marginal umbilical and apical pores ordinary for the genus; reticulation of microsculpture less transverse than in *S. pachys*, composed of wide to transverse meshes.

Ventral surface covered with short suberect pubescence; sternites 4–6 with a pair of paramedian setae; sternite 7 with a pair of setae in ♂, two pairs of setae in ♀ along the apical margin. Legs stout; protibiae slightly bowed and moderately dilated towards apices, covered with fairly stout pubescence which tends to form three rows of suberect hairs on the external to frontal face, and vestigially longitudinally grooved on the external face (vestige of groove is more indistinct in ♀ than in ♂); male pro-tarsal segments 1 and 2 moderately dilated, each inwardly denticulate at apex and provided beneath with adhesive appendages; mesotarsal segment 1 a little longer than segments 2–3 combined; metatarsal segment 1 slightly shorter than segments 2–4 combined, obviously longer than segments 2–3 together.

Male genital organ very small, though moderately sclerotized. Aedeagus about two-ninths as long as elytra, basically similar to that of *S. pachys*, though basal part is shorter than in *S. pachys*; basal part strongly bent towards ventral side, with basal orifice relatively large with sides shallowly emarginate, sagittal aileron very narrow and hyaline in the holotype specimen (very small but ventro-proximally produced in the paratype specimen); dorsal margin a little less regularly arcuate than in *S. pachys*, ventral margin nearly straight at middle in profile; viewed laterally, apical orifice provided with fairly low moderately sclerotized side walls but apico-dorsally surmounted by roundly protrudent sac membrane in which spinous apical portions of copulatory piece are extending; apical lobe slenderer than in *S. pachys*, rather strongly curved ventrad, gradually narrowed apicad and slightly reflexed at the extremity in profile; viewed dorsally apical lobe slenderer and more gradually narrowed apicad than in *S. pachys*, gently inclined to the right towards the somewhat asymmetrically rounded extremity. Inner sac armed with a fairly large copulatory piece which is about two-fifths as long as aedeagus; copulatory piece gently rolled and wholly covered with transparent scales, more widely dilated proximad and more rapidly narrowed apicad than in *S. pachys*, its apical portion branched into numerous spinules. Styles moderate-sized, left one a little longer than the right; in the holotype specimen each style provided with four apical setae, while in the male paratype three setae in right, four setae in left style at apices.

*Type series.* Holotype: ♂, paratype (allotype: ♀), 28.IV.2015, T. NAITÔ leg. Paratypes: 1 ♂, 26.XI.2011, T. NAITÔ leg.; 1 ♀, 28.IV.2015, T. NAITÔ leg. The holotype will be deposited in NSMT.

*Type locality.* Imaki, 115 m alt, in Nagaogô of Hasami-chô, Nagasaki Prefecture, northwestern Kyushu, Japan.

*Notes.* It is worth noting that external longitudinal grooves on the protibia of *S. lampros* are only

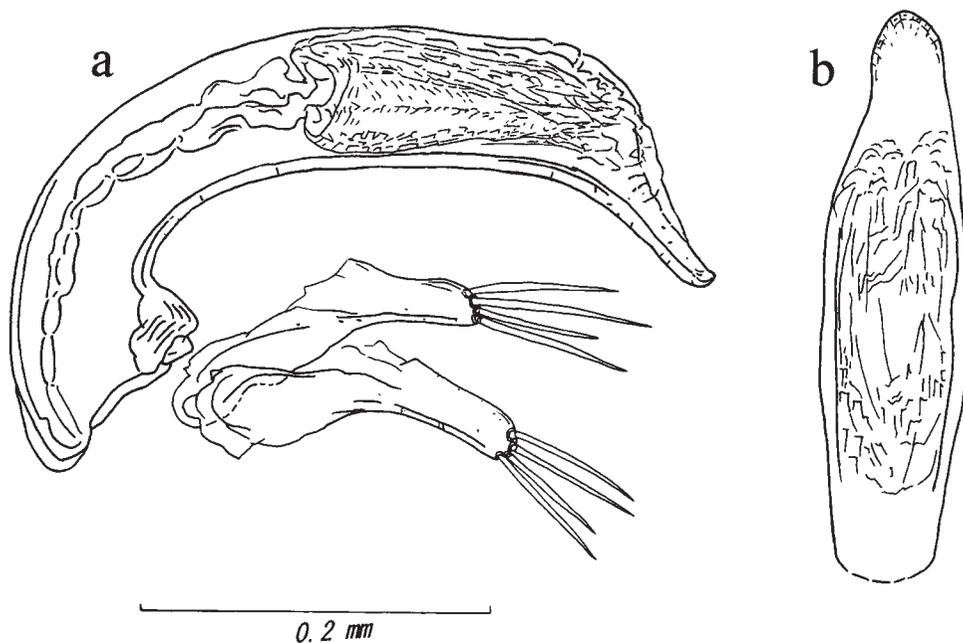


Fig. 8. Male genital organ of *Stygiotrechus lampros* NAITÔ, sp. nov. — a, Left lateral view; b, dorsal view of apical portion.

vestigial ones whose conditions are rather variable according to individual, therefore are not comparable to the distinct external grooves of *S. pachys*.

In general appearances, *S. lampros* may seem more similar to *S. esakii* S. UÉNO (1969, pp. 491, 507, figs. 10, 13) than to *S. pachys*. However, *S. esakii* is radically different from all the other congeners in the structure of pronotal basal part with linear basal foveae and prominent postangular carinae (Fig. 9), in the configuration of aedeagus which is compressed and wide to near apex in profile, and above all, in the male protarsi with no dilated segment. Accordingly, the inference of direct relationship between them cannot be supported.

Since the features by which I include *S. lampros* into *pachys* group are somewhat different from the diagnostic features of *pachys* group given by UÉNO (1970, pp. 606, 610), let us now examine the characteristics of *S. lampros* in comparison with these diagnostic features. *Pachys* group is characterized by the combination of following features: 1) broad body form with small head and stout appendages; 2) peculiar shape of pronotum with wide and ample basal part; 3) extreme reduction of scutellum; 4) presence of a deep external groove on each protibia; 5) characteristic configuration of aedeagus (S. UÉNO, 1970). Features 1), 2) and 5) are basically consistent with the features of *S. lampros*, though the amplitude of pronotal base is not really remarkable in *S. lampros*; moreover, wide pronotal base is also distinctly recognizable in *S. satoui satoui* S. UÉNO, 1976 of *ohtanii* group. Feature 5) appears to require some reservation; aedeagal features of *S. pachys* cannot be regarded as very unique within the genus at the present state of our knowledge, since the similarity between the male genitalia of *S. s. satoui* and that of *S. pachys* has already been indicated (S. UÉNO, 1976, p. 280). Problematical features are 3) and 4). Only feature 4) can be regarded as proper to *S. pachys* in a strict sense, however, concerning this feature *S. lampros* is ambiguous as mentioned above. Finally what to be considered is feature 3). Scutellum of *S. lampros* is proportionally larger than that of *S. pachys* as

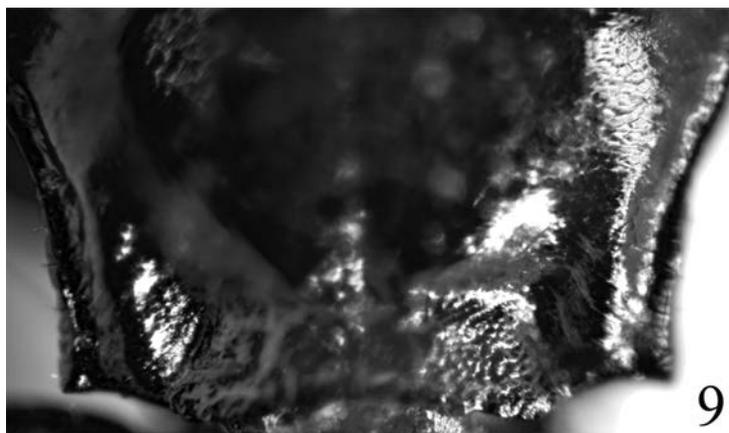


Fig. 9. *Stygiotrechus esakii* S. UÉNO, basal part of pronotum.

shown by the following values: — in *S. pachys*; PB/SC 13.50–16.68 (M 14.86), EB/SC 16.94–21.00 (M 18.79), JP/SC 6.00–8.22 (M 7.08), PW/SC 16.00–19.44 (M 16.97); — in *S. lampros*; PB/SC 9.83–11.56 (M 10.56), EB/SC 11.81–14.29 (M 13.11), JP/SC 4.83–5.24 (M 5.04), PW/SC 12.49–14.47 (M 13.23). The relative scutellar width of *S. lampros* accords well with that of the members of *ohtanii* group. For example, in *S. nishikawai* S. UÉNO, 1980; PB/SC 10.84–11.40 (M 11.01), EB/SC 12.50–14.00 (M 13.10), JP/SC 4.9–5.75 (M 5.34), PW/SC 12.86–14.4 (M 13.29) (S. UÉNO, 1980). On the other hand, reduction of scutellum is more advanced in *S. morimotoi* S. UÉNO, 1973 of *morimotoi* group as follows: PB/SC 17.00–18.22 (M 17.80), EB/SC 19.71–21.83 (M 20.66), JP/SC 9.02–10.35 (M 9.54), PW/SC 21.67–23.01 (M 22.50) (S. UÉNO, 1973). Collectively, these conditions imply that the *pachys* group needs redefinition, in case the attribution of *S. lampros* to this species-group is right. By the way, UÉNO (1970, p. 610) also mentioned a remote relationship between *S. pachys* and *S. kubotai* S. UÉNO, 1958 (the type species of the genus) of *kubotai* group. But it cannot be discussed here for lack of space.

The type locality of *S. lampros*, Imaki, is located along the narrow branch stream of the Kawatana-gawa River. It is about 124.2 km distant to the east by north from the I-ana Caves in Fukué-jima Island, the type locality of *S. pachys*; about 29.2 km distant to the east-northeast from the Shimizu-dô Cave, the type locality of *S. kubotai*; about 49.5 km distant to the southwest from the Mizunashi-dô Cave, the type locality of *S. esakii*. *Stygiotrechus lampros* dwelled in the thick deposits of muddy soil and the clasts of shale accumulated on the weathered parts of the shale bed. They were usually found near the bed rock and moved fairly quickly when disturbed.

*Etymology.* The specific epithet is the latinized spelling of the Greek adjective λαμπρος, denoting the shiny and light-coloured (as compared with *S. pachys*) body of this new species.

***Stygiotrechus costicollis* NAITÔ, sp. nov.**

(Figs. 10 & 11, 13)

Length: 2.68–2.82 mm (from apical margin of clypeus to apices of elytra).

Recognizable at a glance by its peculiarly keeled structure of pronotum, which is brought about by the extraordinary development of the pronotal postangular carinae. Closely related to *S. satoui* S. UÉNO (1976, p. 278, figs. 1–4), and particularly more closely similar to its subspecies *compira* S.

UÉNO (1980, p. 6, figs. 5 & 6) than to the nominate subspecies in dark coloration, in development of postangular carinae of pronotum,<sup>4)</sup> in less pronounced elytral humeral serrulation, and in slenderness of apical lobe of aedeagus. However, apart from the extraordinary postangular carinae of pronotum, *S. costicollis* is different from *S. s. compira* in: larger and more dorsally depressed pronotum with more porrect front angles and more weakly arcuate lateral sides; more narrowly rounded apical portion of elytra; abruptly decurved aedeagal apical lobe (in *S. s. compira* apical lobe is regularly and gently arcuate). In the curvature of apical part of aedeagus, *S. costicollis* also resembling *S. iyonis* S. UÉNO et ASHIDA (2003, p. 410, figs. 1–3), but the latter is different from the former in not developed pronotal postangular carinae which are much less prominent than in *S. satoui*, and in short and small basal portion of aedeagus.

Medium-sized species whose contour of body similar to that of *S. pachys*. Larger than *S. s. compira* on an average, but overlapping with *S. s. satoui* in the range of body length. Colour darker than *S. s. compira*, concolorously dark reddish brown; as in *S. s. compira*, appendages hardly lighter than dorsum except yellowish brown palpi (in *S. s. satoui* all appendages are obviously yellowish brown).

Cephalic features basically identical to that of *S. s. compira*, though proportionally smaller; PW/HW 1.31–1.37 (M 1.33) [in *S. s. compira*; PW/HW 1.26–1.32 (M 1.29)], and a little more transverse on an average; HW/HL 1.32–1.36 (M 1.35) [in *S. s. compira*; HW/HL 1.22–1.36 (M 1.30)]. Mentum tooth bifid at apex; submental setae eight or nine in number.

Pronotum subquadrate, obviously larger than that of *S. s. compira* (even than that of *S. s. satoui*), widest at about 1/2–5/7 from base (curvature of lateral margin rather variable according to individual), and usually a little more strongly contracted basad than apicad, though base is slightly wider than apex on an average; PB/PA 0.99–1.03 (M 1.01) [PA/PB 0.97–1.00 (M 0.98)], PW/PL 1.04–1.12 (M 1.10), PW/PA 1.23–1.27 (M 1.25), PW/PB 1.21–1.29 (M 1.24); dorsum less convex than in *S. s. compira* and rather depressed on disc, sparsely covered with short suberect pubescence and provided with two discal setae on each side of median line; median line distinct, though not so deep, not reaching the apex but usually reaching the base; sides narrowly bordered and sparsely ciliated throughout, gently convergent apicad in slightly arcuate lines (sometimes in almost straight lines) from the widest parts towards the tips of porrect front angles which are more acutely protruding than in *S. s. compira*, only slightly and very briefly sinuate at about three-sevenths from base, then slightly convergent basad in feebly arcuate lines to just before hind angles; hind angles a little more obtuse than rectangle, but small denticle on each corner is rather distinctly latero-posteriorly (chiefly laterally) produced (in *S. s. compira* denticles more weakly, more posteriorly produced); basal portion of lateral margin rather roughly though obtusely indented behind ante-basal situation; both anterior and posterior lateral setae present, the former positioned a little before the widest parts, the latter inserted just before the denticles of hind angles; apex nearly straight; base nearly straight at middle though slightly lobed, obliquely emarginate on each side just inside hind angle; apical transverse impression practically obsolete though slightly recognizable; basal transverse impression relatively shallow though distinct and continuous, almost straightly extending into basal foveae on each side; basal foveae narrow, subtriangular though very narrowly and unusually extending antieriad along inner sides of the hypertrophied postangular carinae; postangular carinae hypertrophied, distinctly edged, inwardly displaced from the sides and running subparallel to lateral borders except in apical one-eighth of carinae where the carinae are slightly and gradually approaching to the sides (but not reaching the sides), extending from basal border to near apex, further exceeding apical twelfth of pronotum (in *S. s. compira* distinct postangular

<sup>4)</sup>The original description of *S. s. compira* lacks the reference to the features of postangular carinae, but in this subspecies the carinae are more prominent than in the nominate subspecies.

carinae are anteriorly extending from base to 3/8–8/15 of pronotum)<sup>5)</sup>; in lateral view, carinae highest at about basal fourth of pronotum and gradually declining both anteriorly and posteriorly, though the position of the highest point and the outlines of carinae vary to some extent according to individual; in dorsal view, carinae arising from near the inside corner of lateral emargination of pronotal basal margin, and widest there, only slightly and very gradually tapered anteriorly, then branching into two or three longitudinal wrinkles in the terminal portion; longitudinal surface between lateral margin and postangular carina moderately concave, rather regularly covered with granular microsculpture; apical area rather smooth; basal area relatively even, but somewhat rugulose in posterior parts, and notched along the basal margin; meshes of microsculpture mostly wide to transverse but isodiametric to granular in basal area, and granular in lateral area as described above. Scutellum small though distinct.

Elytra basically similar to those of *S. s. compira* but basal parts are ampler than in the latter, widest at about four-ninths from base and more strongly narrowed apically than basally; EW/PW 1.31–1.34 (M 1.32), EL/PL 2.17–2.29 (M 2.25), EL/EW 1.51–1.56 (M 1.54); shoulders each more distinctly rectangular than in *S. s. compira*, with basal portions of lateral sides hardly sinuate (only subtly sinuate in *S. s. compira*) and humeral area more weakly explanate; as in *S. s. compira* humeral serrulation less pronounced than in *S. s. satoui*, humeral borders each bearing six to eight distinct teeth, of which median four or three are larger than the others; prehumeral borders perpendicular to the mid line; sides only feebly arcuate, a little more weakly narrowed basally and more slightly arcuate at middle than in *S. s. compira*, then a little more gently and more straightly convergent from behind the level of the preapical pores to apices; apices more narrowly rounded than in *S. s. compira*, with a small re-entrant angle at suture; dorsum moderately convex, though somewhat more strongly depressed on the disc than in *S. s. compira*; microsculpture composed of minute polygonal meshes; striae as in *S. s. compira* though a little shallower; scutellar striole distinct as in *S. s. compira*; apical striole fairly long, only slightly arcuate in front, usually directed to stria 5; intervals as in *S. s. compira*, or a little less convex; apical carina usually fairly long, narrow, only weakly arcuate, similar to that of *S. iyonis*.

Ventral surface and legs as in *S. s. compira*, though darker in colour.

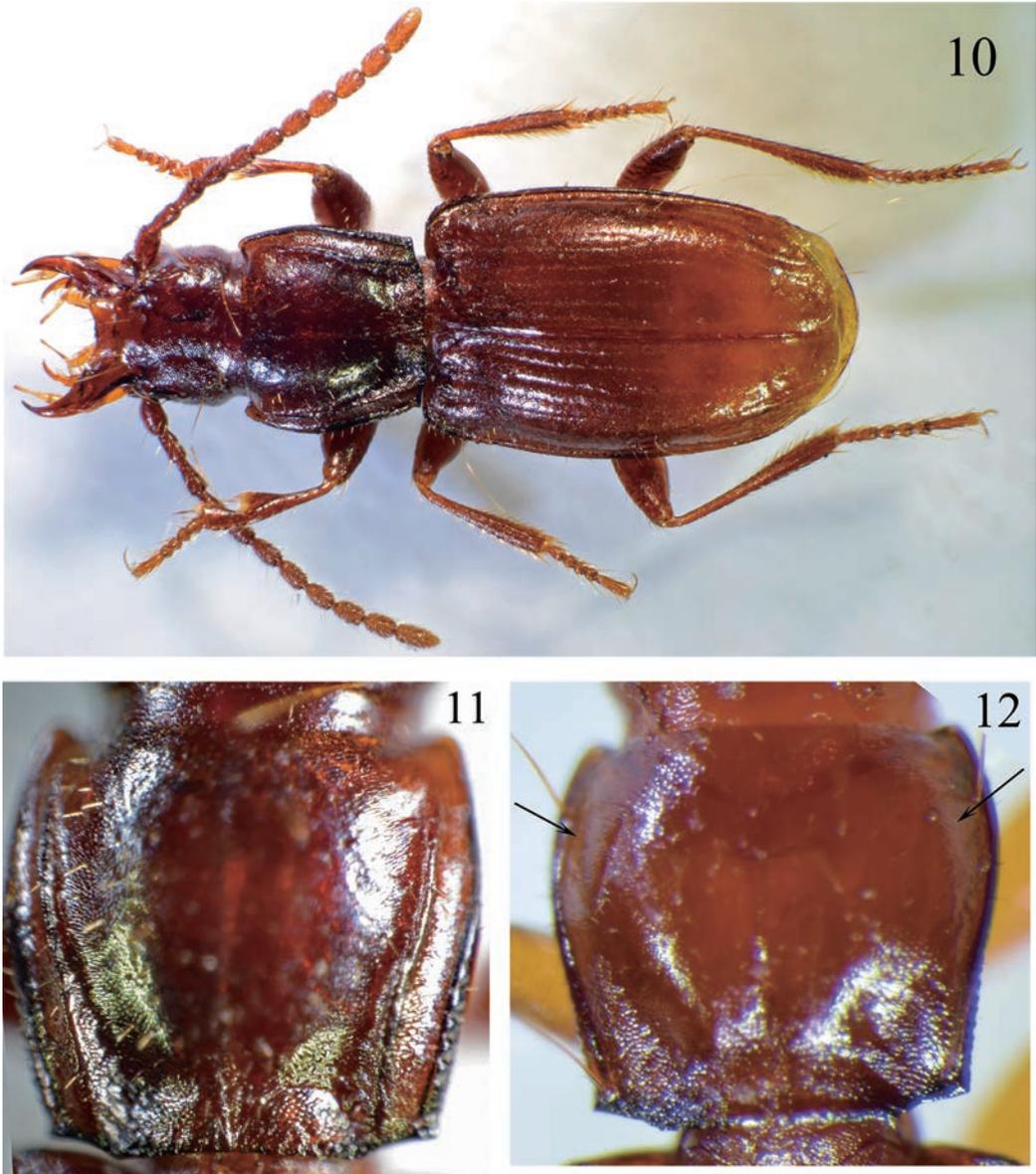
Male genital organ small and lightly sclerotized, in general appearance most similar to that of *S. s. satoui*. Aedeagus about two-sevenths as long as elytra, abruptly decurved in both basal and apical parts in profile, slightly sigmoidally twisted in dorsal view; basal part as in *S. s. satoui* though sagittal aileron is larger; in lateral view, dorsal margin less regularly arcuate than in *S. s. satoui*, ventral margin nearly straight at middle; viewed laterally apical part slenderer than in *S. s. satoui* (as slender as that of *S. iyonis*), more abruptly decurved and more gradually narrowed apically than in *S. s. satoui* towards the blunt tip; viewed dorsally, apical part as a whole gently sigmoidally curved, and narrow apical lobe suddenly inclined to the left towards the rounded extremity. Inner sac armed with a relatively short copulatory piece whose conformation and configuration are almost identical to that of *S. s. compira*. Styles proportionally short, left and right one subequal in length, each with four setae at apex.

*Type series.* Holotype: ♂, paratypes (allotype: ♀; paratypes: 2 ♂♂), 5.V.2015, T. NAITÔ leg. The holotype will be deposited in NSMT.

*Type locality.* Okuyama, 260 m alt, Muku-no-ura-chô on the Island of In-no-shima, Hiroshima Prefecture, W. Honshu, Japan.

*Notes.* This remarkable new species was discovered near the central part of the Island of In-no-shima, at the northern foot of the low hill called Okuyama (390.5 m in height). Being located on the

<sup>5)</sup> In *S. s. compira* vestigial postangular carina is frequently further extending anteriorly beyond that level in the form of a faint wrinkle. Even in such a case, anterior end of the wrinkle at most reaches about basal 11/17 of pronotum.



Figs. 10–12. *Stygiotrechus* spp. —10 & 11, *S. costicollis* NAITÔ, sp. nov. (holotype); 12, *S. s. satoui* S. UENO.  
 — 10, Habitus; 11, pronotum; 12, pronotum (and the parts of femora), arrows indicate the “potential carinae”.

small island in the central part of the Seto Inland Sea, the habitat of this new species is geographically isolated from all the other localities of the relative species. It is about 57.6 km distant to the northwest from Zôzu-san, the type locality of *S. s. compira*, about 87.3 km distant to the northwest from Ôyashiki, the type locality of *S. s. satoui*; about 58.6 km distant to the northeast from Aonami-dani, the type locality of *S. iyonis*. All specimens were collected from under the stones embedded in the banks of shaded narrow stream.

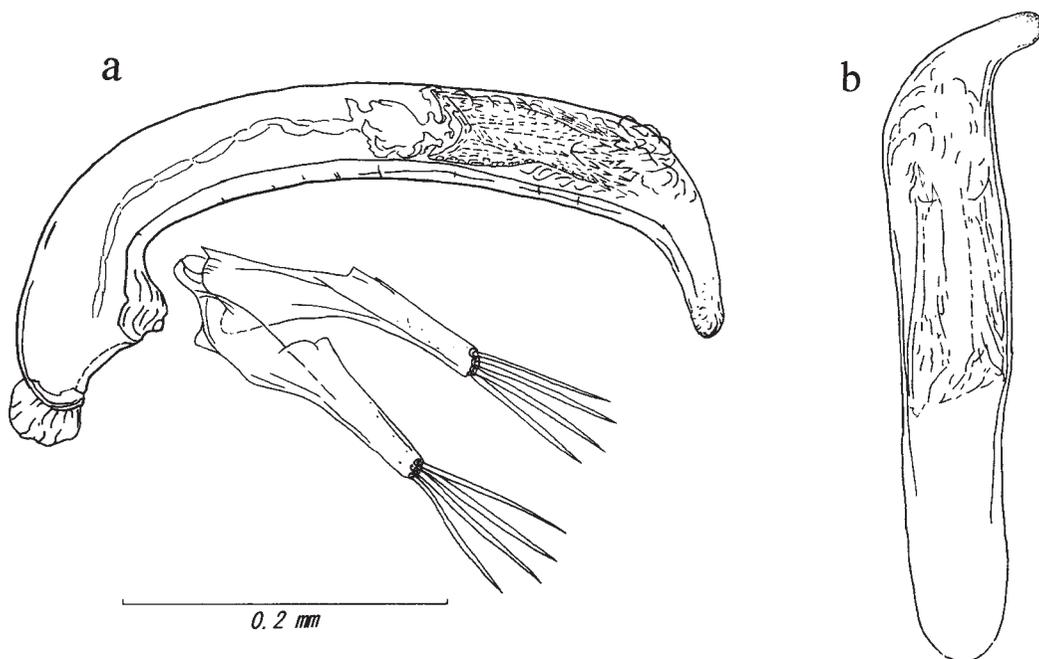


Fig. 13. Male genital organ of *Stygiotrechus costicollis* NAITÔ, sp. nov. — a, Left lateral view; b, aedeagus, dorsal view.

It is very interesting that in some specimens of *S. s. satoui* and *S. s. compira*, according to the optical angles, narrow longitudinal dark areas (or lines) are recognizable on the lines anteriorly elongated from the anterior end of the postangular carinae. These areas are not actually carinate nor raised (probably show the slight difference in the curvature of dorsal surface, or thickened integument under the surface seen by transparency), but exactly indicate the very spaces where the unusual carinae are formed in the pronotum of *S. costicollis* (Fig. 12). Within the genus *Stygiotrechus*, also *S. esakii*, which belongs to the species-group of its own, has the considerably developed postangular carinae (Fig. 9). These facts suggest that the members of *Stygiotrechus* possess the potentiality to form the prominent postangular carinae on the pronotum.

*Etymology.* Specific epithet *costicollis* represents the keeled pronotum of this new species.

#### Acknowledgement

First of all I would like to express my deep gratitude to Dr. Shun-Ichi UENO for his continuous guidance in trechinology. I am also very grateful to Dr. Shûhei NOMURA for his kind support for the examination of the type material, and to the anonymous reviewer for critically reading the manuscript of this paper.

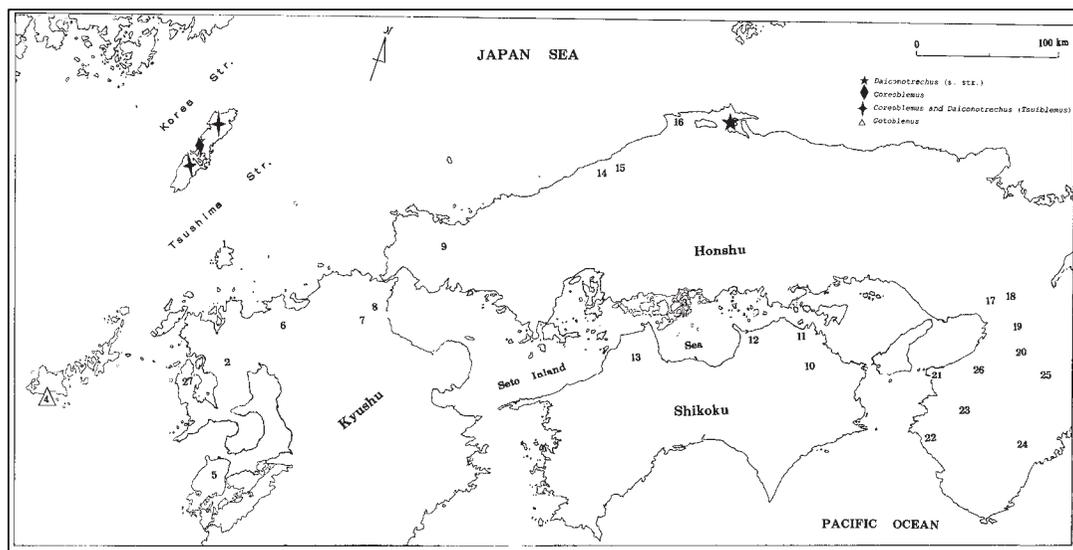


Fig. 14. Localities of the described species of *Stygiotrechus* and its relative genera (undetermined populations are excluded from this map). — 1, *Stygiotrechus ikiensis* sp. nov.; 2, *S. lampros* sp. nov.; 3, *S. costicollis* sp. nov.; 4, *S. pachys*; 5, *S. miyamai*; 6, *S. esakii*; 7, *S. miyoshiorum*; 8, *S. unidentatus*; 9, *S. parvulus*; 10 and 11, *S. satoui satoui*; 12, *S. satoui compira*; 13, *S. iyonis*; 14 and 15, *S. sasajii*; 16, *S. izumonis*; 17, *S. morimotoi morimotoi*; 18, *S. morimotoi notarum*; 19, *S. itoi* ASHIDA et KITAYAMA, 2003; 20, *S. ohtanii*; 21, *S. kadanus* and *S. kitayamai*; 22, *S. nishikawai*; 23, *S. misatonis* ASHIDA et KITAYAMA, 2003; 24, *S. eos* S. UÉNO et NAITÔ, 2003; 25, *S. azami* ASHIDA et KITAYAMA, 2004; 26, *S. kadanus*; 27, *S. kubotai*.

## 要 約

内藤隆夫：日本西部のノコメクラチビゴミムシ属(鞘翅目オサムシ科チビゴミムシ亜科)3新種。——近年になって発見されたノコメクラチビゴミムシ属の3新種を次のように記載した。

イキメクラチビゴミムシ(新称) *Stygiotrechus ikiensis* sp. nov. (長崎県壱岐市勝本町串山), ハサミメクラチビゴミムシ(新称) *Stygiotrechus lampros* sp. nov. (長崎県波佐見町永尾郷), インノシマメクラチビゴミムシ(新称) *Stygiotrechus costicollis* sp. nov. (広島県尾道市因島奥山)。

壱岐島北端部から発見されたイキメクラチビゴミムシは、外部形態および特徴的な雄交尾器形態の類似性からみて、北東に320 km以上離れた島根半島に分布するイズモメクラチビゴミムシ *S. izumonis* S. UÉNO に系統的つながりを持つことがほぼ確実である。両種は全体によく似ているが、イズモメクラチビゴミムシが有する上唇前縁中央の顕著な突起、前頭部および頬部の剛毛をイキメクラチビゴミムシが欠くこと、前胸背板はイズモでは全体に長めの立毛で被われるのに対しイキでは短い微毛と剛毛とに明瞭に分化していること、イキの上翅間室がより強く隆ること、雄交尾器中央片はイキにおいて明らかにより細長いことなどにより区別できる。上記のほかに、イキメクラチビゴミムシには前頭溝が中央後方で強く乱される特徴が認められる。

ハサミメクラチビゴミムシは既知種のなかに明らかな近縁種を見いだせないが、大きく幅広い体型や、上翅肩部の鋸歯の状態、雄交尾器形態の類似性などにより、さしあたりイアナメクラチビゴミムシ群に含まれるものとした。イアナメクラチビゴミムシ *S. pachys* S. UÉNO からは、前胸背板基部が狭まり、前脛節外面の縦溝が痕跡的で、雄交尾器中央片先端がより細いことなどにより容易に識別できる。

インノシマメクラチビゴミムシは、前胸背板両側に顕著な隆起条を持つ特異な種で、世界で最も前胸背板後角稜が発達したチビゴミムシであると思われる。系統的にはオオタキメクラチビゴミムシ *S. satoui* S. UÉNO の亜種コンピラメクラチビゴミムシ *S. s. compira* S. UÉNO に近縁なことが明らかであるが、後種とは発達した後角稜以外にも、前胸背板がより大きくその側縁はより直線的で背面はより強く平圧され、上翅端がより細く突出し、側面から見た雄交尾器中央片先端が強く下方に湾曲するなどの違いが認められる。

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