Japanese Species of the Myrmecophilous Genus Thiasophila Kraatz, 1856 (Coleoptera, Staphylinidae, Aleocharinae)

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Japanese Species of the Myrmecophilous Genus *Thiasophila* Kraatz, 1856 (Coleoptera, Staphylinidae, Aleocharinae)

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Abstract. Faunistic investigation of Japanese myrmecophiles revealed the occurrence of three new species of the genus *Thiasophila* Kraatz, 1856, which are described herein: *T. nipponica* sp. nov. (host: *Lasius* (*Dendrolasius*) sp.; from Hokkaidô and Honshû), *T. aynumosir* sp. nov. (host: *Formica truncorum*; from Hokkaidô), *T. shinanonis* sp. nov. (host: *F. yessensis*; from Honshû). The two species of *Thiasophila* recorded from Japan prior to this work appear not to belong to this genus. A key to the Japanese species is provided.

Key words: *Lasius*, *Dendrolasius*, *Formica*, Honshû, Hokkaidô, new species.

Introduction

Members of the aleocharine genus *Thiasophila* Kraatz, 1856 (tribe Oxypodini) are myrmecophiles associated with ants of the genera *Formica*, *Lasius* and *Camponotus* (Hymenoptera, Formicidae, Formicinae) (Zerche, 1987). The genus is represented by 10 species from the Palaearctic region (Smetana, 2001). Two species, *Thiasophila rufescens* Sharp, 1874, and *T. oxypodina* Sharp, 1888, are known from Japan (Sharp, 1874, 1888). Zerche (1987) reviewed the species of the genus, but did not include these Japanese species. Hence, no redescription or re-examination of the types has been done following their original descriptions, and their validity has remained uncertain.

Recently, M. Maruyama examined the type specimens of both species and revealed that these species should be transferred to other genera. *Thiasophila rufescens* is actually a member of *Homoeusa* Kraatz, 1856 (Maruyama, in prep.) and *T. oxypodina* was transferred to *Losiusa* Seevers, 1978 (Maruyama, 2009). Thus, no genuine species of *Thiasophila* were known to occur in Japan.

In the course of a faunistic investigation of myrmecophilous insects in Japan, M. Maruyama and his colleague found three *Thiasophila* species from Hokkaidô and Honshû. L. Zerche examined those species and found that they are all undescribed species. In the present study, we describe those Japanese species and document their host ants and biology.

Materials and Methods

The material from the following collections are examined: cKam (private collection of H. Kamezawa); cWat (private collection of T. Watanabe); KUM (M. Maruyama Collection at The Kyushu University Museum, Fukuoka, Japan), SDEI (Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany). The methods used for dissection and making permanent slides and line drawings follow Maruyama (2004, 2006). Photographs were taken using a Canon EOS 60D with a Canon MP-E 65 mm 1–5X macro lens and mounted using the automontage software CombineZM.

Thiasophila Kraatz, 1856

[Japanese name: Ariyadori-zoku]

Thiasophila Kraatz, 1856: 69 (original description, type species: *Aleochara angulata* Erichson, 1837); Zerche, 1987: 92 (synonymy; revision of Palearctic species,

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except for Japanese species); Smetana, 2001: 488 (catalogue).

Diagnosis. Among Japanese myrmecophilous aleocharines, members of *Thiasophila* are somewhat similar to those of *Homoeusa* in body shape and size, but can be distinguished from them by the shagreened body and the narrower pronotum (narrower than abdomen). The ligula is bifid in *Thiasophila* whereas it is unilobed in *Homoeusa*.

Thiasophila nipponica
Maruyama & Zerche, sp. nov.
[Japanese name: Kusa-ariyadori]
(Figs. 1, 4-10, 24)

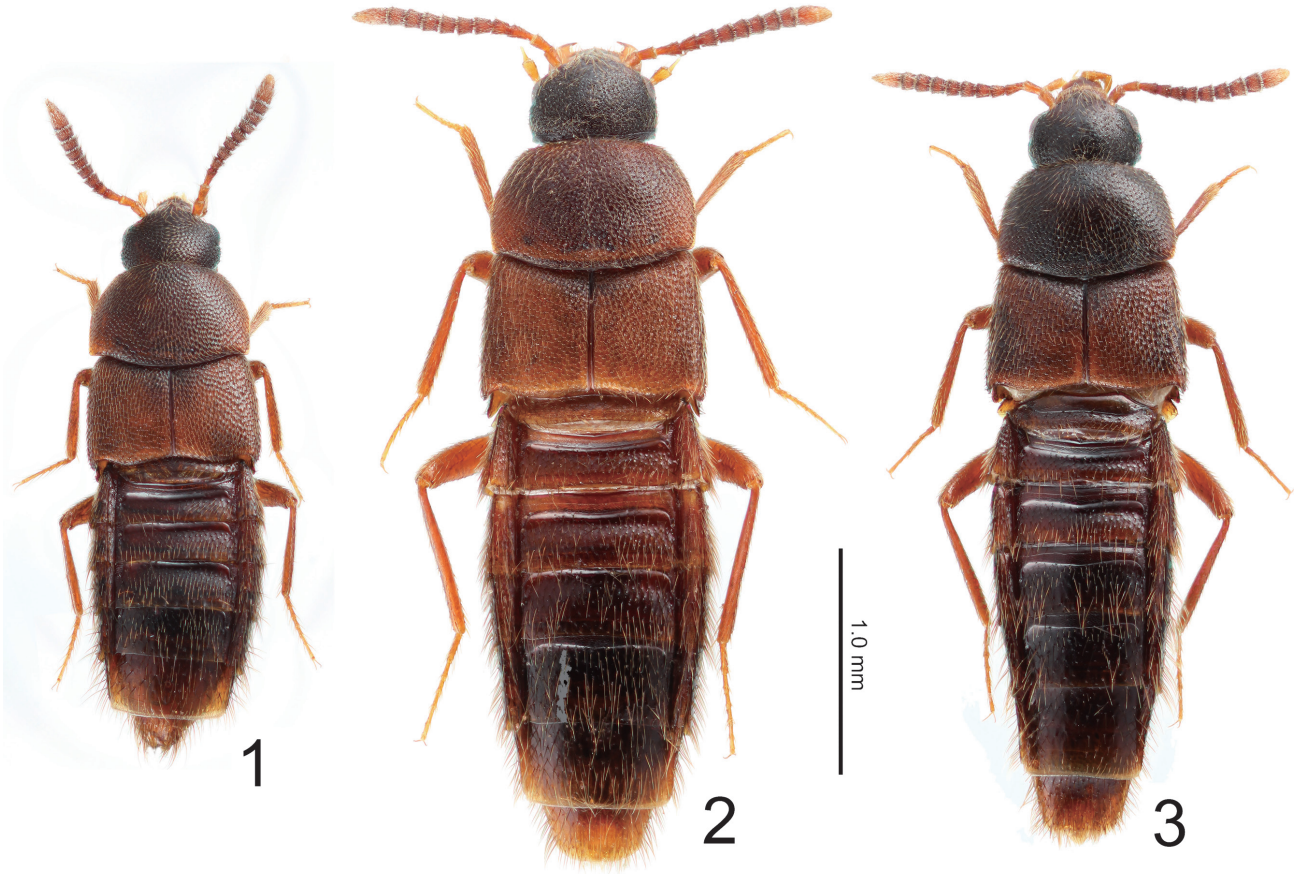
Type locality: Japan, Honshû, Tôkyô-to, Nishitôkyô-shi.

Type series. Holotype ♂: "Japan: Honshu, Mukodai Cho, Nishitokyo Shi, 15 IV 2006, KAMEZAWA Hiromu leg." (KUM). Paratypes: Iriyamabe-Sanjiro, Matsumoto-shi, Nagano-ken, 12 V 2004, Komatsu T. (28: KUM); Ôsawa-guchi, Nopporo-Shinrin-kôen, Ebetsu-shi, Hokkaidô, 26 V 2001, Maruyama M. (7: KUM); Daiichi-Usakumai-bashi, Rankoshi, Chitose-shi, Hokkaidô, 30 VI 2002, Maruyama M. (2: KUM); Jukkoku-tôge, Narahara, Ueno-mura, Gumma-ken, Honshû, 11 IX 2002, Kanai N. (3: cWat); Akigase-kôen, Urawa-shi, Saitama-ken, Honshû, 19 V 2000, Sugaya H. (9: KUM, SDEI); same data, but 8 V 2001 (2: KUM); Mukôdai-chô, Nishitôkyô-shi, Tôkyô-to, 15 IV 2006, Kamezawa H. (1: KUM). All specimens were collected from nests of *Lasius* sp. 1 of Maruyama, a member of the subgenus *Dendrolasius*.

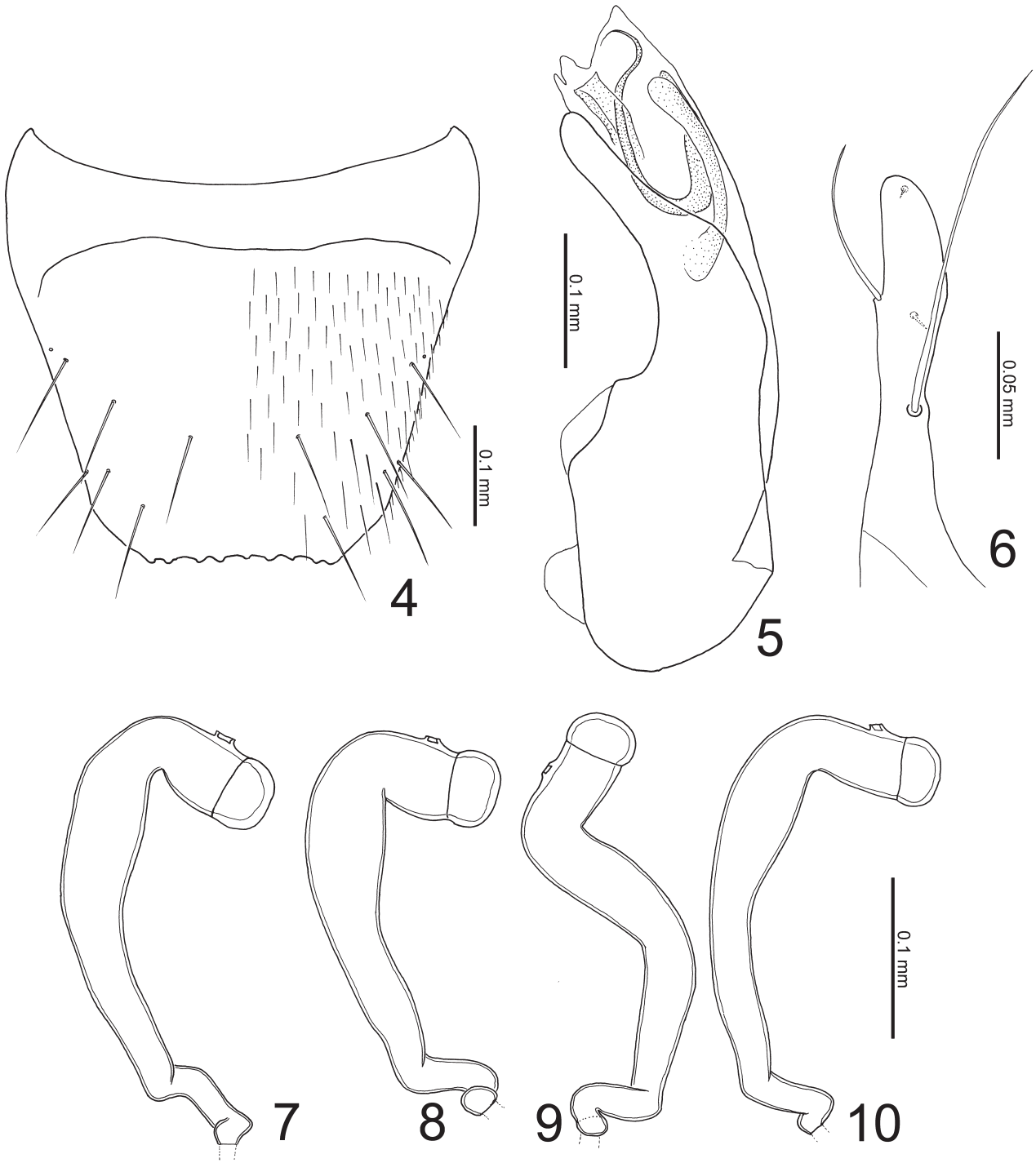
Diagnosis. This species in body shape is closely similar to *T. inquilina* (Märkel, 1842) but distinguished from it by the smaller body, the body setae being longer, the antennae being shorter, the basal 1/3 of the pronotum being parallel-sided, the apical lobe of the median lobe of the aedeagus being shorter, and the apical part of the spermatheca being smaller. Among the Japanese species, this species is readily distinguished from the other two species by the smaller body.

Description.

Body (Fig. 1) small; dorsal surface mostly shagreened but somewhat glossy. Head dark brown; surface shagreened but clypeus and frons weakly punctured;



Figs. 1-3. Facies of *Thiasophila* spp. from Japan (paratypes). 1, *Thiasophila nipponica* sp. nov.; 2, *T. aynumosir* sp. nov.; 3, *T. shinanonis.* sp. nov.



Figs. 4-10. Genital parts of *Thiasophila nipponica* sp. nov. 4, Eighth tergite, male; 5, median lobe of aedeagus, lateral view; 6, apex of apical lobe of paramere, lateral view; 7-10, spermathecae, individual variations from same ant nest.

clypeus slightly rounded apically. Antennae thick, short, shorter than head and pronotum combined, reddish brown, but segments I-III paler; segment I swelling, widest around middle; segment II shorter than III, widened apically; segment III widened apically; segment IV as long as wide; segments V-X much wider than long; segment XI oval. Pronotum very convex, widest around middle, reddish brown, but around lateral margins paler; anterior margin gently rounded; lateral margins rounded; posterolateral corners produced posteriorly, rounded apically but right angled; posterior margins rounded except near lateral corner sinuate; surface shagreened. Elytra slightly widened posteriorly, posterior margins deeply notched near lateral corners, pale reddish brown but around scutellum brown, around lateral margins darker; surface shagreened. Legs pale reddish brown. Abdomen reddish brown but tergite VI and base of tergite VII brown; tergites densely with setiferous punctures that become weaker and sparser toward apical segments; tergite VIII (Fig. 4) with 6 macrosetae.

Male: Tergite VIII (Fig. 4) with posterior margin truncate, dentate. Median lobe of aedeagus (Fig. 5) with apical lobe somewhat thick in lateral view; flagellum long, roundly curved near apex; apical lobe of paramere (Fig. 6) with basal setae long, longer than apical lobe.

Female: Tergite VIII with posterior margin rounded, smooth. Spermathecae (Figs. 7-10) with basal part coiled in 2 parts; apical part small, rounded.

Measurements. Body length: ≈ 1.95-2.25 mm; fore body length: ≈ 1.05-1.10; pronotal length: 0.458-0.480; pronotal width: 0.698-0.740; hind tibial length: 0.428-0.449.

Distribution. Hokkaidô and eastern Honshû of Japan (Fig. 24).

Bionomics. Associated with *Lasius* (*Dendrolasius*) sp. 1 of Maruyama. Seven species of *Dendrolasius* are known (Maruyama, unpublished data) in Japan. Probably this species uses most Japanese *Dendrolasius* species as hosts, since little host specificity is known in other myrmecophiles associated with *Dendrolasius*. This species is normally rare and collected from inside nest entrances, but not deep inside of the nest.

Etymology. Named after *Nippon*, Japan in Japanese language.

Thiasophila aynumosir

Maruyama & Zerche, sp. nov.

[Japanese name: Kita-ariyadori]

(Figs. 2, 11-16, 24)

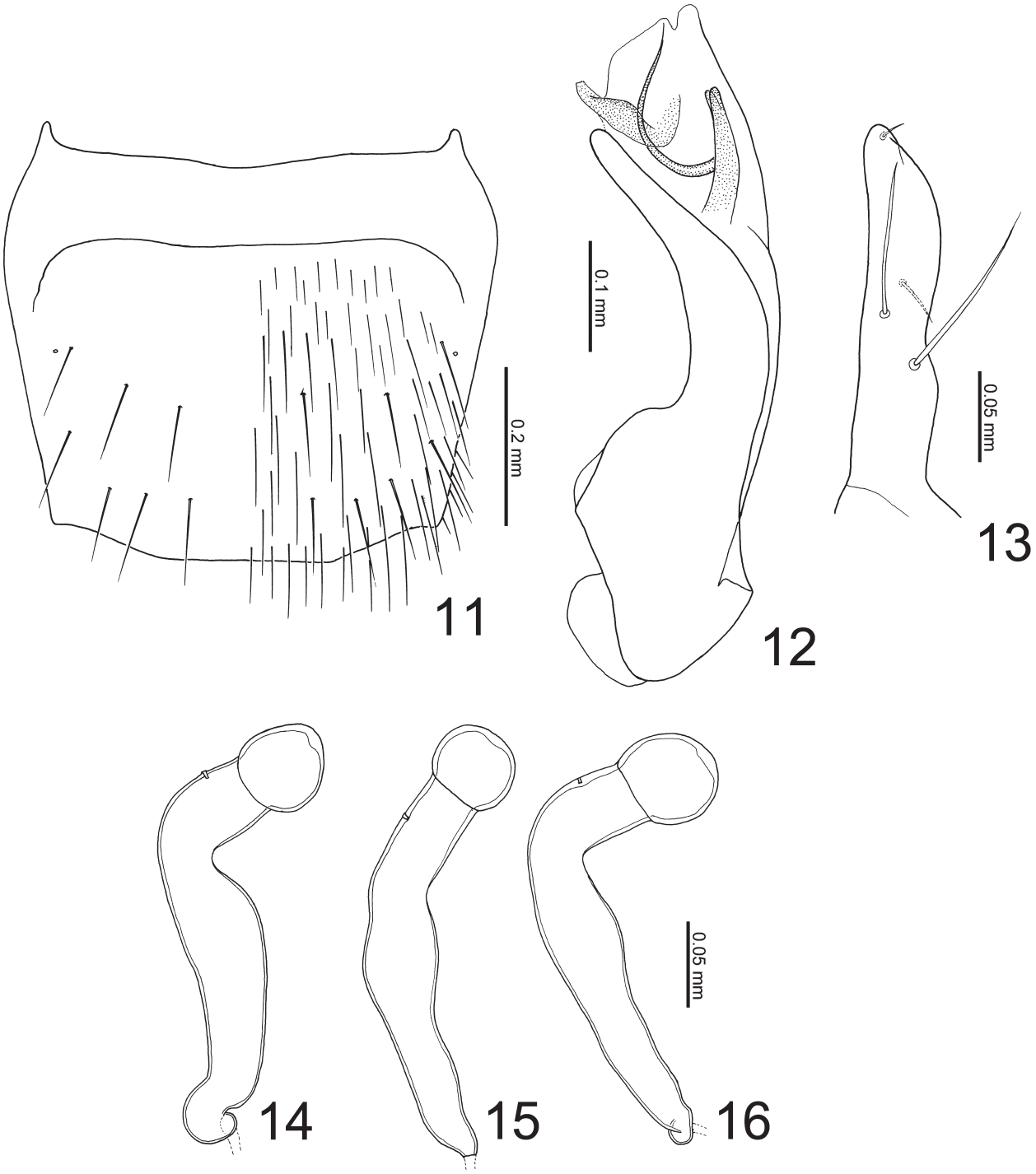
Type locality: Japan, Hokkaidô, Kamishihoro-chô.

Type series. Holotype ♂: "NIPPON: Hokkaidô, Kamishihoro-chô, Mitsumata (680 m alt.), 13 IX 2000, Maruyama M. & Sugaya H." (KUM). Paratypes: same data as holotype. (by sifting a mound of nest) (88: KUM, SDEI); same data, but 23 VII 2000, Maruyama M. (21: KUM); same data, but 4 VIII 2001, Maruyama M. (15: KUM); Tayoro-chô, Shibetsu-shi, Hokkaidô, 20 V 2006, Kamezawa H. (5: KUM, cKam); Shimoshibetsu-chô, Shibetsu-shi, Hokkaidô, 20 V 2006, Kamezawa H. (7: KUM, cKam); Arakawanosawa (ca. 300 m alt.), Engaru-chô (Maruseppu-chô), Hokkaidô, 2-3 VIII 2000, Kida Y. (under bark of dead tree near a nest) (8: KUM); same data, but 25 VIII 2000, Maruyama M. (16: KUM); Kotaki-gawa-bunki, Teppenbetsu-gawa, Shari-chô, Hokkaidô, 2 VIII 1989, Haga K. (1: KUM).

Diagnosis. This species in body shape and sexual dimorphism of antennae is similar to *T. angulata* (Erichson, 1837) known from Central Europe (host: *F. polyctena*, Zerche, unpublished data) but is distinguished from it by the darker body, antennomere XI being thicker, the median lobe of aedeagus possessing a small apical crista (as well as the structure of sclerites of the internal sac), and the spermatheca having a thicker basal part. Among the Japanese species, this species is similar to *T. shinanonis* but distinguished from it by the lager body, the paler color (almost unicolorous), and the body being more matte.

Description.

Body (Fig. 2) large; dorsal surface mostly shagreened and completely matte. Head blackish brown; surface shagreened, reticulated, but clypeus and frons weakly punctured; clypeus slightly rounded apically. Antennae slender, as long as head and pronotum combined, reddish brown, but segments I-III and XI paler; segment I dilated, widest near apex; segment II shorter than III, widened apically; segment III widened apically; segment IV longer than wide; segments V and VI as long as wide; segments VII-X slightly wider than long; segment XI oblong oval. Pronotum somewhat convex, widest around middle, brown, but around lateral and posterior margins paler; anterior margin almost truncate; lateral margins gently rounded, subparallel-sided in posterior half; posterolateral corners rounded, but sometimes very weakly produced posteriorly; basal margin rounded except near lateral corner where it is slightly curved laterally; surface



Figs. 11-13. Genital parts of *Thiasophila aynumosir* sp. nov. 11, Eighth tergite, male; 12, median lobe of aedeagus, lateral view; 13, apex of apical lobe of paramere, lateral view; 14-16, spermathecae, individual variations from same ant nest.

shagreened, reticulated. Elytra slightly widened posteriorly, posterior margins shallowly notched near lateral corners, reddish brown but around scutellum and lateral margins brown; surface shagreened, reticulated. Legs reddish brown. Abdommen brown but tergite III and IV slightly paler; tergites densely with setiferous punctures that become sparser toward apical segments; tergite VIII (Fig. 11) with 7 macrosetae.

Male: Segment XI of antenna long, 2.1 times as long as X. Tergite VIII (Fig. 11) with posterior margin truncate medially. Median lobe of aedeagus (Fig. 12) with apical lobe narrow in lateral view; flagellum short; apical lobe of paramere (Fig. 13) with basal setae short, 1/2 times as long as apical lobe.

Female: Segment XI of antenna short, 1.5 times as long as X. Tergite VIII with posterior margin rounded. Spermatheca (Figs. 14-16) with basal part somewhat thickened around middle, only curved or slightly coiled; apical part large, rounded.

Measurements. Body length: ≈ 3.2-3.5 mm; forebody length: ≈ 1.3-1.4; pronotal length: 0.452-0.490; pronotal width: 0.799-0.843; hind tibial length: 0.645-0.681.

Distribution. Eastern Hokkaidô of Japan (Fig. 24).

Bionomics. All specimens were collected from nest mounds of *Formica truncorum*, except for a single specimen from Shari-chô collected from rotten wood. This species is abundant in the area where the host ant is distributed.

Etymology. The Ainu language *Aynumosir* means "land of people" and is Hokkaidô for the Ainu people.

Thiasophila shinanonis

Maruyama & Zerche, sp. nov.

[Japanese name: Yama-ariyadori]

(Figs. 3, 17-24)

Type locality: Japan, Honshû, Nagano-ken, Yachiho-mura (Sakuho-chô).

Type series. Holotype ♂: "NIPPON: Nagano-ken, Yachiho-mura, Mugikusa-tôge (ca. 2000 m alt.), 5 VI 2001, Maruyama M." (KUM). Paratypes. same data as holotype (3: KUM); same data, but 11 VIII 2003 (13: KUM, SDEI); same data, but 8 V 2010, Komatsu T; Ikenokurumi (1550 m alt.), Suwa-shi, Nagano-ken, Honshû, 9 V 2010, Komatsu T. (4: KUM).

Diagnosis. This species in body shape and size is similar to *T. pexa* Motsulsky, 1860 known from Transbaikal (Dauria) and Mongolia (host: *Formica cunicularia*, after Motsulsky (1860) but this is doubtful) but is distinguished from it by the darker body, the median lobe of the aedeagus posessing a shorter apical lobe (as well as the structure of sclerites of the internal sac), and the spermatheca having a longer basal part. Among the Japanese species, this species is similar to *T. aynumosir* but distinguished from it by the smaller size, the darker color (clearly bicolor), and the shinier body.

Description.

Body (Fig. 3) medium-sized; dorsal surface mostly shagreened but slightly glossy. Head black; surface weakly shagreened, reticulated, but clypeus and frons weakly punctured; clypeus slightly rounded apically. Antennae slender, as long as head and pronotum combined, reddish brown, but segments I-III and XI paler; segment I dilated, widest near apex; segment II shorter than III, widened apically; segment III widened apically; segments IV and V longer than wide; segments VI-VIII as long as wide; segments IX-X slightly wider than long; segment XI oblong oval. Pronotum somewhat convex, widest around middle, blackish brown, but around edges with narrow paler band; anterior margin almost truncate; lateral margins gently rounded; posterolateral corners rounded; posterior margin rounded except near lateral corner where it curves slightly laterally; surface shagreened, reticulated. Elytra slightly widened posteriorly, posterior margins shallowly notched near lateral corners, reddish brown but around scutellum and lateral margins to posterolateral corners dark brown; surface shagreened, reticulated. Legs reddish brown. Abdomen brown but apices of segments III-V paler; tergites densely with setiferous punctures that become weaker and sparser toward apical segments; tergite VIII (Fig. 17) with 7 macrosetae.

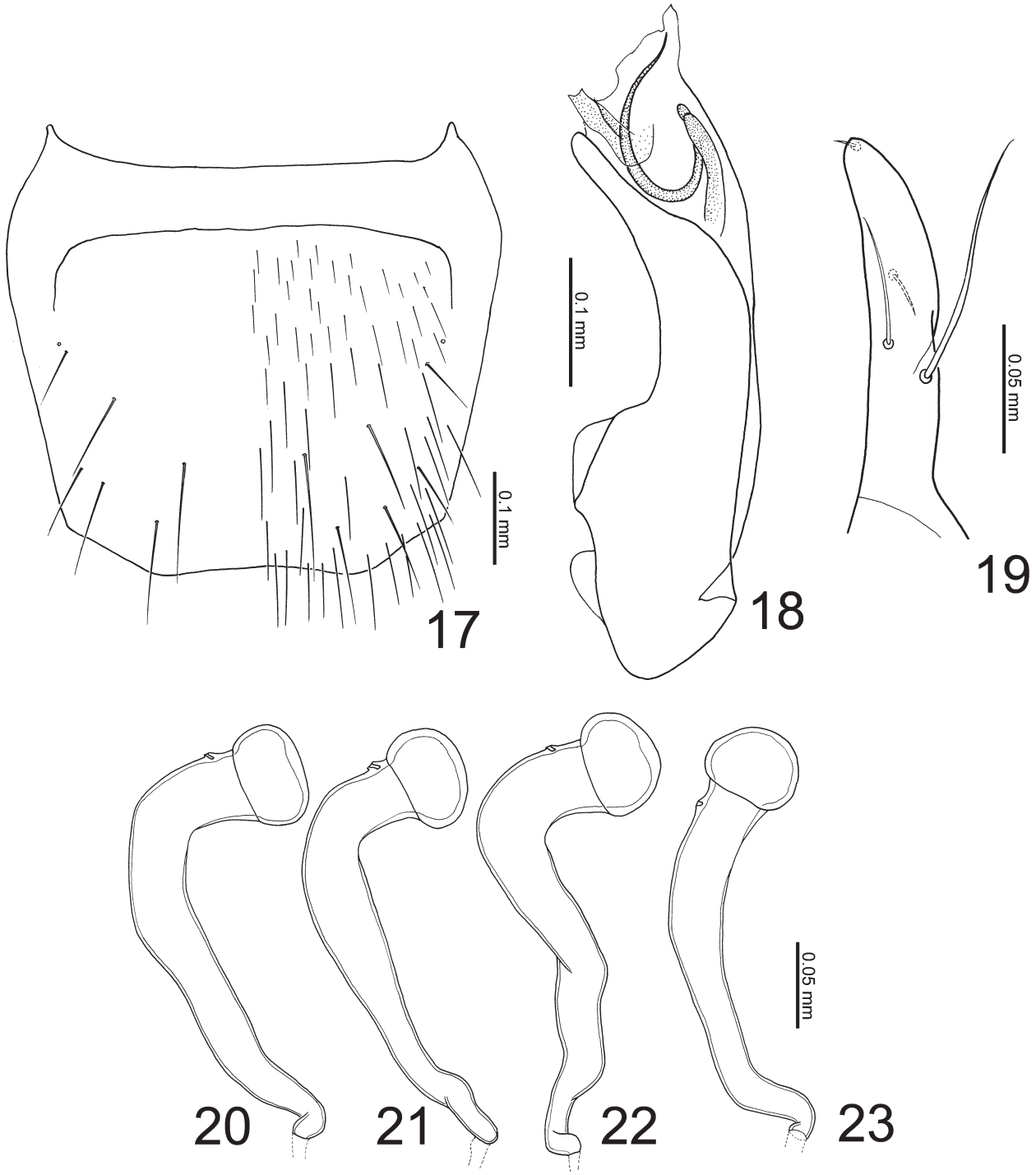
Male: Segment XI of antenna 1.6 times as long as X. Tergite VIII (Fig. 17) with posterior margin slightly emarginated medially. Median lobe of aedeagus (Fig. 18) with apical lobe narrow in lateral view; flagellum short; apical lobe of paramere (Fig. 19) with basal setae long, 0.7 times as long as apical lobe.

Female: Segment XI of antenna 1.4 times as long as X. Tergite VIII with posterior margin truncate. Spermatheca (Figs. 20-23) with basal part only curved or slightly coiled; apical part large, rounded.

Measurements. Body length: ≈ 2.9-3.1 mm; fore body length: ≈ 1.1-1.2; pronotal length: 0.452-0.490; pronotal width: 0.745-0.791; hind tibial length: 0.510-0.545.

Distribution. Central Honshû (high altitude zones) of Japan (Fig. 24).

Bionomics. All specimens were collected from nest mounds of *Formica yessensis*. This species apparently prefers large nest mounds, since few specimens were found in small mounds. The host ant is becoming increasingly rare in Japan, especially in Central Honshû,



Figs. 17-23. Genital parts of *Thiasophila shinanonis* sp. nov. 17, Eighth tergite, male; 18, median lobe of aedeagus, lateral view; 19, apex of apical lobe of paramere, lateral view; 20-23, spermathecae, individual variations from same ant nest.

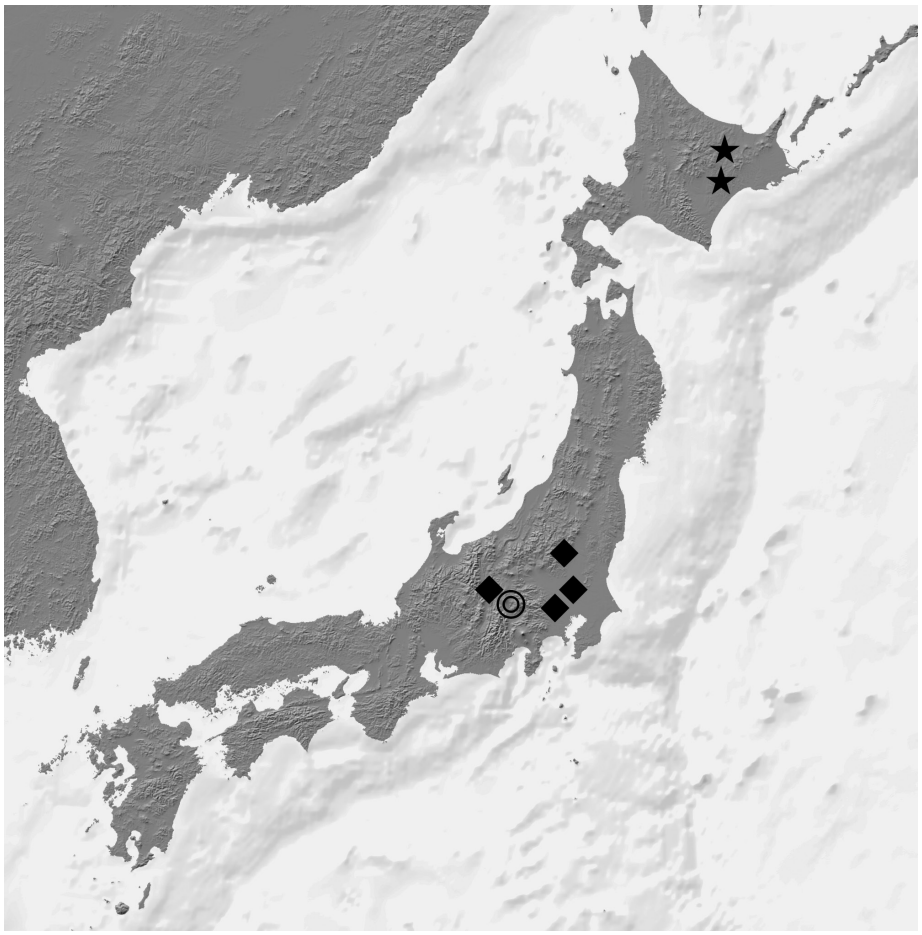


Fig. 24. Locality map of examined specimens of *Thiasophila* spp. from Japan (showing only Mainland): black diamond, *Thiasophila nipponica*; black star, *T. aynumosir*; double circle, *T. shinanonis*.

probably due to warming temperatures. Large nest mounds in the type locality, Mugikusa-tôge, and other localities, have disappeared during the past decade, and finding these large nests in most areas is now difficult. As its host declines, *T. shinanonis* is also apparently becoming rarer, and will soon become extinct if no conservation measures are implemented for the host ant.

In Hokkaidô and Honshû, *Formica fukaii*, another nest mound-making ant, is found. In Europe, strict host specificity of *Thiasophila* to *Formica* species has been confirmed (Zerche, in prep.). *Formica yessensis* and *F. fukaii* are relatively distantly related (belonging to different species groups). Therefore, it is highly likely that additional, new *Thiasophila* species associated with *F. fukaii* may be found if large nest mounds suitable for *Thiasophila* are examined. However, *F. fukaii* also prefers cool temperature and is becoming rarer in Japan, again probably due to warming temperatures. Although small colonies with low mounds are still sometimes found, large nest mounds, which were commonly observed until 20-30 years ago, are now infrequently encountered, especially in Central Honshû. Although scarce, exploring these large nest mounds of *F. fukaii* is necessary to determine the existence of additional Japanese *Thiasophila* species.

Etymology. Named after *Shinano*, an old name of Nagano-ken where the type locality is situated.

Key to the Japanese Species of *Thiasophila*

1. Body small, less than 2.5 mm. Antennal segments VI wider than long. Posterolateral corner of pronotum produced posteriorly. Symbiotic host: *Lasius* (*Dendrolasius*) sp. ..... *T. nipponica*
-. Body medium-sized to large, more than 3.0 mm. Antennal segment VI as long as wide, or longer than wide. Postero-lateral corner of pronotum rounded. Symbiotic host: *Formica* spp. ..... 2.
2. Pronotum reddish brown, same as elytra in color. Fore

body length 1.3-1.4 mm. Symbiotic host: *Formica truncorum*. Distribution: Hokkaidô. ..... *T. aynumosir*

-. Pronotum blackish brown, darker than elytra. Fore body length 1.1-1.2 mm. Symbiotic host: *Formica yessensis*. Distribution: Central Honshû. .... *T. shinanonis*

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