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Five New Species of the Intertidal Genus *Halorhadinus* Sawada, 1971 (Coleoptera, Staphylinidae, Aleocharinae) from Japan

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Abstract. Five new species of the intertidal aleocharine genus *Halorhadinus* are described: *Halorhadinus kawashimai* sp. nov. (from Honshû), *H. miyataorum* sp. nov. (from Shikoku), *H. miyakei* sp. nov. (from Kyûshû), *H. masakazui* sp. nov. (from Honshû and Kyûshû), *H. satoi* sp. nov. (from Honshû, shikoku and Kyûshû). The following new locality records are given: *Halorhadinus aequalis* Sawada, 1971 (from Izu-shotô, Shikoku and Kyûshû) and *H. sawadai* Maruyama & Hayashi, 2009 (from Shikoku). A key to the species of the genus and biological notes are provided.

Key words: Liparocephalini, Myllaenini, taxonomy, key, new locality records

Introduction

The genus *Halorhadinus* of the subfamily Aleocharinae was established by Sawada (1971) for *H. aequalis* described at the same time, together with a congener, *H. inaequalis*, from intertidal zones of Japanese coasts. Later, these species were recorded from coastal areas of South Korea (Ahn, 2001). Sawada (1971) suggested that *Halorhadinus* is phylogenetically related to the genus *Bryothinusa* Casey, 1904 of the tribe Myllaenini. Moore and Legner (1976) followed Sawada's (1971) arrangement. Pace (1999) classified *Halorhadinus* into the tribe Diglottini, which included *Bryothinusa* and other genera. Ahn (2001) hypothesized that *Halorhadinus* belongs to the tribe Liparocephalini based on the contiguous mesocoxal cavities and the arrangement of setae on the galea. Maruyama and Hayashi (2009) described another species, *H. sawadai*, from Shimane, western Japan. They reevaluated the systematic position of *Halorhadinus* and again placed it in Myllaenini.

All *Halorhadinus* species are inhabitants of interstitial spaces within the substrata of intertidal zones of gravel beaches (Maruyama & Hayashi, 2009). They are not commonly found because their habitats are difficult to investigate, and little is known about their species diversity. Recently, during a faunistic survey of Japanese intertidal beetles, we discovered several undescribed species of the genus. In the present paper, we describe these species.

Materials and Methods

Most specimens were sifted from gravel or coarse sand in intertidal zones. Some were extracted by digging small pools around the shoreline, in which the beetles would float to the water surface.

Specimens were dissected under a stereoscopic microscope (Leica MZ95). Removed genitalia were cleared in 10% KOH solution and dehydrated in 99.5% ethanol, then mounted on glass slides with Euparal (Maruyama, 2004). Holotypes and most paratypes are deposited in the Kyushu University Museum (KUM) and some paratypes are stored in the Ehime University Museum and the private collection of H. Ono.

The following abbreviations are used for measurements: AL, maximum length of antenna; BL, body length (from apex of clypeus to apex of abdomen); FBL, fore body length (from apex of clypeus to apices of elytra); HW, head width; PL, pronotal length; PW, pronotal width; HTL, hind tibial length. All measurements are in millimeters.

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Taxonomy

Halorhadinus Sawada, 1971

Halorhadinus Sawada, 1971: 92 (original description; type species: *H. aequalis* Sawada, 1971); Ahn, 2001: 123 (redescription, key to species, phylogenetic analysis); Maruyama & Hayashi, 2009: 72 (supplementary description, key to species, systematic position).

Key to the Species of *Halorhadius*

1. Eyes large, more than 0.2 times as long as head; elytra longer than pronotum; hind wings entire 2
-. Eyes small, less than 0.17 times as long as head; elytra not longer than pronotum; hind wings reduced..... 5
2. Antennal segments VII-X as long as wide 3
-. Antennal segments VII-X longer than wide..... 4
3. Body flattened; elytra reddish brown, somewhat paler than head and pronotum; legs light reddish brown; median lobe of aedeagus strongly curved ventrad, weakly constricted at middle and apical lobe heavily protruding..... *H. ineaqualis* (Fig. 1)
-. Body thick; elytra almost black and concolorous with head and pronotum; legs reddish brown; median lobe of aedeagus slightly curved, not constricted at middle and apical lobe slender ..... *H. kawashimai* (Fig. 2)
4. Body medium-sized (FBL, ≈ 1.5-1.7), shining, almost black; legs pale reddish brown; median lobe of aedeagus with distinct swelling at middle in lateral view, with apex of apical lobe slightly curved ventrad ..... *H. aequalis* (Fig. 3)
-. Body large (FBL, ≈ 2.0-2.1), weakly lustered, elytra reddish brown; legs reddish brown; Median lobe of aedeagus without swelling at middle in lateral view, with apical lobe weakly reflexed dorsad .... *H. miyataorum* (Fig. 4)
5. Head elongate, with clypeus strongly protruding; mesocoxal cavities separated by mesoventrite process ..... *H. sawadai* (Fig. 5)
-. Head almost circular, with clypeus not protruding; mesocoxal cavities contiguous. 6
6. Body small (FBL, ≈ 1.2-1.3); apical margin of tergite VIII deeply emarginate. ..... *H. miyakei* (Fig. 6)
-. Body medium-sized (FBL, ≈ 1.6-1.9); apical margin of tergite VIII rounded..... 7
7. Body pale brown; dorsal surface of head slightly flattened; swelling of mid-ventral side of median lobe distinct ..... *H. masakazui* (Fig. 7)
-. Body light reddish brown; dorsal surface of head strongly flattened; swelling of mid-ventral side of median lobe indistinct..... *H. satoi* (Fig. 8)

Comments. Most species can be identified based on the general body shape, body size, coloration, antennal shape, and ratio of pronotal and elytral length. However, for distinguishing *H. inaequalis* and *H. kawashimai*, and *H. masakazui* and *H. satoi*, observation of the median lobe of the aedeagus, or the spermatheca is much easier.

Halorhadinus inaequalis Sawada, 1971

[Japanese name: Wakasa-iso-hanekakushi]

(Fig. 1, 44)

Halorhadinus inaequalis Sawada, 1971: 95 (original description; type locality: Takahama-chô, Fukui-ken); Maruyama & Hayashi, 2009: 74 (locality records).

Specimens examined. [**JAPAN**]**: Honshû:** 1 sex?, Shimakage, Kurita, Miyazu-shi, Kyôtô-fu, 31 III 2000, K. Yasukawa leg.; 2 sex?, Fukuura, Mihonoseki-chô, Matsue-shi, Shimane-ken, 23 IV 2006, M Hayashi leg.; 2 sex?, east of Hinomisaki-tôdai, Hinomisaki, Taisha-chô, Izumo-shi, Shimane-ken, 7 VII 2006, M. Hayashi leg.; 1 sex?, Sakaura, Sakaura-chô, Izumo-shi, Shimane-ken, 22. IV. 2006, M. Hayashi leg.; 7 sex?, same locality, 5 IV 2009, M. Hayashi leg.; 2 sex?, same locality, 27 IV 2009, T. Hayama leg. (Fig. 44: map).

Distribution. Honshû.

Halorhadinus kawashimai Ono & Maruyama, sp. nov.

[Japanese name: Tsuyakeshi-iso-hanekakushi]

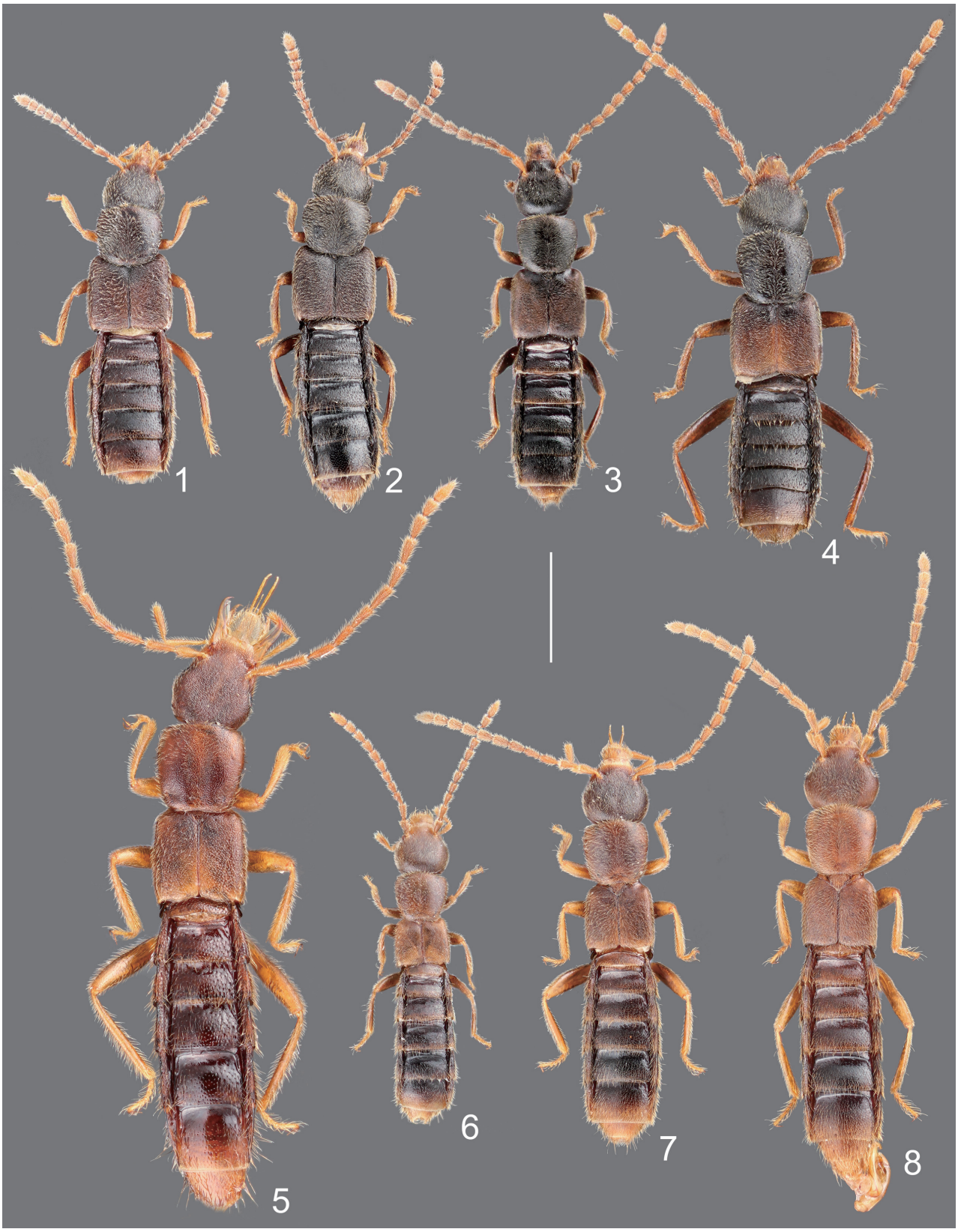
(Figs. 2, 9-15, 44)

Type series. Holotype, ♂, **[JAPAN]: Honshû:** Kuruwa-kaigan, Yokosuka-shi, Kanagawa-ken, 7 VI 2012, H. Ono leg. (KUM). Paratypes: 1 sex?, same locality as holotype, 25 XI 2011, H. Ono leg.; 1 ♂,same locality, 30 XI 2011, H. Onoleg.; 1 ♂, 1 sex?, same locality, 7 VI 2012, H. Ono leg.; 1 sex?, same locality, 16 X 2012, H. Ono leg. (Fig. 44: map).

Diagnosis. Halorhadinus kawashimai is most similar to *H. inaequalis* in body shape and color, and shorter antennae, but distinguishable from it by the body being more robust and thicker dorso-ventrally, the uniformly blackish elytra (in *H. inaequalis* they are somewhat paler), and the apical lobe of the aedeagal median lobe being elongate.

Description.

Body (Fig. 2) robust, hairy, matte black; antennae, maxillary and labial palpi, and legs yellow to reddish



Figs. 1-8. Habitus of *Halorhadinus* spp. 1, *H. inaequalis* Sawada, 1971; 2, *H. kawashimai* Ono & Maruyama sp. nov. (paratype); 3, *H.aequalis* Sawada, 1971; 4, *H. miyataorum* Ono & Maruyama sp. nov. (paratype); 5, *H. sawadai* Maruyama & Hayashi, 2009; 6, *H. miyakei* Ono & Maruyama sp. nov. (paratype); 7, *H. masakazui* Ono & Maruyama sp. nov. (paratype); 8, *H. satoi* Ono & Maruyama sp. nov. (paratype). Scale: 1.0 mm.

brown; surface matte, rather finely punctate. Head semicircular, weakly flattened dorsally; clypeus gently rounded. Eyes rather large, 0.24 times as long as head. Antennae short, reaching posterior margin of pronotum; segment IV-VI longer than wide; segment VII-X as long as wide. Labrum narrowed anteriorly, with anterior margin slightly rounded. Left mandible with 1 blunt tooth near apex; right mandible without teeth. Lacinial spines arranged irregularly, strongly differing in shape and size, with one stout spine and several short spines. Mentum with anterior margin emarginate in deep U-shape, and with 4 or 5 long setae around antero-lateral corners. Pronotum slightly longer than wide (PW/ PL=1.2), somewhat wider than head, widest around anterior 1/3; weakly emarginate near postero-lateral corners; with 2 macrosetae around antero-lateral corner, 1 or 2 macrosetae in mid-lateral margin, 1 macroseta around postero-lateral corner. Mesocoxae barely separated by elongate mesoventrite process and triangular metaventrite process. Elytra slightly longer than pronotum. Hind wings entire. Legs short.

Male: tergite VIII (Fig. 9) subtrapezoidal, with 4 macrosetae around anterior margin; sternite VIII (Fig. 10) with 7 macrosetae. Median lobe of aedeagus (Fig. 13-14) slender, not constricted at middle, slightly curved ventrad; apical lobe of median lobe thin and almost straight in lateral view.

Female: tergite VIII (Fig. 11) with 4 macrosetae; slightly sinuate along posterior margin; sternite VIII (Fig. 12) with 5 macrosetae. Spermatheca (Fig. 15) loosely coiled basally; apical part subspherical.

Measurements. BL, ≈ 3.3-3.5; FBL, ≈ 1.7-1.9; HW, 0.53-0.54; PL, 0.52-0.58; PW, 0.59-0.63; AL, 1.16-1.19 ; HTL; 0.56.

Etymology. The specific epithet is dedicated to Mr. Itsuro Kawashima, a scientific illustrator, who has been surveying the insect fauna of Miura Peninsula, Kanagawa-ken, Japan, and helped H. Ono's field survey of this species.

Halorhadinus aequalis Sawada, 1971

[Japanese name: Kuro-iso-hanekakushi]

(Figs. 3, 44)

Halorhadinus aequalis Sawada, 1971: 92 (original description; type locality: Shingû-shi, Wakayama-ken).

Specimens examined. **[JAPAN]: Honshû:** 1♀, Jôgashima, Miura-shi, Kanagawa-ken, 6 III 2007, M. Asano leg.; **Izu-shotô:** 1♀, Noda-hama, Okada, Ôshima, Izu-shotô, Tôkyô-to, 4 X 2012, H. Kamezawa leg.; **Shikoku:** 2 ex?, Mori, Iyo-shi, Ehime-ken, Shikoku, 16-23 I 2011, K. Sugaya leg.; 81 sex?, same locality, 25 VII 2013, M. Maruyama leg.; **Kyûshû:** 1 sex?, Kurogahama, Seki, Ôita-shi, Ôita-ken, Kyûshû, 2 VIII 1992, A. Sato leg.; 1 sex?, same locality, 5 V 2012, M. Miyake leg.; 24 sex?, same locality, 20 VI 2012, M. Maruyama & T. Miyake leg. (Fig. 44: map).

Distribution. Honshû, Izu-shotô, Shikoku, Kyûshû. New record from Izu-shotô, Shikoku and Kyûshû.

Halorhadinus miyataorum

Ono & Maruyama, sp. nov.

[Japanese name: Ashinaga-iso-hanekakushi]

(Figs. 4, 16-22, 44)

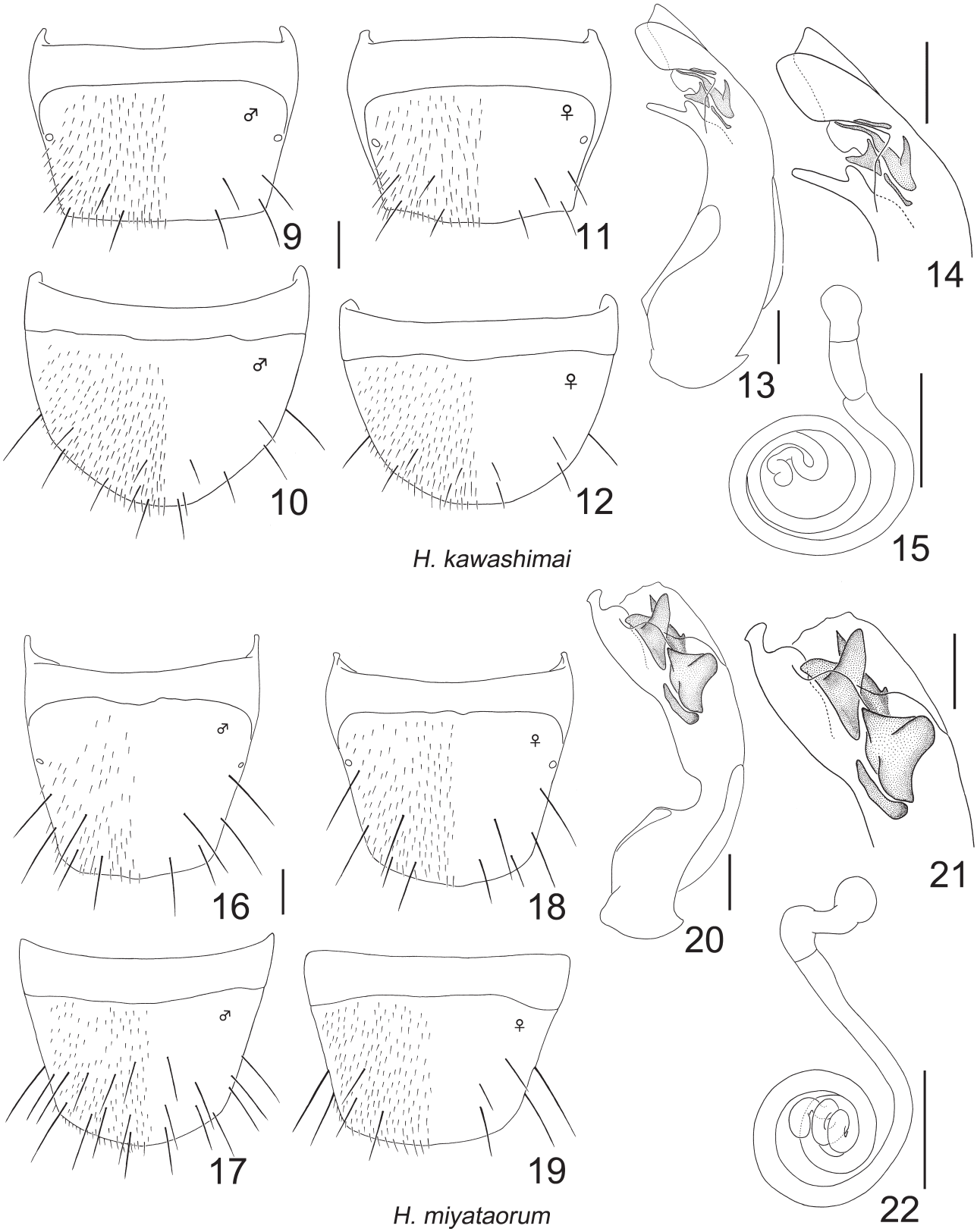
Type series. Holotype, ♂, **[JAPAN]: Shikoku:** Shimanto-gawa (near the mouth of the river, east bank), Shimoda, Shimanto-shi, Kôchi-ken, 21 VII 2011, T. Miyata & T. Miyata leg. (KUM). Paratypes: 2 ♀, same data as holotype (Fig. 44: map).

Diagnosis. Halorhadinus miyataorum is similar to *H. aequalis* in body shape, longer antennae and well developed hind wings but distinguishable from it by the larger, more matte body, the longer legs (PL/HTL: 0.80-0.81) which are reddish brown, the aedeagal median lobe lacking a swelling at middle, and the dorsally reflexed apical lobe of the aedeagal median lobe.

Description.

Body (Fig. 4) large. Head, pronotum, abdominal segments III-VI and basal half of abdominal segment VII black; elytra gradually paler apicad; antennae, maxillary and labial palpi, and legs reddish brown; surface slightly shining, finely punctate. Head almost circular, slightly flattened dorsally; clypeus slightly rounded. Eyes rather large, 0.23 times as long as head. Antennae long, clearly exceeding apices of elytra; all segments longer than wide. Labrum transverse, with anterior margin slightly rounded. Left and right mandibles each with 1 acute tooth near apex and 1 small blunt tooth around middle. Lacinial spines arranged almost regularly, becoming larger towards base. Mentum with anterior margin emarginate in deep U-shape; antero-lateral corners acutely angled. Pronotum as wide as long (PW/PL= 1.08), somewhat wider than head, widest around anterior 1/3; with 2 macrosetae near antero-lateral corner, 1 macroseta in mid-lateral margin, 1 indistinct macroseta near postero-lateral corner. Mesocoxal cavities contiguous; apex of mesoventrite process obtuse. Elytra longer than pronotum. Hind wings entire. Legs long, almost uniformly reddish brown.

Male: tergite VIII (Fig. 16) oblong, with posterior



Figs. 9-22. Sexual characters of *Halorhadinus kawashimai* Ono & Maruyama, sp. nov. (Figs. 9-15) and *H. miyataorum* Ono & Maruyama, sp. nov. (Figs. 16-22). 9, 16, Male tergite VIII (holotype: HT); 10, 17, male sternite VIII (HT); 11, 18, female tergite VIII; 12, 19, female sternite VIII; 13, 14, 20, 21, median lobe of aedeagus, lateral view (HT); 15, 22, spermatheca. Scale: 0.1 mm.

margin slightly prominent medially; sternite VIII (Fig. 17) with 9 or 10 macrosetae. Median lobe of aedeagus (Figs. 20-21) elongate, without swelling at middle in lateral view; apical lobe weakly reflexed dorsally.

Female: tergite VIII (Fig. 18) somewhat shorter than male, slightly produced apicomedially; sternite VIII (Fig. 19) with 5 macrosetae. Spermatheca (Fig. 22) coiled twice basally and bent perpendicularly towards apex.

Measurements. BL, ≈ 3.5-4.0; FBL, ≈ 2.0-2.1; HW, 0.68-0.69; PL, 0.62-0.64; PW, 0.68-0.69; AL, 2.13-2.26; HTL; 0.77-0.79.

Etymology. The specific epithet is dedicated to Mr. Takasuke Miyata and his wife Mrs. Toshie Miyata, who have been conducting research on terrestrial staphylinids in Shikoku, Western Japan.

Distribution. Shikoku.

Halorhadinus sawadai

Maruyama & Hayashi, 2009

[Japanese name: Umazura-iso-hanekakushi]

(Figs. 5, 44)

Halorhadinus sawadai Maruyama & Hayashi, 2009: 72 (original description).

Specimens examined. **[JAPAN]: Shikoku:** 15 sex?, Mori, Iyo-shi, Ehime-ken, Shikoku, 16 XII 2010, K. Sugaya leg.; 1 sex?, same locality, 25 VII 2013, M. Maruyama leg.

Distribution. Honshû, Shikoku. New record from Shikoku.

Halorhadinus miyakei

Ono & Maruyama, sp. nov.

[Japanese name: Hime-iso-hanekakushi]

(Figs. 6, 23-29, 44)

Type series. Holotype, ♂, **[JAPAN]: Kyûshû:** Kurogahama, Seki, Ôita-shi, Ôita-ken, 20 VII 2012, M. Maruyama leg. (KUM). Paratypes: 99 sex?, same locality as holotype, 20 VI 2012, M. Maruyama & T. Miyake leg.; 16 sex?, same data as holotype. (Fig. 44: map).

Diagnosis. *Halorhadinus miyakei* is similar to *H. masakazui* and *H. satoi* in body shape and color but easily distinguishable from it by the smaller body (FBL, ≈ 1.2-1.3) and the genital shape.

Description.

Body (Fig. 6) small, flattened; pale reddish brown except abdominal segments III-IV and basal half of VII blackish brown; surface matte and finely punctate. Head almost circular, weakly flattened dorsally; clypeus slightly rounded. Eyes small, 0.13 times as long as head. Antennae long, slightly exceeding apices of elytra; all segments longer than wide. Labrum transverse, with anterior margin slightly rounded. Left and right mandibles each with 1 acute tooth near apex and 1 small, blunt tooth around middle, slightly asymmetric. Lacinial spines arranged almost regularly, becoming larger towards base, but right spines clearly longer than those of left. Mentum with anterior margin weakly emarginate; antero-lateral corner protruding obtusely. Pronotum as wide as head, slightly transverse (PW/PL = 1.1), widest around anterior 1/4; with 2 macrosetae near antero-lateral corner, 1 or 2 macrosetae in mid-lateral margin, 1 indistinct macroseta near postero-lateral corner. Mesocoxal cavities contiguous; apex of mesoventrite process obtuse. Elytra almost as long as pronotum. Hind wings reduced, subequal in size to elytra. Legs rather long.

Male: tergite VIII (Fig. 23) apical margin emarginate, with 5 macrosetae. Sternite VIII (Fig. 24) with 10 or 11 macrosetae; apical margin weakly dentate. Median lobe of aedeagus (Figs. 27-28) slightly curved ventrad, not constricted around middle, apex of apical lobe of median lobe spatulate in lateral view.

Female: apical margin of tergite VIII (Fig. 25) deeply emarginate; sternite VIII (Fig. 26) with 6 macrosetae. Spermathecal duct (Fig. 29) thin, loosely coiled basally and bent near apex.

Measurements. BL, ≈ 2.3-2.7; FBL, ≈ 1.2-1.3; HW, 0.44-0.48; PL, 0.40-0.44; PW, 0.43-0.48; AL, 1.19-1.35; HTL; 0.37-0.41.

Etymology. The specific epithet is dedicated to Mr. Takeshi Miyake, who has been continuing research of the beetle fauna of Ôita-ken, Kyushu, Japan.

Distribution. Kyûshû.

Halorhadinus masakazui

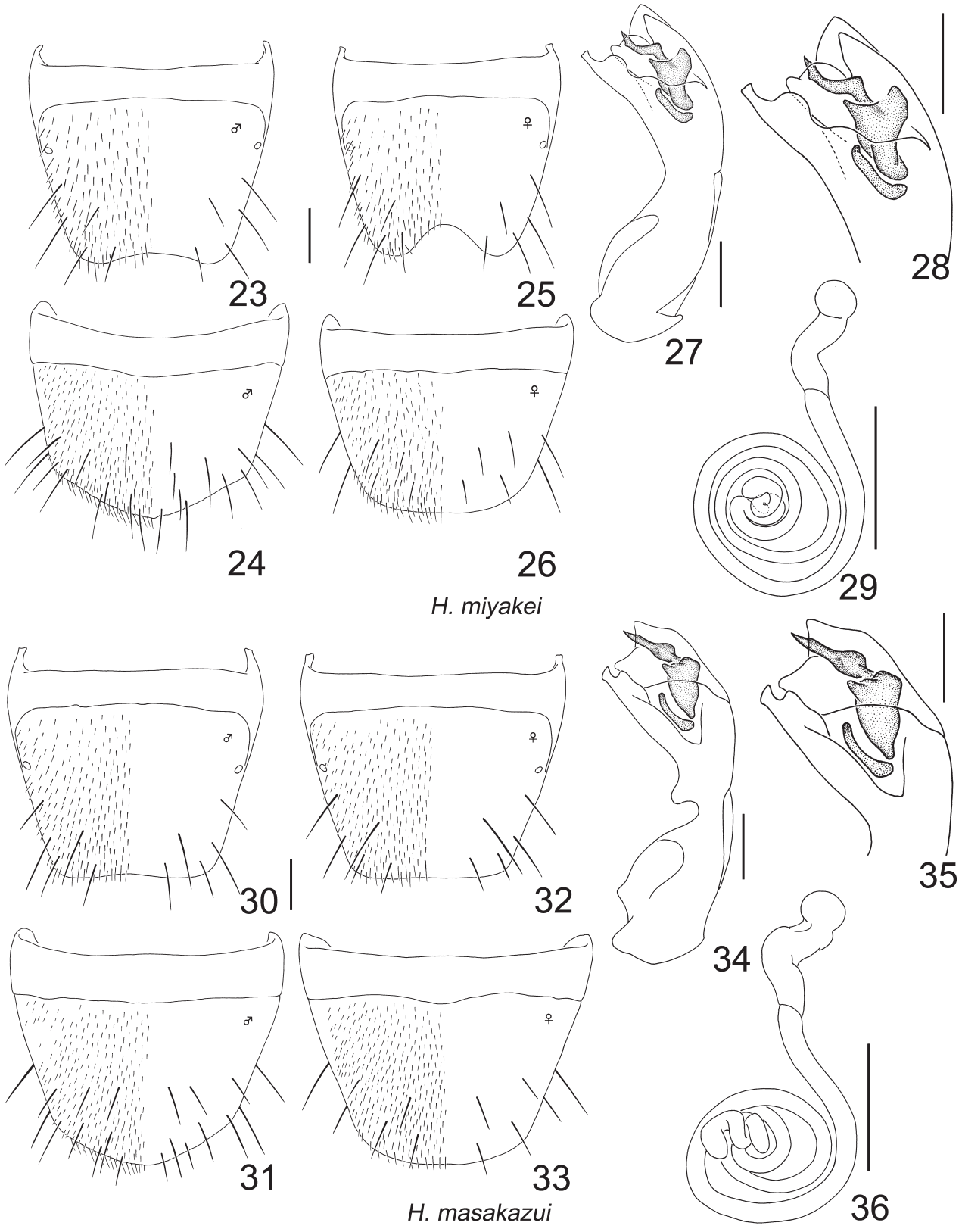
Ono & Maruyama, sp. nov.

[Japanese name: Usucha-iso-hanekakushi]

(Figs. 7, 30-36, 44)

"*Halorhadinus aequalis*" (in part): Maruyama & Hayashi, 2009: 73 (misidentification, included *H. masakazui* and *H. satoi*).

Type series. Holotype, ♂, **[JAPAN]: Kyûshû:** Kurogahama, Seki, Ôita-shi, Ôita-ken, 2 VIII 1992, A. Sato leg. (KUM). Paratypes: **Honshû:** 1 ♀, 1 sex?; Nakayama, Hinomisaki, Taisha-chô, Izumo-shi, Shimane-ken, 9 VIII 2006, M. Hayashi leg.; same locality, 10 IV 2009, M. Hayashi; 1 ♂, Owashi-hama, Hinomisaki, Taisha-chô, Izumo-shi, Shimane-ken, 10 IV 2009, M.



Figs. 23-36. Sexual characters of *Halorhadinus miyakei* Ono & Maruyama, sp. nov. (Figs. 23-29) and *H. masakazui* Ono & Maruyama sp. nov. (Figs. 30-36). 23, 30, Male tergite VIII (holotype: HT); 24, 31, male sternite VIII (HT); 25, 32, female tergite VIII; 26, 33, female sternite VIII; 27, 28, 34, 35, median lobe of aedeagus, lateral view (HT); 29, 36, spermatheca. Scale: 0.1 mm.

Hayashi; 5 sex?, same locality, 20 IV 2009, T. Hayama leg.; **Kyûshû:** 2 sex?, same locality as holotype, 5 V 2012, T. Miyake leg.; 34 sex?, same locality, 20 VI 2012, M. Maruyama & T. Miyake leg. (Fig. 44: map).

Diagnosis. *Halorhadinus masakazui* is very similar to *H. satoi* in body size, color, flattened and parallel-sided body shape, but distinguishable from it by the slightly larger body, the darker body color, the aedeagal median lobe being less strongly curved ventrad, with the swelling on the mid-ventral side of the median lobe being distinct (in *H. masakazui* it is slightly swollen). *Halorhadinus masakazui* is also similar to *H. aequalis* in body size, mouthpart structures and male genitalia but distinguishable from it by the paler body color, the narrower elytra, the reduced hind wings, and the lacinial spines being longer and sparser.

Description.

Body (Fig. 7) flattened; pale brown, except head and abdominal segments V-VI somewhat darker; surface matte, finely punctate. Head semicircular, somewhat flattened dorsally; clypeus gently rounded. Eyes small, 0.14 times as long as head. Antennae long, slightly exceeding apices of elytra; all segments longer than wide. Left and right mandibles each with 1 acute teeth near apex and 1 small, blunt teeth around middle. Labrum transverse, with anterior margin slightly rounded. Lacinial spines sparse, arranged almost regularly, becoming larger to base. Mentum transverse with anterior margin emarginate; antero-lateral corners acutely angled. Pronotum as wide as long (PW/ PL=1.06), as wide as head, widest around anterior 1/3; with 2 macrosetae around antero-lateral corner, 1 macroseta in mid-lateral margin, 1 macroseta around postero-lateral corner. Mesocoxae contiguous; apex of mesoventrite process pointed. Elytra as wide as pronotum. Hind wing reduced, about 1.3 times as long as elytra. Legs rather long. Tergite VIII (Figs. 30, 32) with 5 macrosetae.

Male: sternite VIII (Fig. 31) with 10 macrosetae. Median lobe of aedeagus (Figs. 34-35) with distinct swelling and strongly constricted at middle in lateral view; apex of apical lobe truncate.

Female: sternite VIII (Fig. 33) with 6 macrosetae; apical margin rounded. Spermatheca (Fig. 36) strongly coiled basally with apex sub-spherical.

Measurements. BL, ≈ 3.4-3.6; FBL, 1.6-1.8; HW, 0.52-0.56; PL, 0.52-0.56; PW, 0.52-0.60; AL, 1.73-1.86 ; HTL; 0.56-0.59.

Etymology. The specific epithet is dedicated to Dr. Masakazu Hayashi who has been surveying the fauna of Shimane-ken, especially aquatic and coastal insects.

Distribution. Honshû. Kyûshû.

Halorhadinus satoi

Ono & Maruyama, sp. nov.

[Japanese name: Ameiro-iso-hanekakushi]

(Figs. 8, 37-44)

"*Halorhadinus aequalis*" (in part): Maruyama & Hayashi, 2009: 73 (misidentification, included *H. masakazui* and *H. satoi*).

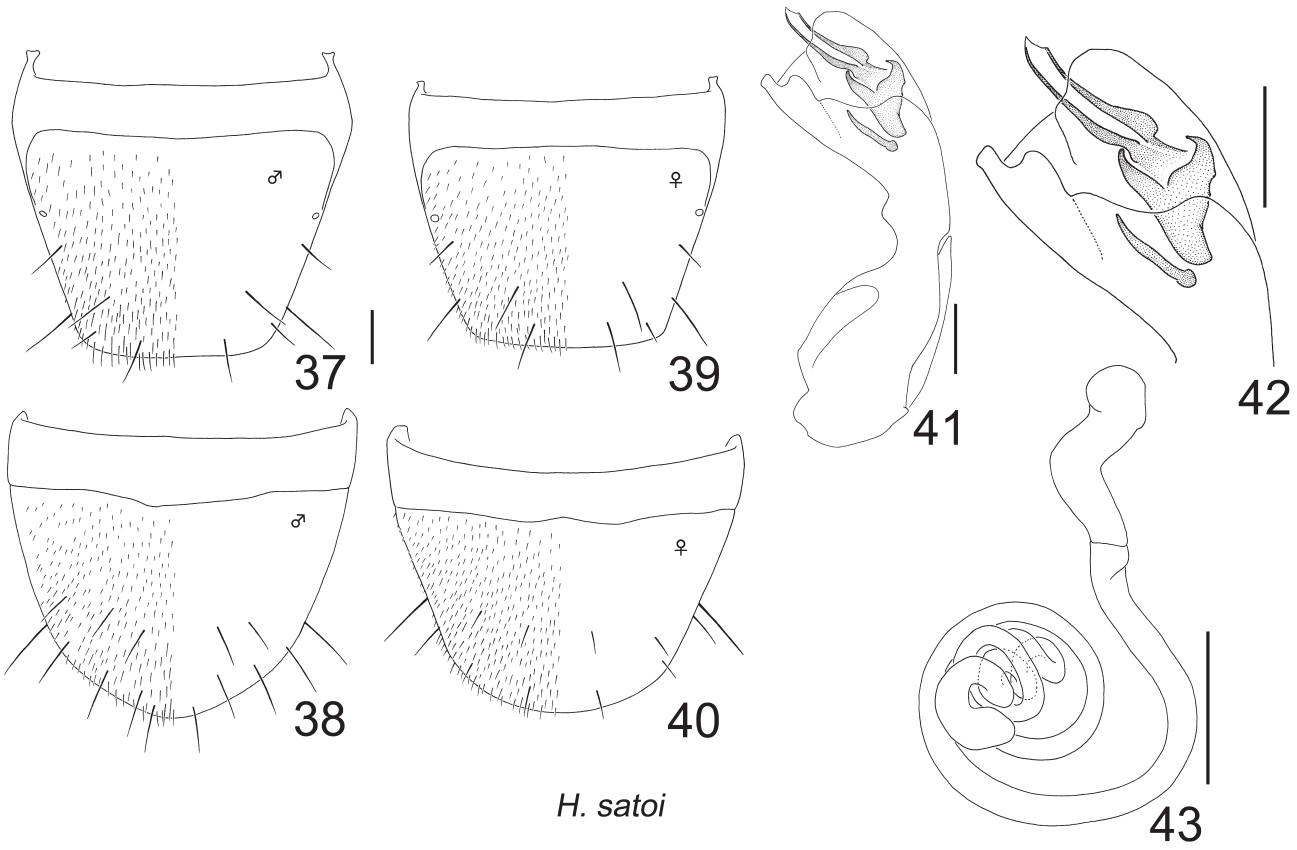
Type series. Holotype, ♂, **[JAPAN]: Kyûshû:** Kurogahama, Seki, Ôita-shi, Ôita-ken, 20 VII 2012, Maruyama, M. leg. (KUM). Paratypes: **Honshû:** 4 sex?, Nagashima, Kaminosekicho, Yamaguchi, 5 V 2005, Y. Nakase leg.; **Shikoku:** 1 sex?, Mori, Iyo-shi, Ehime-ken, 25 VII 2013, M. Maruyama leg.; **Kyûshû:** 1♂, same locality as holotype, 2 VIII 1992, A. Sato leg.; 1♂, 1♀, 9 sex?, same locality as holotype, 20 VI 2012, M. Maruyama & T. Miyake leg.; 4♂, 1♀, 23 sex?, same locality as holotype, 20 VII 2012, M. Maruyama leg. (Fig. 44: map).

Diagnosis. *Halorhadinus satoi* is very similar to *H. masakazui* in body size, flattened and parallel-sided body shape, but distinguishable from it by the lighter body color, the aedeagal median lobe being more strongly curved ventrad, with the swelling on the mid-ventral side of the median lobe being indistinct (in *H. masakazui* it is strongly swollen).

Description.

Body (Fig. 8) flattened; light reddish brown, except head and abdominal segments V-VI somewhat darker; surface matte, finely punctate. Head almost circular, strongly flattened; clypeus slightly rounded. Eyes small, 0.17 times as long as head. Antennae long, slightly exceeding apices of elytra; all segments longer than wide. Labrum transverse, with anterior margin slightly rounded. Left and right mandibles each with 1 acute tooth near apex and 1 small blunt tooth around middle. Lacinial spines long, arranged almost regularly, becoming larger towards base. Mentum transverse with anterior margin emarginate; antero-lateral corners acutely angled. Pronotum trapezoidal, as long as wide (PW/ PL=1.06), slightly narrower than head, widest around anterior 1/4 with a weak longitudinal depression medially; with 2 macrosetae near antero-lateral corner, with 2 macrosetae in mid-lateral margin, with 1 macrosetae near postero-lateral corner. Mesocoxae contiguous; apex of mesoventral process pointed. Elytra almost as long as pronotum. Hind wings reduced, subequal in size to elytra. Legs rather long.

Male: tergite VIII (Fig. 37) trapezoidal, with 5 macrosetae around apical margin. Sternite VIII (Fig. 38) rounded, with 7 or 8 macrosetae. Median lobe of aedeagus (Figs. 41-42) curved ventrally, with an indistinct medial



Figs. 37-43. Sexual characters of *Halorhadinus satoi* Ono & Maruyama sp. nov. 37, Male tergite VIII (holotype: HT); 38, male sternite VIII (HT); 39, female tergite VIII; 40, female sternite VIII; 41-42, median lobe of aedeagus, lateral view (HT); 43, spermatheca. Scale: 0.1 mm.

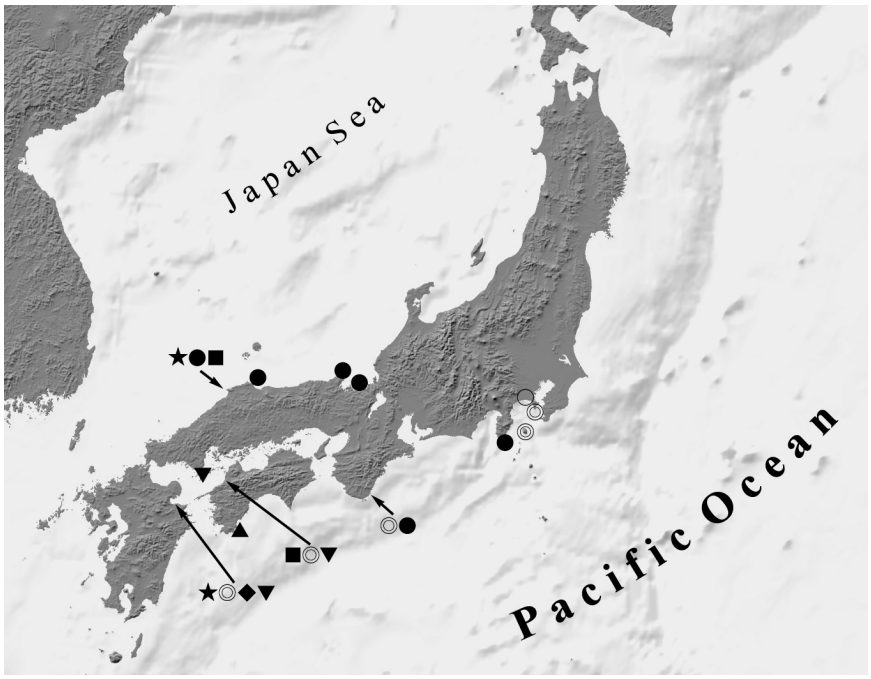


Fig. 44. Locality map of examined specimens of *Halorhadinus* spp. from Japan: black circle, *H. inaequalis*; white circle, *H. kawashimai*; double circle, *H. aequalis*; black triangle, *H. miyataorum*; black square, *H. sawadai*; black diamond, *H. miyakei*; black star, *H. masakazui*; black inverted triangle, *H. satoi*.

swelling and constricted at middle in lateral view.

Female: tergite VIII (Fig. 39) with 5 macrosetae around apical margin. Sternite VIII (Fig. 40) with 6 or 7 macrosetae. Spermatheca (Fig. 43) long and coils complex at base, kinked apically.

Measurements. BL, ≈ 2.9-3.8; FBL, 1.89-1.93; HW, 0.61-0.66; PL, 0.56-0.62; PW, 0.60-0.66; AL, 1.89-2.06; HTL; 0.66-0.73.

Etymology. The specific epithet is dedicated to Mr. Akira Sato who collected this species in Kûshû for the first time.

Distribution. Shikoku, Kyûshû.

Bionomics

Most *Halorhadinus* species have been collected from the intertidal zones of gravel beaches. They live in the matrix of open spaces that form in the gravel substrate (Maruyama & Hayashi, 2009), and some species exhibit a morphology often associated with subterranean life histories (e.g. reduced eyes, shortened hind wings and lightly-pigmented body).

Halorhadinus kawashimai was found liviing deep in the substrate. In particular, the species was collected from coarse sand and gravel around the bases of concrete blocks forming a breakwater on a sandy shorefront. This species was found together with *Bryothinusa* spp. and *Myrmecopora* sp.

Four species, *H. masakazui*, *H. satoi*, *H. aequalis,* and *H. miyakei* were collected at a single locality, Kurogahama beach of Oita-ken. *Salinamexus browni*, *Gyulianium* sp. and *Bryothinusa minuta* were collected together with these species. Such high species richness of intertidal staphylinids in Kurogahama is noteworthy.

We speculate that the body sizes of *Halorhadinus* species may be related to the average gravel grain size of the substrate a particular species is found in. For example, large species (*H. satoi*) appear to prefer coarser gravel, while small species (*H. miyakei*) are restricted to finer gravels. In Kurogahama, grain sizes are very variable across the habitat. It is this, together with the well-preserved environment of Kurogahama, that may allow four species of this genus to coexist.

Only three specimens of *H. miyataorum* were captured by truck-mounted car-net along the river mouth of Shimanto-gawa. Therefore, their exact habitat is still unknown, but may be revealed through future investigations of gravel beaches around this locality.

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