New Record of the Seashore Genus Salinamexus (Coleoptera, Staphylinidae, Aleocharinae) from Japan, with Descriptions of a New Species

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New Record of the Seashore Genus *Salinamexus* (Coleoptera, Staphylinidae, Aleocharinae) from Japan, with Descriptions of a New Species

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Abstract. The seashore rove beetle genus *Salinamexus* is recorded from Japan for the first time, and the following species are recognized and compared: *S. browni* Moore et Legner, 1977, *S. koreanus* Jeon et Ahn, 2007, and *S. hayamai* sp. nov. A key to the Japanese species of *Salinamexus* is given. All species live among the coarse sand or gravel of beaches.

Key words: taxonomy, Coleoptera, Staphylinidae, new record, coarse sand beach, gravel beach, *Salinamexus browni*, *S. koreanus*, *S. hayamai* sp. nov, species key, supratidal zone.

Introduction

Three species are currently recognised in the seashore rove beetle genus *Salinamexus* Moore et Legner, 1977 from the Pacific Coast: *S. browni* Moore et Legner, 1977 and *S. reticulatus* (Moore et Legner, 1977) from Sonora, northern Mexico, and *S. koreanus* Jeon et Ahn, 2007 from southern South Korea (Moore & Legner, 1977; Ahn, 1996; Jeon & Ahn, 2007). However, records of other aleocharines from widely dispersed regions suggest that this genus could also be found in other temperate and subtropical areas such as Japan, China, and the United States. Recently, during research on coastal insects in Shimane, western Honshû (the Sea of Japan coast), Mr. Takeshi Hayama collected *Salinamexus* specimens representing three different species, including one undescribed species. Following this, Mr. Hiroki Ono collected additional specimens of *Salinamexus* in Chiba, central Honshû. This paper reports *Salinamexus* spp. from Japan for the first time and describes the new species.

Materials and Methods

Mr. Takeshi Hayama collected the beetles from coarse sand or gravel with a grain diameter >1.0 mm in supratidal zones of sandy beaches, using a plastic sieve with 1.5×20-mm mesh. Some of the beetles were also collected using flight interception traps (FITs) and yellow pan traps set on beaches.

Each whole body was soaked in 10% KOH at 60ºC for 1 h and cleaned with water for a few minutes. Abdominal segments VIII-X and genitalia were removed from the body and placed in a water drop on a Petri dish. For each female specimen, the spermatheca was placed in water under a microscope (Nikon Eclipse 50i) and was sketched. The body and terminalia of each specimen were moved to a solution of 80% ethanol and dehydrated in 99% ethanol. Then, these parts were placed in a drop of Euparal and mounted on a small slide glass for permanent preservation (Maruyama, 2004). The holotype of the new species was deposited in the author's collection at Kyushu University Museum.

The bionomic information presented here is based on personal communication with Mr. Takeshi Hayama.

Salinamexus Moore et Legner, 1977

[Japanese name: Hama-hanekakushi-zoku]

Salinamexus Moore et Legner, 1977: 463 (original description: type species: *S. browni*, by original designation); Jeon & Ahn, 2007: 189 (revision, redescription).

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***Additional description*.**

Mandible (Fig. 4) with a deep sulcus on basal 2/3 of outer magin. Galea (Fig. 5) with an apical lobe covered with numerous fine pubescence. Lacinia (Fig. 5) with a row of 8-10 well-separated spines on inner margin. Labium (Fig. 6): apodeme with medial projection; surface with 2 real pores surrounded by several minute pseudopores; palpus 3-segmented; ligula bifid.

Diagnosis. This genus is similar to *Bryothinusa* Casey, 1904, in having a small size and slender body, but is easily distinguished from it by having a shorter labial palpus and bifid ligula. *Salinamexus* is also similar to *Amblopusa* Casey, 1893, in general appearance, but is distinguished from it by a bifid ligula and fully developed hind wings.

Remarks. Four species are recognised in this genus. The figures of the mouthpart characters are those of *S. browni* (type species), which has the largest body size in the genus (≈ 3.0 mm). The other species are considerably smaller (<2.0 mm). The mouthparts of the smaller species, *S. koreanus* and *S. hayamai*, are somewhat different from those of *S. browni*. In *S. koreanus* and *S. hayamai*, the apical segment III of the maxillary palpus is short and swollen and the labial palpus is less clearly segmented. The mouthpart characters in the small species are apparently apomorphic, probably due to their reduced body size.

Ahn and Ashe (1996) placed *Salinamexus* in the aleocharine tribe Liparocephalini. However, a recent phylogenetic analysis (Ahn *et al*., 2010) concluded that it did not belong to that tribe. The biggest difference between *Salinamexus* and the members of Liparocephalini (sensu Ahn *et al*., 2010) is in the shape of the ligula. In *Salinamexus*, it is clearly bifid, and in Liparocephalini, it is unilobed. This variation has also been observed in Oxypodini, but the monophyly of Oxypodini has not been established, and Oxypodini is most probably not monophyletic. The general shape of the ligula is generally stable in most aleocharine tribes and could be a phylogenetically important character; if so, this would also support the implication that *Salinamexus* is not a member of Liparocephalini.

The phylogenetic analysis by Ahn *et al*. (2010) postulated monophyly of the genera, which Ahn and Ashe (1996) classified as Liparocephalini, based on a few outgroups. The taxonomies of seashore and intertidal aleocharines are rather complicated due to the convergence of many taxonomically important mouthpart characters. Probably, the core members of Liparocephalini (the species of the type genus *Liparocephalus* and its obvious relative *Diaulota*) are correctly placed within the tribe Homalotini because no clear difference is detectable between them and certain homalotines (e.g., *Leptusa* and *Heterota*). A phylogenetic analysis of seashore and intertidal aleocharines that includes many outgroups of "higher" aleocharines will be needed for their precise taxonomy.

Salinamexus browni Moore et Legner, 1977

[Japanese name: Hama-hanekakushi]

(Figs. 1, 4-15)

Salinamexus browni Moore et Legner, 1977: 464 (original description; type locality: Sonora, Mexico); Jeon & Ahn, 2007: 192 (redescription).

Specimens examined. [**JAPAN**]: Akaishihana, Taisha-chô, Izumo-shi, Shimane-ken (N35°24′43″ E132°38′56″), 29 IV-V 5 2009, Hayama-T. (FITs) (2); Koura-kaigan, Kashima-chô, Matsue-shi, Shimane-ken (N35°31′1″ E132°58′22″), 16-18 VII 2009, Hayama-T. (FITs) (3); same data, but 3-5 X 2009 (1); same data, but 21-23 X 2009 (23).

Distribution. Japan (Honshû); Mexico (Sonora)

***Additional description*.**

Body (Fig. 1) large: 2.9-3.2 mm; dark brown, but antennae, elytra, legs, abdominal segments VII and VIII reddish brown.

Antennae (Fig. 7) with segments IV-IX longer than wide; segment X as long as wide; segment XI oblong oval.

Pronotum (Fig. 8) with 8 macrosetae that are short and poorly differentiated from setae except for anterolateral one.

Male: Tergite VIII (Fig. 9) roundly emarginated apically, with 6 macrosetae; sternite VIII (Fig. 10) with apical margin rounded, crenulated, with 18-20 macrosetae. Median lobe of aedeagus (Fig. 11) with apical lobe rhombic in lateral view, carinate at base; sclerite of inner sac located along ad-parameral margin rather long, thin. Apical lobe of paramere (Fig. 12) slightly pointed apically.

Female: Tergite VIII (Fig. 13) largely rounded apically, with 6 macrosetae; sternite VIII (Fig. 14) with apical margin rounded, crenulated, with 14-16 macrosetae. Spermatheca (Fig. 15) with apical part oblong oval, its wall rather thick.

Diagnosis. This species is easily distinguished from the other *Salinamexus* species by a larger body and elongate antennal segments IV–IX.

Jeon and Ahn (2007) illustrated the aedeagal median lobe, but this depiction is inaccurate and did not include

other distinguishing characters. Therefore, those characters of this species are illustrated here for precise identification.

***Salinamexus koreanus* Jeon et Ahn, 2007**
[Japanese name: Chousen-hama-hanekakushi]
(Figs. 2, 16-24)

Salinamexus koreanus Jeon et Ahn, 2007: 193 (original description; type locality: Tobmeori Beach, Mangun-myeon, Muan-gun, Jeonnam Province, Korea)

Specimens examined. [**JAPAN**]: Akaishihana, Taisha-chô, Izumo-shi, Shimane-ken (N35°24′43″ E132°38′56″), 29 IV-V 5 2009, Hayama-T. (FITs) (3); Koura-kaigan, Kashima-chô, Matsue-shi, Shimane-ken (N35°31′1″ E132°58′22″), 16-18 VII 2009, Hayama-T. (FITs) (88); same data, but 1-3 IX 2009 (9); same data, but 3-5 X 2009 (1); same data, but 21-23 X 2009 (7).

This species was also collected in Sotosono-kaigan, Izumo-shi, Shimane-ken (N35°20′21″ E132°39′58″), and Kiami, Masuda-shi, Shimane-ken (N34°40′39″ E131°45′15″) (Hayama, pers. comm.).

Distribution. Japan (Honshû), Korea.

Additional description.

Body (Fig. 2) small: 1.6-1.8 mm; brown, but antennae, elytra, legs, abdominal segments VII and VIII yellowish brown.

Antennae (Fig. 16) with segments IV-VIII longer than wide; segment IX and X as long as wide; segment XI oblong oval.

Male: Tergite VIII (Fig. 18) roundly emarginated apically, with 4 macrosetae; sternite VIII (Fig. 10) with apical margin rounded, crenulated, with 8 macrosetae. Median lobe of aedeagus (Fig. 20) with apical lobe elongate, almost strait, subparallel-sided in lateral view; sclerite of inner sac located along ad-parameral margin long. Apical lobe of paramere (Fig. 21) slightly pointed apically.

Female: Tergite VIII (Fig. 22) roundly emarginated

Figs. 1-3. Habitus of *Salinamexus* spp. 1, *S. browni* Moore et Legner, 1977; 2, *S. koreanus* Jeon et Ahn, 2007; 3, *S. hayamai* sp. nov.

apically, with 4 macrosetae; sternite VIII (Fig. 23) with apical margin rounded, crenulated, with 5 macrosetae. Spermatheca (Fig. 24) with apical part spherical, its wall thin.

Diagnosis. This species is very similar to *S. hayamai* in many characters, but can be distinguished from it by the smaller body (pronotal length, ≈ 0.25), the paler colour, the apical margin of sternite VIII being regularly crenulate, the apical lobe of the aedeagal median lobe being subparallel-sided in the lateral view, and the thinner wall of the apical part of the spermatheca.

Remarks. All characters of this species, except for the body size, the body colour and the sexual characters, are almost the same as in *S. hayamai*. Jeon & Ahn (2007) mischaracterized the mandible and elytra in the original description. The mandible has a row of three setae on the outer margin and the elytron lack a carina.

Salinamexus hayamai Maruyama sp. nov.
[Japanese name: Hime-hama-hanekakushi]
(Figs. 3, 25-34)

Type material. Holotype, ♂, [**JAPAN**]: Akaishihana, Taisha-chô, Izumo-shi, Shimane-ken (N35°24′43″ E132°38′56″), 15 VIII 2009, Hayama-T. (KUM).

Paratypes: same data as holotype (7); same data, but 2-8 V 2009 (FITs) (30); Sunosaki-kaigan, Tateyama-shi, Chiba-ken, 14 VI 2009, Ono-H. (4); same data, but 24 VIII 2009 (1).

This species was also collected in Sotosono-kaigan, Izumo-shi, Shimane-ken (Hayama, pers. comm.).

Distribution. Japan (Honshû).

Etymology. This species name is dedicated to Mr. Takeshi Hayama, who has found many undescribed species of seashore rove beetles in Japan and helped to collect the type series.

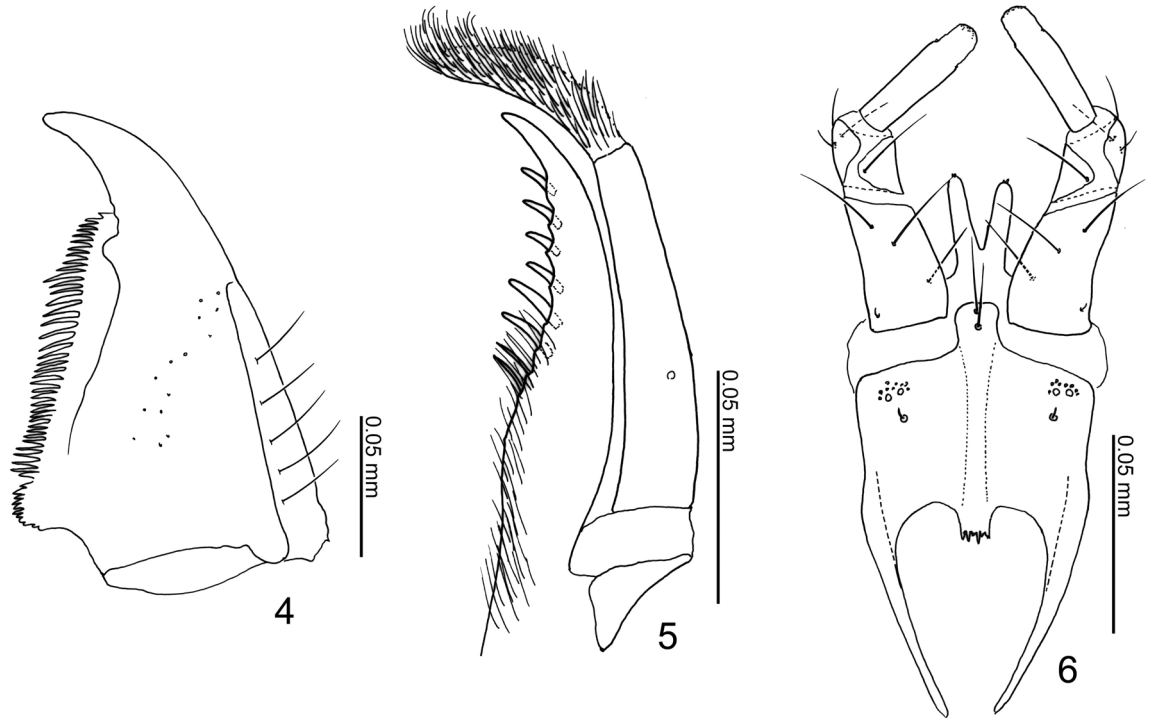
***Description*.**

Body (Fig. 3) small: 1.8-2.0 mm; dark brown, but antennae, elytra, legs, abdominal segments VII and VIII reddish brown.

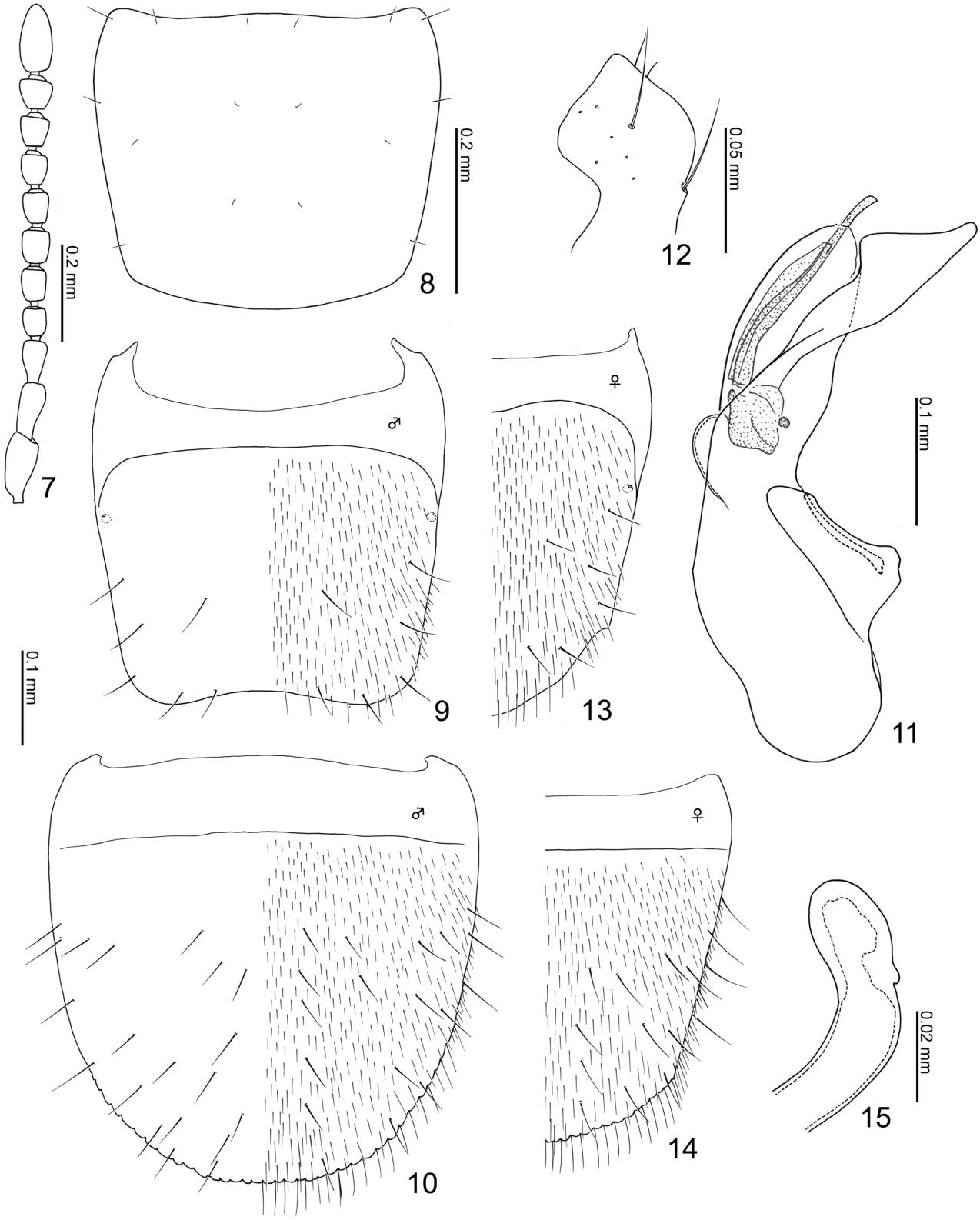
Labrum rounded apically, with about 10 major setae. Mandible with a row of 3 setae on outer margin. Maxilla with segment III of palpus short, swollen; lacinia with a row of 10 well-separated spines on inner margin.

Antennae (Fig. 25) with segments IV-X almost as long as wide; segment XI oval.

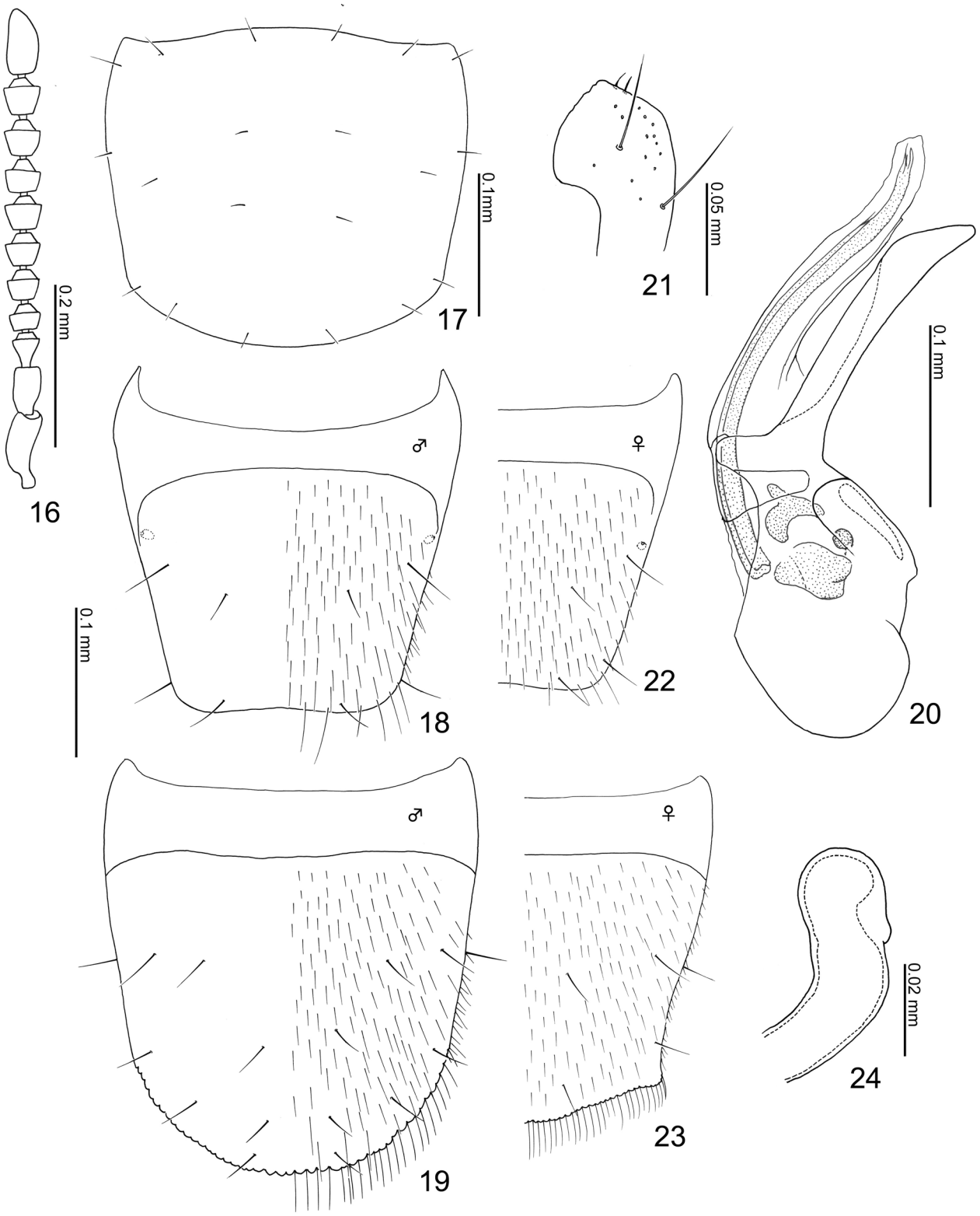
Pronotum (Fig. 26) subquadrate, anterior margin slightly sinuate, gently narrowed posteriorly, rounded on posterior margin; surface with 10 macrosetae that are clearly differentiated from setae.



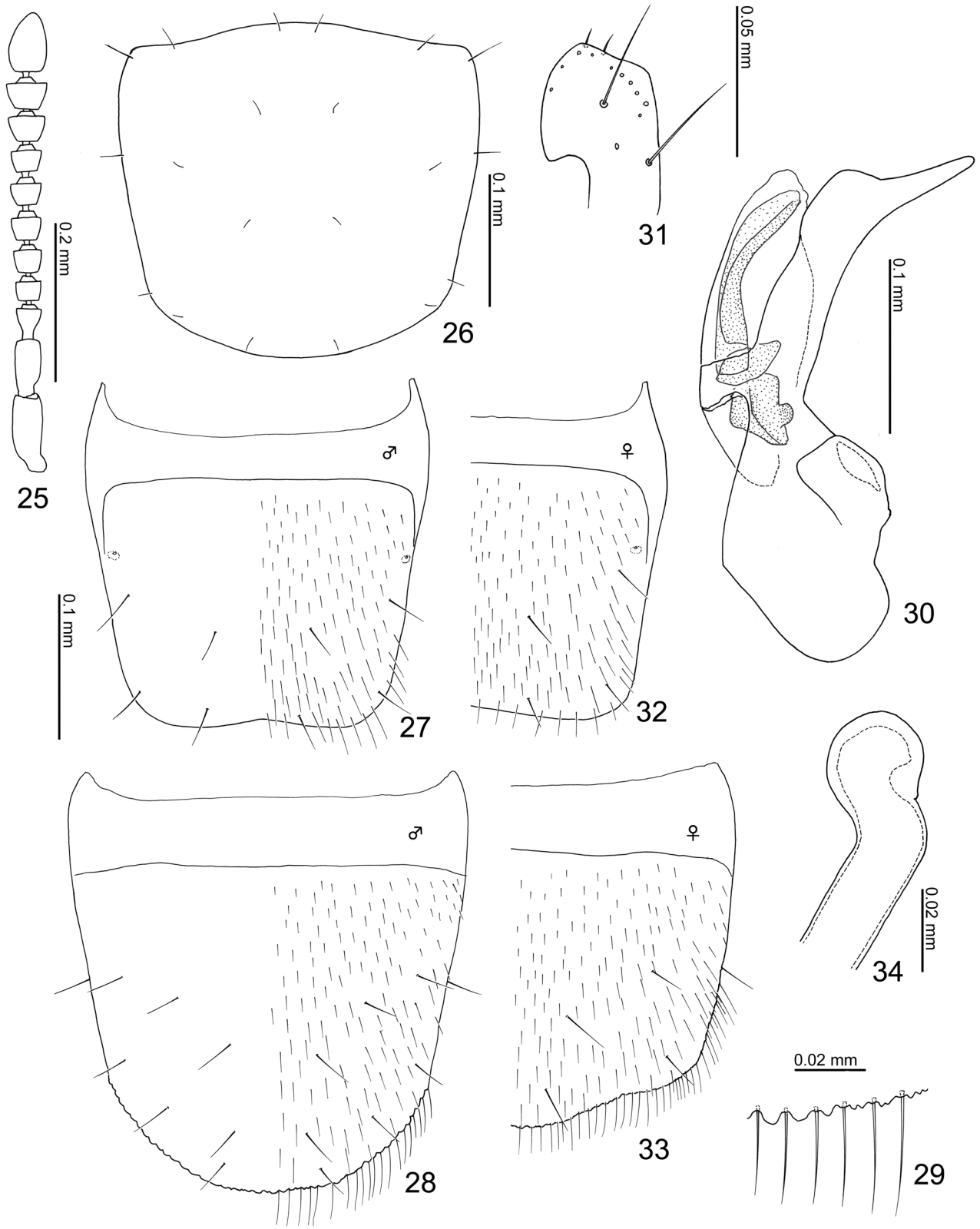
Figs. 4-6. Mouthparts of *Salinamexus browni* Moore et Legner, 1977. 4, Right mandible; 5, galea and lacinia; 6, labium.



Figs. 7-15. *Salinamexus browni* Moore et Legner, 1977. 7, Right antenna; 8, pronotum; 9, male tergite VIII; 10, male sternite VIII; 11, median lobe of aedeagus; 12, apical lobe of paramere; 13, female tergite VIII; 14, female sternite VIII; 15, apical part of spermatheca.



Figs. 16-24. *Salinamexus koreanus* Jeon et Ahn, 2007. 16, Right antenna; 17, pronotum; 18, male tergite VIII; 19, male sternite VIII; 20, median lobe of aedeagus; 21, apical lobe of paramere; 22, female tergite VIII; 23, female sternite VIII; 24, apical part of spermatheca.



Figs. 25-34. *Salinamexus hayamai* sp. nov. 25, Right antenna; 26, pronotum; 27, male tergite VIII; 28, male sternite VIII; 29, ditto, apex; 30, median lobe of aedeagus; 31, apical lobe of paramere; 22, female tergite VIII; 33, female sternite VIII; 34, apical part of spermatheca. 27-31, Holotype.

Male: Tergite VIII (Fig. 27) roundly emarginated apically, with 4 macrosetae; sternite VIII (Figs. 28-29) with apical margin rounded, rather irregularly crenulated, slightly dentate, with 8 macrosetae. Median lobe of aedeagus (Fig. 30) with apical lobe elongate, narrowed apically in lateral view; sclerite of inner sac located along ad-parameral margin short. Apical lobe of paramere (Fig. 31) rounded apically.

Female: Tergite VIII (Fig. 32) roundly emarginated apically, with 4 macrosetae; sternite VIII (Fig. 33) with apical margin rounded, rather irregularly crenulated, slightly dentate, with 5 macrosetae. Spermatheca (Fig. 34) with apical part spherical, its wall rather thick.

Diagnosis. This species is very similar to *S. koreanus* in many characters, but can be distinguished from it by the larger body (pronotal length, ≈ 0.30), the daker colour, the apical margin of sternite VIII (Fig. 29) being rather irregularly crenulate and slightly dentate, the apical lobe of the aedeagal median lobe being narrowed apically in the lateral view, and the thicker wall of the apical part of the spermatheca.

Remarks. All characters of this species, except for the body size, the body colour and the sexual characters, are almost the same as in *S. koreanus*.

Key to the Japanese Species of *Salinamexus*

1. Body large (≈ 3.0 mm); blackish brown; antennal segments IV-IX elongate; tergite VIII with 8 macrosetae; sternite VIII with more than 10 macrosetae; apical lobe of aedeagal median lobe rhombic; apical part of spermatherca oval ..... *S. browni*
- Body small (<2.0 mm); brown; antennal segments

Figs. 35-38. Collecting sites of *Salinamexus* species in Japan. 35-36, Akaishihana, Shimane-ken, Taisha-chô, Izumo-shi, Shimane-ken, Honshû (*S. koreanus* and *S. hayamai*); 37, Kiami, Masuda-shi, Shimane-ken (*S. koreanus*); 38. Koura, Kashima-chô, Matsue-shi, Shimane-ken (*S. browni* and *S. koreanus*). Photo © T. Hayama.

IV-IX not elongate; tergite VIII with 4 macrosetae; sternite VIII with less than 10 macrosetae; apical lobe of aedeagal median lobe elongate; apical part of spermatherca spherical 2

2. Body slightly smaller; pronotal length ≈ 0.25. Apical margin of sternite VIII regularly crenulate. Apical lobe of aedeagal median lobe subparallel-sided in lateral view. Wall of apical part of spermatheca thin ..... *S. koreanus*

- Body slightly larger; pronotal length ≈ 0.30. Apical margin of sternite VIII being rather irregularly crenulate, slightly dentate. Apical lobe of aedeagal median lobe narrowed apically in lateral view. Wall of apical part of the spermatheca thick ..... *S. hayamai*

Bionomics and Distribution

Salinamexus beetles were collected in the supratidal zone (Figs. 35-38), which is apparently higher than the habitat of *Bryothinusa* beetles, which are similarly sized aleocharines that live in middle to high intertidal zones. *Salinamexus* live among the coarse sand or gravel on beaches. Collection records show the use of FITs and YPTs, indicating that *Salinamexus* can fly. The population increases from early summer to autumn (June to October).

Salinamexus browni was originally described from Mexico (Moore & Legner, 1977), and this is the first report from Japan. Presently in Japan, all *Salinamexus* species are found only in Chiba and Shimane, in Honshû (Fig. 39). However, considering the wide distributions of the other seashore aleocharines and the present record of *S. browni*, they will probably be found at other localities along the Pacific Coast of continental Asia and the United States. The research by Mr. Takeshi Hayama has demonstrated the effectiveness of FITs for collecting *Salinamexus* species, as well as the common occurrence of *Salinamexus* at the localities in which they were collected. The use of this trap, as well as the sieve method described in the Materials and Methods section, will contribute to further discoveries of *Salinamexus* species.

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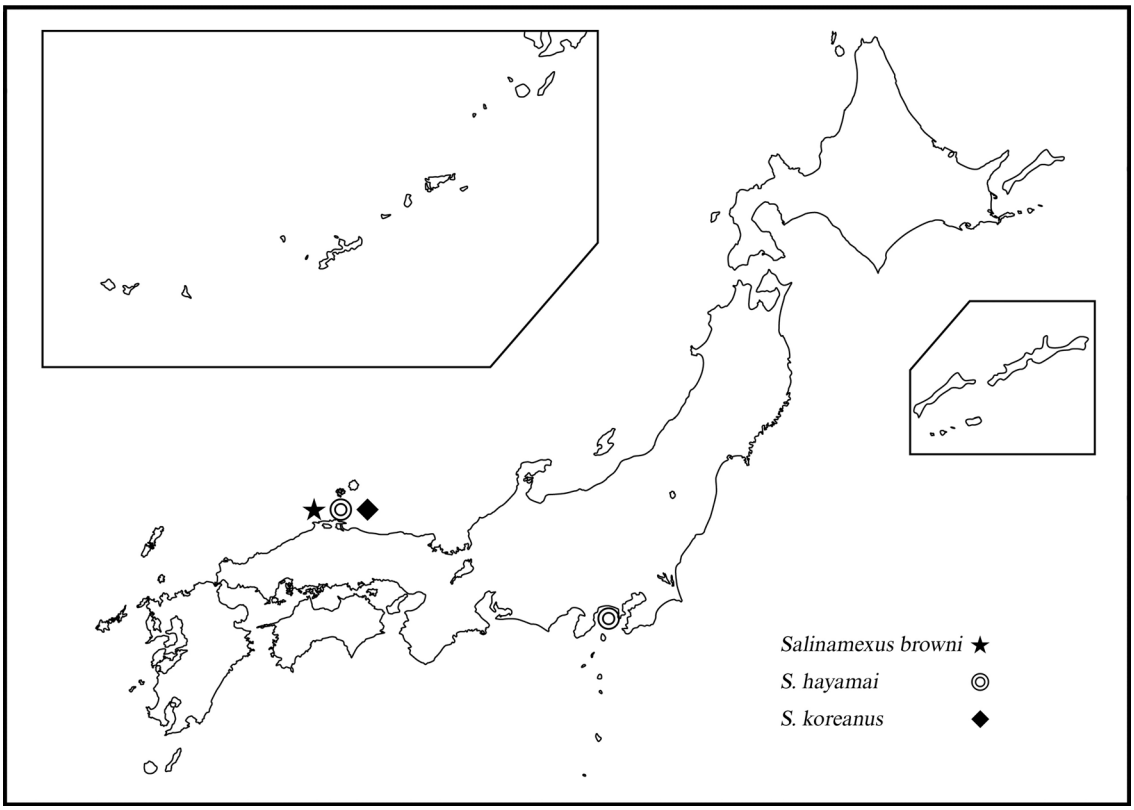

Figs. 39. Known localities of *Salinamexus* species in Japan. Black star, *S. browni* Moore et Legner, 1977; double circle, *S. hayamai* sp. nov.; black diamond, *S. koreanus* Jeon et Ahn, 2007.

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