

Notes on the *Stenelmis hisamatsui* species group in Japan, with description of a new species from Kume-jima, Ryukyu Islands (Coleoptera: Elmidae)

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Abstract

The Japanese species of the *Stenelmis hisamatsui* species group (Coleoptera: Elmidae) are reviewed. A new species of this group is described from Kume-jima, Ryukyu Islands, Japan. A key to the Japanese species of the *Stenelmis hisamatsui* species group is provided.

Key words: Coleoptera, Elmidae, *Stenelmis*, *Stenelmis hisamatsui* species group, taxonomy, Japan, Ryukyu Islands.

Introduction

The genus *Stenelmis* DUFOUR, 1835 is the largest and most widespread genus in the family Elmidae. This genus has 175 species throughout the world except in the Australian and Neotropical Regions (JÄCH et al. 2016).

The *Stenelmis hisamatsui* species group was proposed by JENG & YANG (1991). At present it contains the following seven species: *S. aritai* SATÔ, 1964, *S. hisamatsui* SATÔ, 1960, *S. ishiharai* SATÔ, 1964, *S. nipponica* NOMURA, 1958 (Japan), *S. formosana* JENG & YANG, 1991, *S. wongi* JENG & YANG, 1991 (Taiwan), and *S. metatibialis* DELÈVE, 1968 (Vietnam).

Recently, HAYASHI et al. (2016a) discussed the Japanese species of *Stenelmis* and some related genera from the standpoint of larval morphological characters and molecular phylogeny. According to these authors the *Stenelmis hisamatsui* species group is a monophyletic unit.

In this paper, we describe a new species of the *Stenelmis hisamatsui* species group from Kume-jima, Ryukyu Islands, Japan.

Material and methods

Specimens was examined with a stereoscopic microscope (Olympus SZH10), a biological microscope (Olympus BX51, Nikon OPTIPHOT–2) and a scanning electron microscope (SEM; HITACHI. TM3030Plus). The SEM material was sputter coated with gold. The genitalia were cleaned in 10% KOH solution for about one hour at 60°C in an automatic oven (AS ONE, ON–450). The cleaned parts were mounted on slides with Gum-chloral medium. After observation, some genitalia were remounted in Canada balsam.

Abbreviations:

EL	elytral length along the suture from base of scutellum to elytral apices
EW	maximum width of elytra
PL	pronotal length along midline in dorsal view
PW	maximum width of pronotum
TL	total length of PL and EL

Type specimens and the material examined are deposited in the following collections:

CKN	collection of Yuuki Kamite, Nagoya, Japan
EMEC	Essig Museum of Entomology, University of California, Berkeley, California, USA
EUMJ	Ehime University Museum, Matsuyama, Japan
JNC	collection of Jun Nakajima, Dazaifu, Japan
NMW	Naturhistorisches Museum Wien, Vienna, Austria

The terminology generally follows KODADA et al. (2016). The mean of the measurements is indicated in parenthesis after the ranges.

Key to Japanese species of the *Stenelmis hisamatsui* species group

- 1 Body larger, TL 2.80–3.09 mm. Phallobase sparsely pubescent in dorsal view (Fig. 38). Honshu, Shikoku, Kyushu, Tsushima Islands *nipponica*
- Body smaller, TL 2.18–2.71 mm. Phallobase densely pubescent in dorsal view (Figs. 34–37). Ryukyu Islands 2
- 2 Apex of prosternal process emarginate (Fig. 30). Penis stout, apex truncate (Fig. 35). Iriomote-jima Island, Yonaguni-jima Island *aritai*
- Apex of prosternal process rounded (Figs. 29, 31–32). Penis slender, apex rounded (Figs. 34, 36–37)..... 3
- 3 Body slender (Fig. 3). Eyes large (Fig. 16). Femora and tibiae slender. Amami-Ōshima Island, Tokuno-shima Island, Okinoerabu-jima Island, Okinawa-jima Island, Theya-jima Island, Tokashiki-jima Island *hisamatsui*
- Body stout (Figs. 1, 4). Eyes smaller (Figs. 14, 17). Femora and tibiae relatively stout..... 4
- 4 Body strongly granulate. Femora and tibiae clearly stout (Fig. 4). Ishigaki-jima Island, Iriomote-jima Island *ishiharai*
- Body weakly granulate. Femora and tibiae less stout (Fig. 1). Kume-jima Island..... *hikidai*

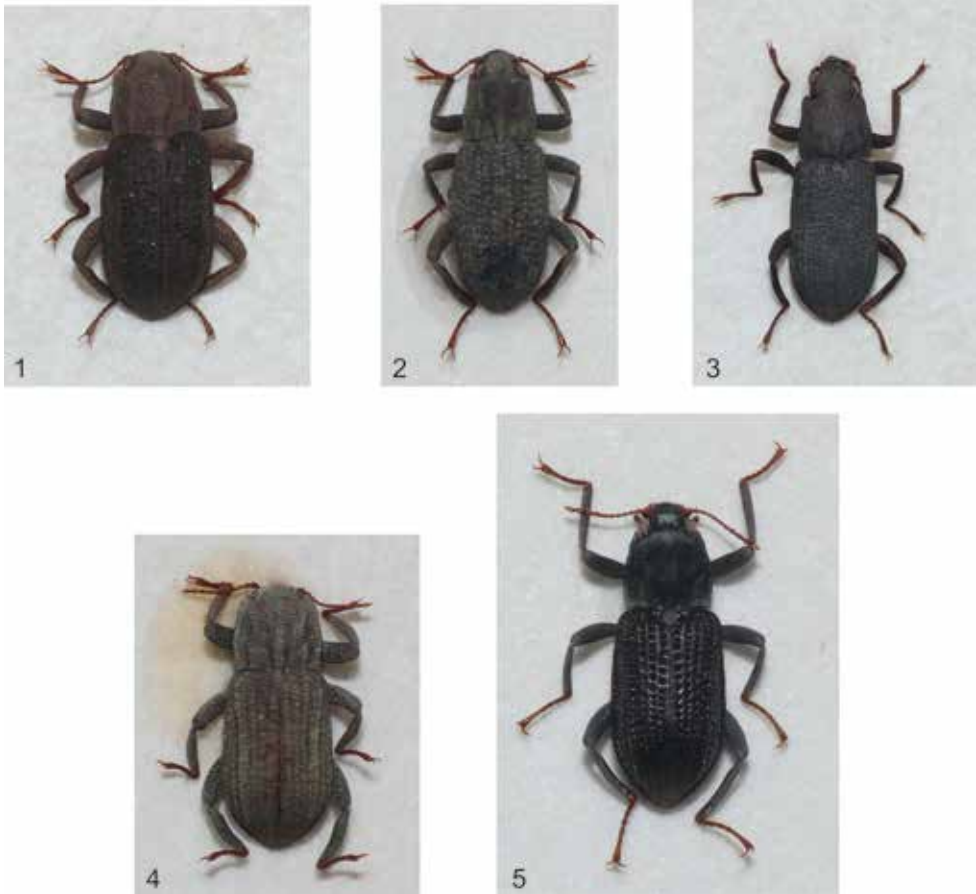
Stenelmis hikidai sp.n.

[Japanese name: Kume-jima-ashinaga-mizo-doromushi]
(Figs. 1, 6–14, 19, 24, 29, 34, 39, 40, 45; Tab. 1)

TYPE MATERIAL: **JAPAN: OKINAWA PREF.: Holotype** ♂ (EUMJ): “*KUMEJIMA JPN*, Shirase-gawa, Kanegusuku, Kumejima-chō, 22.II.2016, Y. Kamite leg.”. **Paratypes**: 6 exs. (CKN, EMEC, NMW): same data as for the holotype; 8 exs. (CKN): “*KUMEJIMA JPN*, Kanegusuku, Kumejima-chō, 20. V. 2007, Y. Kamite leg.”; 2 exs. (CKN): “*KUMEJIMA JPN*, Suhara-gawa, Kumejima-chō, 21. V. 2007, Y. Kamite leg.”; 11 exs. (CKN): “*KUMEJIMA JPN*, Gima, Kumejima-chō, 20. V. 2007, Y. Kamite leg.”; 1 ex. (CKN): “*OKINAWA JPN*, Suhara, Nakazato-Vil., Kumejima Is., 9. III. 2003, Y. Kamite leg.”; 1 ex. (CKN): “*OKINAWA JPN*, Oota, Gushikawa-Vil., Kumejima Is., 10. III. 2003, Y. Kamite leg.”; 18 exs. (CKN, JNC): “*KUMEJIMA JPN*, Shirase-gawa, Kumejima-chō, 7. III. 2005, J. Nakajima leg.”; 3 exs. (CKN): “*KUMEJIMA JPN*, Kumejima Sub Base, JASDF, Kumejima-chō, 20. II. 2016, Y. Kamite leg.”; 5 exs. (CKN, EMEC, NMW): “*KUMEJIMA JPN*, Suhara-gawa, Kumejima-chō, 21. II. 2016, Y. Kamite leg.”; 10 exs. (CKN): “*KUMEJIMA JPN*, Ōta, Kumejima-chō, 19. II. 2016, Y. Kamite leg.”.

DESCRIPTION: Coloration of body reddish brown to blackish brown, but antennae, mouth parts and tarsi yellowish brown to reddish brown.

Head almost flat on dorsal surface, punctate, granulate and pubescent. Eyes small (Fig. 14); the distance between eyes about 2.07 times as long as the maximum diameter of an eye. Antennae as illustrated (Fig. 6); antennomeres 1 and 2 stout; antennomeres 3–7 slender and subequal length; antennomeres 8–10 with some setae at antero-lateral corners; antennomere 11 with some setae at apical part. Mandible with three apical teeth (Fig. 7). Clypeus transverse, broadly emarginate antero-medially, about 2.68 times as wide as maximum length (Fig. 14). Labrum transverse, about 1.92 times as wide as long (Fig. 8).



Figs. 1–5: Habitus photographs of the species of the *Stenelmis hisamatsui* species group, males; 1) *S. hikidai*, holotype; 2) *S. aritai*, Yonaguni-jima Is. Okinawa Pref.; 3) *S. hisamatsui*, Amami-Ōshima Is., Kagoshima Pref.; 4) *S. ishiharai*, Ishigaki-jima Is., Okinawa Pref.; 5) *S. nipponica*, Shikke, Gifu Pref., Honshu.

Pronotum transverse, moderately convex; each side slightly sinuate, broadest at basal 1/3 and narrowest at apical 2/5; lateral margin slightly serrate; with granules and pubescence; with shallow median longitudinal impression; sublateral carinae distinct, sinuate, extending from base to apical 1/8; with prescutellar pits; antero-lateral corners produced anteriorly (Fig. 19). Scutellum suboval, sparsely granulate and pubescent (Fig. 9).

Elytra elongate oval; moderately convex; broadest at apical 1/3, each side subparallel anteriorly and gradually narrowed posteriorly; lateral margin serrate; intervals with granules and pubescence; slightly convex but 6th interval somewhat strongly convex; with large and deep punctures; punctate striae vague.

Prosternum as illustrated (Fig. 29); prosternal process expanded posteriorly and apex rounded. Legs with granules and pubescence except for tarsi; tarsi reticulate; femora and tibiae slightly stout; hind tibiae of males dilated at basal 1/3, with serial denticulations on inner side (Fig. 10). Apex of abdominal ventrite 5 slightly emarginate and with spinulate setae (Fig. 12).

Tab. 1: Measurement data (in mm) and ratios of *Stenelmis hisamatsui* species group.
N = number of specimens examined. Mean values in brackets.

	<i>Stenelmis hikidai</i>		<i>Stenelmis aritai</i>		<i>Stenelmis hisamatsui</i>	
	♂ (N = 5)	♀ (N = 5)	♂ (N = 5)	♀ (N = 5)	♂ (N = 5)	♀ (N = 5)
TL (mm)	2.31–2.38 (2.34)	2.37–2.49 (2.44)	2.36–2.51 (2.44)	2.55–2.71 (2.64)	2.18–2.31 (2.23)	2.25–2.48 (2.36)
PL (mm)	0.65–0.68 (0.67)	0.67–0.73 (0.70)	0.67–0.73 (0.70)	0.72–0.75 (0.73)	0.58–0.66 (0.61)	0.64–0.68 (0.66)
PW (mm)	0.79–0.82 (0.81)	0.79–0.87 (0.84)	0.70–0.75 (0.74)	0.76–0.83 (0.80)	0.67–0.76 (0.72)	0.73–0.78 (0.75)
EL (mm)	1.66–1.70 (1.68)	1.69–1.80 (1.74)	1.69–1.80 (1.74)	1.83–1.96 (1.91)	1.59–1.70 (1.62)	1.61–1.82 (1.70)
EW (mm)	0.97–1.06 (1.00)	1.02–1.07 (1.03)	0.92–0.99 (0.96)	0.98–1.05 (1.02)	0.83–0.89 (0.86)	0.83–0.92 (0.88)
PW/PL	1.21–1.22 (1.22)	1.15–1.24 (1.20)	1.00–1.07 (1.05)	1.04–1.14 (1.08)	1.09–1.25 (1.18)	1.09–1.18 (1.14)
EL/EW	1.60–1.72 (1.67)	1.61–1.76 (1.69)	1.77–1.84 (1.82)	1.81–1.94 (1.87)	1.84–1.92 (1.88)	1.89–1.99 (1.94)
EL/PL	2.47–2.57 (2.52)	2.41–2.69 (2.50)	2.36–2.54 (2.48)	2.51–2.66 (2.60)	2.42–2.79 (2.65)	2.44–2.76 (2.57)
EW/PW	1.20–1.29 (1.24)	1.21–1.29 (1.23)	1.28–1.32 (1.30)	1.25–1.32 (1.28)	1.17–1.24 (1.20)	1.14–1.21 (1.17)
TL/EW	2.25–2.39 (2.33)	2.27–2.44 (2.37)	2.49–2.61 (2.56)	2.52–2.67 (2.59)	2.53–2.64 (2.59)	2.65–2.74 (2.69)

	<i>Stenelmis ishiharai</i>		<i>Stenelmis nipponica</i>	
	♂ (N = 5)	♀ (N = 5)	♂ (N = 5)	♀ (N = 5)
TL (mm)	2.25–2.42 (2.32)	2.37–2.51 (2.43)	2.80–2.99 (2.92)	2.86–3.09 (2.97)
PL (mm)	0.67–0.72 (0.69)	0.71–0.72 (0.71)	0.74–0.84 (0.79)	0.79–0.89 (0.84)
PW (mm)	0.79–0.84 (0.82)	0.83–0.87 (0.85)	0.91–0.96 (0.93)	0.93–1.02 (0.98)
EL (mm)	1.57–1.71 (1.63)	1.66–1.79 (1.71)	2.02–2.21 (2.13)	2.07–2.20 (2.13)
EW (mm)	0.93–1.02 (0.99)	0.98–1.06 (1.01)	1.17–1.22 (1.20)	1.16–1.27 (1.21)
PW/PL	1.10–1.22 (1.18)	1.17–1.21 (1.19)	1.12–1.26 (1.18)	1.14–1.23 (1.17)
EL/EW	1.60–1.69 (1.65)	1.67–1.74 (1.70)	1.71–1.83 (1.77)	1.73–1.81 (1.76)
EL/PL	2.18–2.46 (2.35)	2.34–2.49 (2.40)	2.50–2.99 (2.68)	2.47–2.66 (2.54)
EW/PW	1.18–1.23 (1.21)	1.17–1.22 (1.19)	1.27–1.30 (1.29)	1.20–1.26 (1.24)
TL/EW	2.30–2.46 (2.35)	2.37–2.47 (2.40)	2.37–2.50 (2.44)	2.43–2.49 (2.46)

Aedeagus as illustrated (Fig. 34); phallobase pubescent in dorsal and ventral view; penis about 1.10 times as long as phallobase, dilated at base, gradually narrowed to basal 1/2, gradually dilated at apical 1/2 and apical part round; parameres slender, about 1.04 times as long as penis,

gradually narrowed to basal 1/2, gradually dilated at apical 1/2, each paramere with pubescent projection at apical 1/6 in dorsal view.

Females. Body somewhat larger. Hind tibiae not dilated and without serial denticulations. Ovipositor as illustrated (Fig. 13).

DISTRIBUTION: Japan (Kume-jima Is.).

BIOLOGICAL NOTES: The main habitat of this species is the middle of the watershed where they are abundant on small rocks and in the gravel of riffles.

ETYMOLOGY: The specific name is dedicated to Mr. Naoyuki Hikida who provided much useful advice in this study.

DIFFERENTIAL DIAGNOSIS: This new species differs from the other Japanese species in the combination of the following characteristics: body relatively small, weakly granulate; eyes small (Fig. 14); apex of prosternal process rounded (Fig. 29); femora and tibiae slightly stout; phallobase densely pubescent in dorsal view; penis slender, apex rounded (Fig. 34); found only on Kume-jima Island.

Notes on the other species of the *Stenelmis hisamatsui* species group

Stenelmis aritai SATÔ, 1964

(Figs. 2, 15, 20, 25, 30, 35, 39, 41, 47; Tab. 1)

Stenelmis aritai SATÔ 1964a: 32; SATÔ 1965: 79; SATÔ 1977: 1; SATÔ 1985: 434, pl. 79, fig. 23; JENG & YANG 1991: 239 (key to species), 251; SATÔ 1992: 149; SATÔ 2003: 459 (key to species); HAYASHI & KAMITE 2015: 111 (larva); HAYASHI et al. 2016a: 464 (larva); JÄCH & KODADA 2016: 599; JÄCH et al. 2016: 204.

TYPE LOCALITY: Tabaru-gawa River, Yonaguni-jima Island of the Sakishima Islands [= Miyako Islands and Yaeyama Islands].

MATERIAL EXAMINED: **OKINAWA PREF.: Iriomote-jima Is.:** 3 exs. (CKN): “*IRIOMOTE JPN*, Aira-gawa, Komi, Taketomi-chô, 3. II. 2011, Y. Kamite leg.”; 6 exs. (CKN): “*IRIOMOTEJIMA JPN*, Aira-gawa, Taketomi-chô, 7. VI. 2014, Y. Kamite leg.”; 1 ex. (CKN): “*IRIOMOTE JPN*, Shirahama, Taketomi-chô, 5. II. 2011, Y. Kamite leg.”; 2 exs. (CKN): “[RYÛKYÛ: Japan] Riv. Aira, Taketomi-chô, 29. IV. 2003, T. Kurihara leg.”; 9 exs. (CKN, JNC): “R-Airagawa, Komi, Is. Iriomotejima, Okinawa, 1999. 12. 24, N. Hikida leg.”; 1 ex. (JNC): “JAPAN: RYUKYU, Aira R., Komi, Iriomote-jima Is., Okinawa Pref., 18. V. 2004, J. Nakajima leg.”; 1 ex. (JNC): ditto but: “15. V. 2004, J. Nakajima leg.”; 1 ex. (JNC): ditto but: “10. II. 2004, J. Nakajima leg.”; 1 ex. (JNC): ditto but: “7. II. 2004, J. Nakajima leg.”. **Yonaguni-jima Is.:** 5 exs. (CKN): “*YONAGUNIJIMA JPN*, Tabaru-gawa-suien, Yonaguni-chô, Okinawa Pref., 2. II. 2013, Y. Kamite leg.”; 2 exs. (CKN): “[RYÛKYÛ: Japan] Tabaru, Yonaguni-chô, 26. III. 1999, T. Kurihara leg.”; 1 ex. (CKN): “[YONAGUNI ISL. JAPAN] Tabaru-gawa, Yonaguni-chô, Okinawa Pref., leg. J. FUJIWARA, 3. ix. 2007, *Stenelmis aritai* M. SATÔ Det. J. FUJIWARA 2007”; 1 ex. (CKN): ditto but: “leg. J. FUJIWARA, 5. ix. 2007, *Stenelmis aritai* M. SATÔ Det. J. FUJIWARA 2007”; 6 exs. (JNC): “JAPAN: RYUKYU, Tabaru R., Yonaguni, Yonaguni-jima Is., Okinawa Pref., 3. III. 2004, J. Nakajima leg.”; 3 exs. (JNC): “JAPAN: RYUKYU, Tabaru R., Yonaguni, Yonaguni-jima Is., Okinawa Pref., 30. IV. 2003, N. Shimura leg.”.

DISTRIBUTION: Japan (Yaeyama Is.: Iriomote-jima Is., Yonaguni-jima Is. (type locality)).

BIOLOGICAL NOTES: In Iriomote-jima Is., *S. aritai* mainly appears from late autumn to spring, while *S. ishiharai* mainly appears from spring to summer.

DIFFERENTIAL DIAGNOSIS: This species differs from the other Japanese species in the combination of the following characteristics: body relatively small, weakly granulate; eyes large (Fig. 15); apex of prosternal process emarginate (Fig. 30); femora and tibiae slender; phallobase densely pubescent in dorsal view; penis stout, apex truncate (Fig. 35); distribution confined to Yaeyama Is. (Iriomote-jima Is., Yonaguni-jima Is.).

***Stenelmis hisamatsui* SATÔ, 1960**

(Figs. 3, 16, 21, 26, 31, 36, 39, 42, 46; Tab. 1)

Stenelmis hisamatsui SATÔ 1960: 253; NOMURA 1961: 3; SATÔ 1965: 4; SATÔ 1965: 78; ARITA & SATÔ 1969: 14; SATÔ 1977: 1; SATÔ 1985: 434, pl. 79, fig. 22; JENG & YANG 1991: 239 (key to species), 251; SATÔ 1992: 151, figs. 30A–G; SATÔ & KIMURA 2000: 130; SATÔ 2003: 459 (key to species); NAKAJIMA 2007: 13; HAYASHI 2007a: 11; HAYASHI et al. 2009: 17; INAHATA 2013: 25; HAYASHI et al. 2016a: 459 (larva); JÄCH & KODADA 2016: 600; JÄCH et al. 2016: 214.

TYPE LOCALITY: Shinmura, Amami-Ôshima Island.

MATERIAL EXAMINED: **KAGOSHIMA PREF.: Amami-Ôshima Is.:** 7 exs. (CKN): “*AMAMI JPN*, Kawakami, Kasari-cho, 16. VII. 2006, Y. Kamite leg.”; 1 ex. (CKN): “*AMAMI JPN*, Kinsakubaru, Naze, Amami-shi, 17. VII. 2006, Y. Kamite leg.”; 4 exs. (CKN): “*AMAMI JAPAN*, Akina-gawa, Setouchi-chô, 20.II. 2010, Y. Kamite leg.”; 1 ex. (CKN): “Hatsuno, Sumiyô-son, Amami Ôshima, 21. II. 2010, Y. Kamite leg.”; 1 ex. (CKN): “Hatsuno, Sumiyô-chô, Amami-shi, Amami Ôshima, Light Trap, 17. VII. 2010, H. Torikai and H. Morita leg.”; 7 exs. (JNC): “[Yakugachi-gawa], Kamiyakugachi, Amami-shi, Kagoshima pref., Japan, 18, July, 2006, Y. Kamite leg.”; 2 exs. (JNC): “JAPAN: RYUKYU, Kawauchi R., Kawauchi, Sumiyô, Amami-Oshima Is., Kagoshima Pref., 14. III. 2003, J. Nakajima leg.”. **Tokuno-shima Is.:** 5 exs. (CKN): “*TOKUNOSHIMA*, Itokina, Isen-cho, 11. IX. 2004, Y. Kamite leg.”; 9 exs. (CKN): “*TOKUNOSHIMA*, Asan, Isen-cho, 12. IX. 2004, Y. Kamite leg.”; 4 exs. (CKN): “*TOKUNOSHIMA JPN*, Yaezô, Isen-chô, 26. VIII. 2013, Y. Kamite leg.”; 8 exs. (CKN): “*TOKUNOSHIMA*, Mikyo, Amagi-cho, 12. IX. 2004, Y. Kamite leg.”; 6 exs. (CKN): “*TOKUNOSHIMA*, Kedoku, Tokunoshima-cho, 12. IX. 2004, Y. Kamite leg.”; 7 exs. (CKN): “*TOKUNOSHIMA*, Kametsu, Tokunoshima-cho, 12. IX. 2004, Y. Kamite leg.”; 1 ex. (JNC): “JAPAN: RYUKYU, Akirikami R., Mikyo, Amagi, Tokuno-shima Is., Kagoshima Pref., 30. VII. 2016, J. Nakajima leg.”. **Okinoerabu-jima Is.:** 20 exs. (CKN): “*OKINOERABUJIMA*, Amata-gawa, Saodu, China-chô, Kagoshima Pref., JPN, 8–9. VII. 2012 BLT, Y. Kamite leg.”; 6 exs. (CKN, JNC): “Taniyama, China-chô, Okinoerabu, 28. II. 2010, J. Nakajima leg.”; 1 ex. (CKN): “Amata-gawa-joyôryû, Okinoerabu, 28. II. 2010, T. Kitano leg.”. **OKINAWA PREF.: Okinawa-jima Is.:** 8 exs. (CKN): “*OKINAWA JPN*, Genka-ôkawa, Genka, Nago-shi, 16. V. 2007, Y. Kamite leg.”; 35 exs. (CKN): “*OKINAWA JPN*, Oura-gawa, Okawa, Nago-shi, 18. V. 2007, Y. Kamite leg.”; 1 ex. (CKN): “*OKINAWA JPN*, Ura-gawa, Ura, Kunigami-son, 17. V. 2007, Y. Kamite leg.”; 1 ex. (CKN): “Oku-gawa-shiryû, Oku, Kunigami-son, Okinawajima, 26–VII–2015, Y. Kamite leg.”; 4 exs. (CKN): “*OKINAWA JPN*, Yukasawa, Kunigami-son, 27. VI. 2003, J. Nakajima leg.”; 7 exs. (CKN): “*OKINAWA JPN*, Kin, Kin-Cho, 2. VII. 2003, J. Nakajima leg.”; 2 exs. (JNC): “JAPAN: RYUKYU, Tokuru R., Kunigami, Okinawa-jima Is., Okinawa Pref., 27. VI. 2003, J. Nakajima leg.”; 8 exs. (JNC): “10, Oct., 2003, Okinawa-ken, Nago-shi, Genka-gawa, T. Ogata leg.”; 1 ex. (JNC): “6, May, 2002, Okinawa-ken, Haneji, T. Nobumoto leg.”. **Iheya-jima Is.:** 1 ex. (CKN): “Tanna-take-kita, Iheya-son, Iheyajima, 14–III–2015, Y. Kamite leg.”. **Tokashiki-jima Is.:** 2 exs. (JNC): “JAPAN: RYUKYU, Ishippi R., Aharen, Tokashiki-jima Is., Okinawa Pref., 10. III. 2007, J. Nakajima leg.”.

DISTRIBUTION: Japan (Amami Is.: Amami-Ôshima Is. (type locality), Tokuno-shima Is., Okinoerabu-jima Is.; Okinawa Is.: Okinawa-jima Is., Iheya-jima Is., Tokashiki-jima Is.), Guam.

DIFFERENTIAL DIAGNOSIS: This species differs from the other Japanese species in the combination of the following characteristics: body relatively small and clearly slender, weakly granulate; eyes large (Fig. 16); apex of prosternal process rounded (Fig. 31); femora and tibiae slender; phallobase densely pubescent in dorsal view; penis slender, apex rounded (Fig. 36); widely distributed in the Amami and Okinawa Isls. (except for Kume-jima Is.).

***Stenelmis ishiharai* SATÔ, 1964**

(Figs. 4, 17, 22, 27, 32, 37, 39, 43, 47; Tab. 1)

Stenelmis ishiharai SATÔ 1964a: 31; SATÔ 1965: 79; SATÔ 1977: 2; SATÔ 1985: 434, pl. 79, fig. 21; JENG & YANG 1991: 239 (key to species), 251; SATÔ 1992: 153; SATÔ 2003: 459 (key to species); HAYASHI et al. 2016a: 462 (larva); JÄCH & KODADA 2016: 600; JÄCH et al. 2016: 216.

TYPE LOCALITY: Takeda, Ishigaki-jima Island of the Sakishima Islands [= Miyako Islands and Yaeyama Islands].

MATERIAL EXAMINED: **OKINAWA PREF.: Ishigaki-jima Is.:** 1 ex. (CKN): “*ISHIGAKI JPN*, Banna-kôen, Tonoshiro, Ishigaki-shi, 1. II. 2011, Y. Kamite leg.”; 3 exs. (CKN): “*ISHIGAKI JPN*, Hakusui, Ishigaki-shi, 2. II. 2011, Y. Kamite leg.”; 5 exs. (CKN): “*ISHIGAKI JPN*, Sakieda, Ishigaki-shi, 2. II. 2011, Y. Kamite leg.”; 1 ex. (CKN): “Nishihama-gawa, Nosoko, Ishigaki-shi, Ishigakijima, 5. VI. 2014, Y. Kamite leg.”; 6 exs. (CKN):

“[RYŪKYŪ: Japan] Kaneshiro, Ishigaki-shi, 5. V. 2003, T. Kurihara leg.”; 2 exs. (JNC): “JAPAN: RYUKYU, Shiramizu R., Shiramizu, Ishigaki, Ishigaki-jima Is., Okinawa Pref., 12. VI. 2011, J. Nakajima leg.”. **Iriomote-jima Is.:** 2 exs. (CKN): “OKINAWA JPN, Shirahama (Iriomote), Taketomi Town, 21. X. 2002, Y. Kamite leg.”; 1 ex. (CKN): “IRIOMOTE JPN, Aira-gawa, Taketomi-chō, 7. VI. 2014, Y. Kamite leg.”; 1 ex. (CKN): “[IRIOMOTE ISL. JAPAN] Yuchin-bashi-seihō-no-sairyū, Taketomi-chō, Iriomote, leg. J. FUJIWARA, 8. ix. 2007, *Stenelmis ishiharai* M. SATŌ Det. J. FUJIWARA 2007”; 5 exs. (CKN): “R-Airagawa, Komi, Is. Iriomotejima, Okinawa, 1999. 12. 24, N. Hikida leg.”; 1 ex. (JNC): “JAPAN: RYUKYU, Hinai R., Uehara, Taketomi, Iriomote-jima Is., Okinawa Pref., 9. VI. 2011, J. Nakajima leg.”; 1 ex. (JNC): “JAPAN: RYUKYU, Aira R., Komi, Taketomi, Iriomote-jima Is., Okinawa Pref., 18. V. 2004, J. Nakajima leg.”; 2 exs. (JNC): ditto but: “15. V. 2004, J. Nakajima leg.”; 2 exs. (JNC): ditto but: “8. II. 2004, J. Nakajima leg.”; 1 ex. (JNC): ditto but: “7. II. 2004, J. Nakajima leg.”; 1 ex. (JNC): ditto but: “6. VII. 2003, Y. Kaji leg.”; 1 ex. (JNC): “JAPAN: RYUKYU, Nishifunatsuki R., Otomi, Taketomi, Iriomote-jima Is., Okinawa Pref., 8. II. 2004, J. Nakajima leg.”.

DISTRIBUTION: Japan (Yaeyama Isls.: Ishigaki-jima Is. (type locality), Iriomote-jima Is.).

DIFFERENTIAL DIAGNOSIS: This species differs from the other Japanese species in the combination of the following characteristics: body relatively small, strongly granulate; eyes small (Fig. 17); apex of prosternal process rounded (Fig. 32); femora and tibiae clearly stout; phallobase densely pubescent in dorsal view; penis slender, apex rounded (Fig. 37); distribution confined to Yaeyama Isls. (Ishigaki-jima Is., Iriomote-jima Is.).

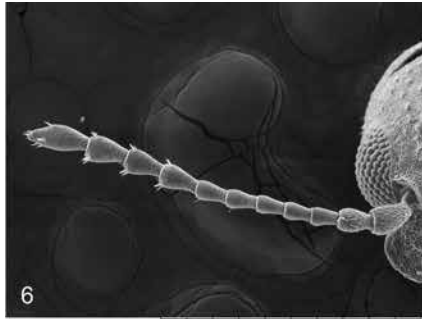
Stenelmis nipponica NOMURA, 1958

(Figs. 5, 18, 23, 28, 33, 38, 44, 48; Tab. 1)

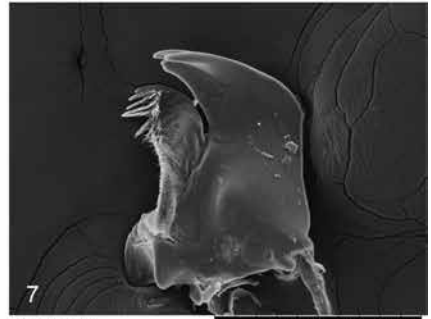
Stenelmis nipponica NOMURA 1958: 41; SATŌ 1977: 2; SATŌ 1985: 434, pl. 79, fig. 24; JENG & YANG 1991: 239 (key to species), 251; SATŌ 1992: 156; YOSHITOMI 1996: 9; YOSHITOMI et al. 1999: 99, photograph 2A; AKIYAMA 2005: 212, pl. 3, fig. 2; HAYASHI & SHIMADA 2006: 129, fig. 6C; OGATA & NAKAJIMA 2006: 229, fig. 2B; HAYASHI 2007b: 91; HAYASHI & KADOWAKI 2007: 163; YOSHIOKA 2007: 241, fig. 17C; AKIYAMA 2008: 116; HAYASHI 2008: 74; HAYASHI & KADOWAKI 2008a: 282, fig. 2H; HAYASHI & KADOWAKI 2008b: 299; HAYASHI et al. 2008: 49; YAMAJI 2008: 9; YOSHIOKA 2008: 224; FUJIWARA 2009: 52; HAYASHI 2009: 241; HAYASHI & KADOWAKI 2010: 174; HAYASHI 2011a: 100, fig. 46D; HAYASHI 2011b: 82; HAYASHI & KADOWAKI 2011: 121; HAYASHI et al. 2011: 35; HAYASHI et al. 2012: 74; HAYASHI & KADOWAKI 2013: 69, fig. 7P; JUNG et al. 2015: 107; MIYAKE & TSUTSUMIUCHI 2015: 12, fig. 2A; HAYASHI et al. 2016a: 459 (larva); HAYASHI et al. 2016b: 95; INAHATA 2016: 6; JÄCH & KODADA 2016: 601; JÄCH et al. 2016: 220.

TYPE LOCALITY: Matsuyama, Ehime Pref.

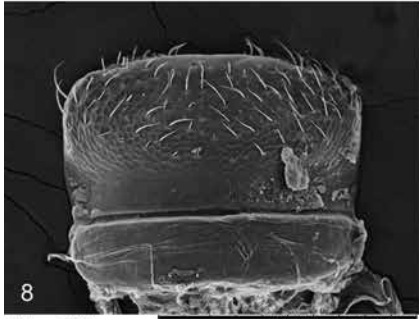
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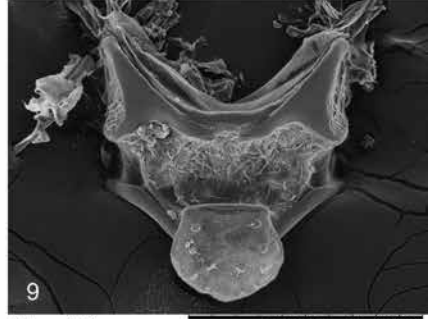
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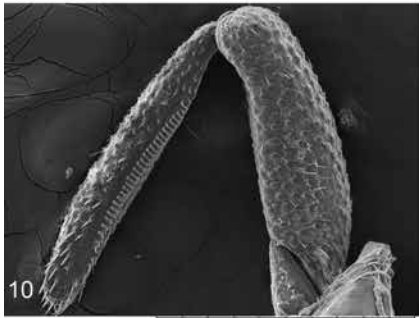
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Miniscope0055 NMUD5.3 x400 200 µm



8
Miniscope0057 NMUD5.5 x500 200 µm



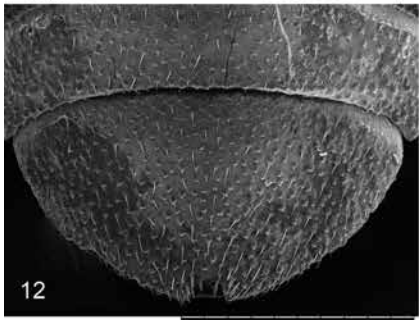
9
Miniscope0059 NMUD5.6 x300 300 µm



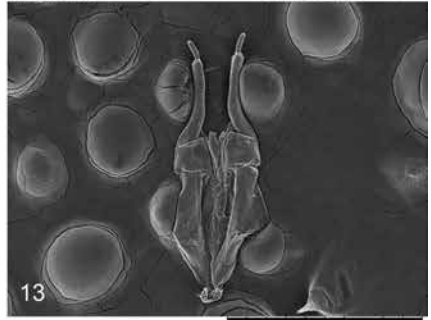
10
Miniscope0094 NMUD5.2 x200 500 µm



11
Miniscope0053 NMUD4.9 x100 1 mm



12
Miniscope0054 NMUD5.1 x300 300 µm



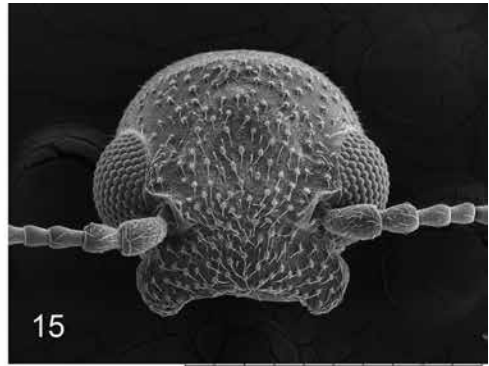
13
Miniscope0097 NMUD4.8 x150 500 µm

Figs. 6–13: *Stenelmis hikidai*, 6–12) male, 13) female; 6) antenna; 7) mandible; 8) labrum; 9) mesonotum; 10) femur and tibia of hind leg; 11) abdomen, ventral view; 12) abdominal ventrite 5; 13) ovipositor.



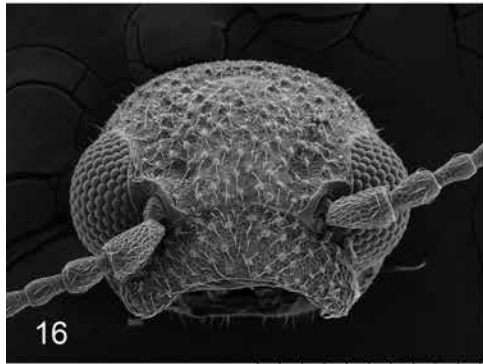
Miniscope0084

NMUD4.6 x200 500 µm



Miniscope0075

NMUD4.7 x200 500 µm



Miniscope0065

NMUD5.3 x250 300 µm



Miniscope0070

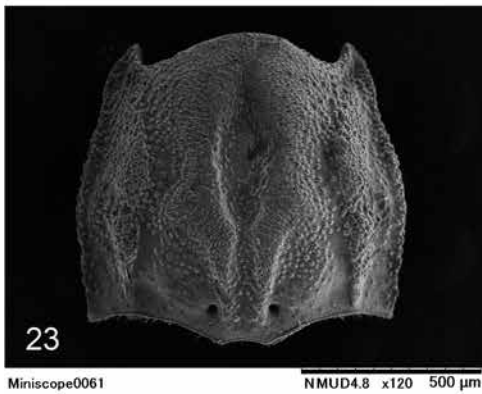
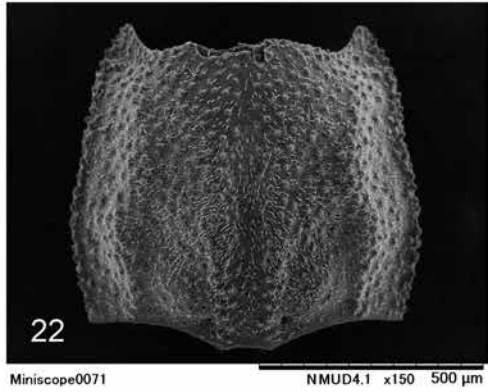
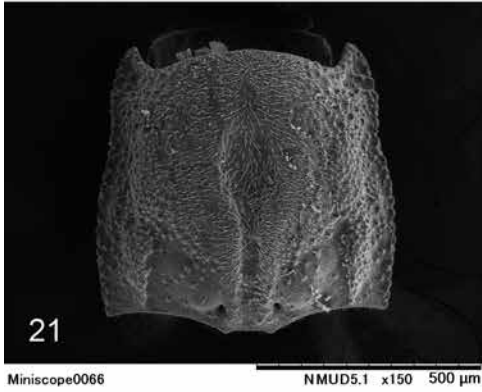
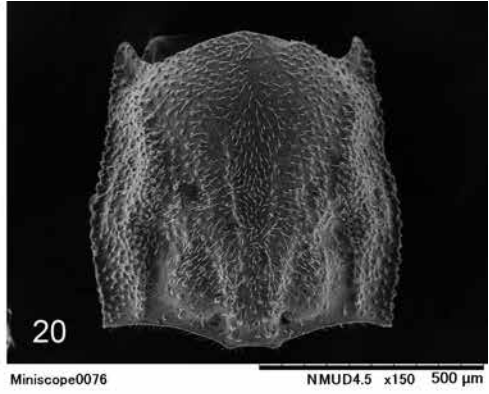
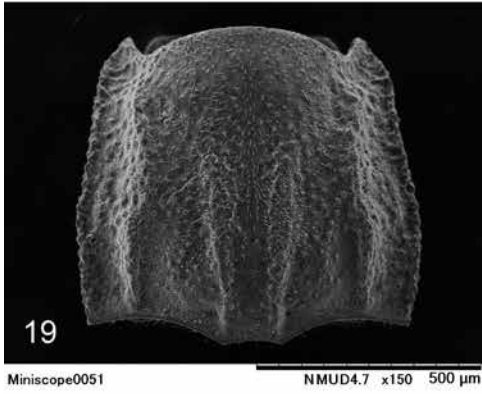
NMUD4.1 x250 300 µm



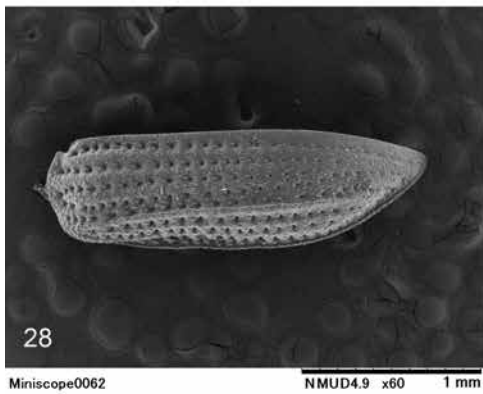
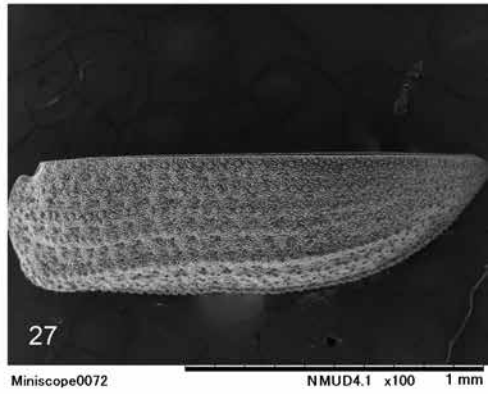
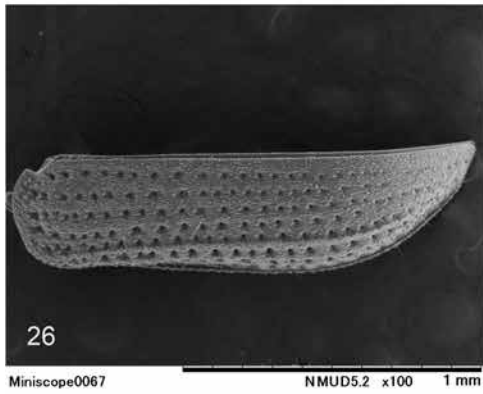
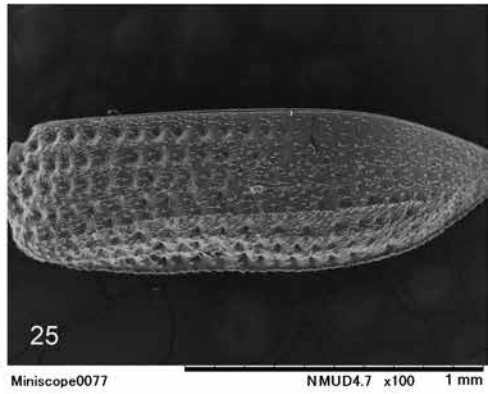
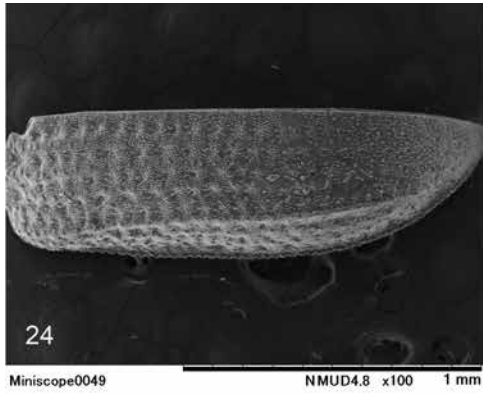
Miniscope0060

NMUD4.9 x200 500 µm

Figs. 14–18: Heads of *Stenelmis hisamatsui* species group, males, frontal view; 14) *S. hikidai*; 15) *S. aritai*, Yonaguni-jima, Is. Okinawa Pref.; 16) *S. hisamatsui*, Amami-Ōshima Is., Kagoshima Pref.; 17) *S. ishiharai*, Ishigaki-jima Is., Okinawa Pref.; 18) *S. nipponica*, Shikke, Gifu Pref., Honshu.



Figs. 19–23: Pronota of *Stenelmis hisamatsui* species group, males; 19) *S. hikidai*; 20) *S. aritai*, Yonaguni-jima Is., Okinawa Pref.; 21) *S. hisamatsui*, Amami-Ōshima Is., Kagoshima Pref.; 22) *S. ishiharai*, Ishigaki-jima Is., Okinawa Pref.; 23) *S. nipponica*, Shikke, Gifu Pref., Honshu.

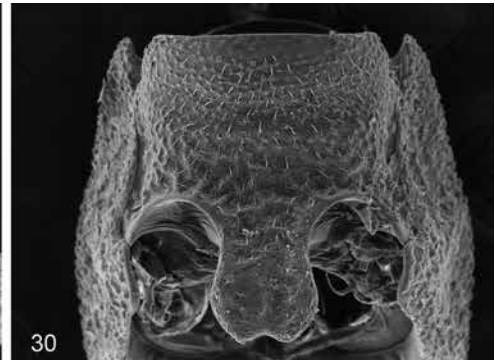


Figs. 24–28: Left elytra of *Stenelmis hisamatsui* species group, males; 24) *S. hikidai*; 25) *S. aritai*, Yonaguni-jima Is., Okinawa Pref.; 26) *S. hisamatsui*, Amami-Ōshima Is., Kagoshima Pref.; 27) *S. ishiharai*, Ishigaki-jima Is., Okinawa Pref.; 28) *S. nipponica*, Shikke, Gifu Pref., Honshu.



Miniscope0104

NMUD4.1 x180 500 µm



Miniscope0105

NMUD4.1 x180 500 µm



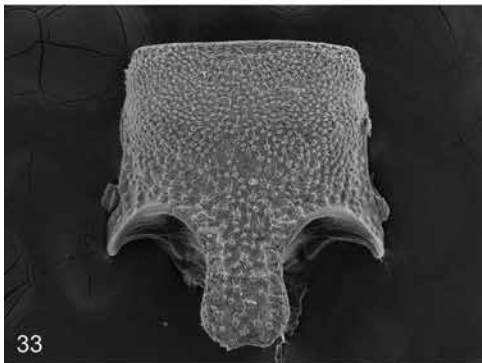
Miniscope0118

NMUD4.8 x200 500 µm



Miniscope0108

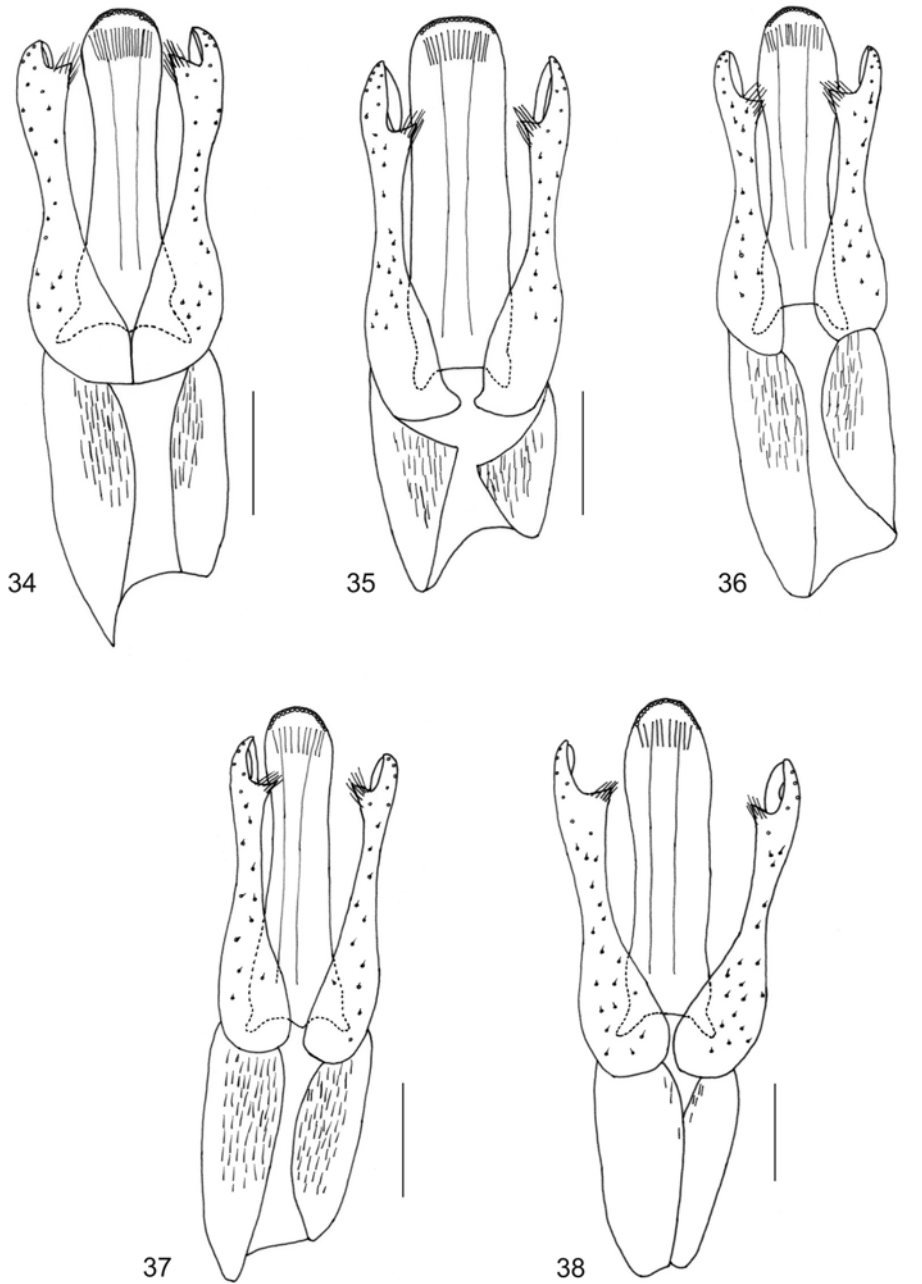
NMUD4.3 x180 500 µm



Miniscope0109

NMUD4.3 x150 500 µm

Figs. 29–33: Prosterna of *Stenelmis hisamatsui* species group, males; 29) *S. hikidai*; 30) *S. aritai*, Iriomote-jima Is., Okinawa Pref.; 31) *S. hisamatsui*, Amami-Ōshima Is., Kagoshima Pref.; 32) *S. ishiharai*, Ishigaki-jima Is., Okinawa Pref.; 33) *S. nipponica*, Shikke, Gifu Pref., Honshu.



Figs. 34–38: Aedeagi of *Stenelmis hisamatsui* species group, dorsal view; 34) *S. hikidai*; 35) *S. aritai*, Iriomote-jima Is., Okinawa Pref.; 36) *S. hisamatsui*, Amami-Ōshima Is., Kagoshima Pref.; 37) *S. ishiharai*, Ishigaki-jima Is., Okinawa Pref.; 38) *S. nipponica*, Shikke, Gifu Pref., Honshu. Scales: 100 μm .

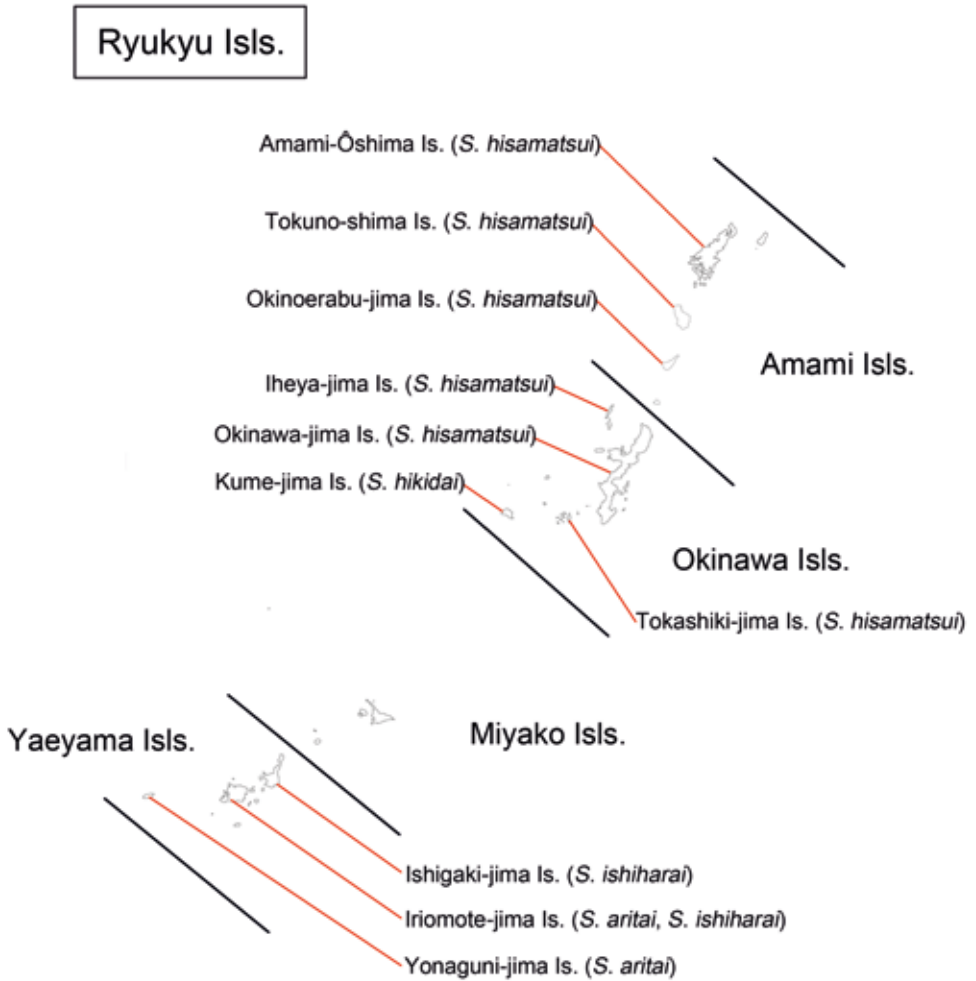


Fig. 39: Geographical distribution of the Ryukyuan species of the *Stenelmis hisamatsui* species group.



Figs. 40–44: Habitus photographs of living specimens of the *Stenelmis hisamatsui* species group; 40) *S. hikidai*; 41) *S. aritai*, Yonaguni-jima Is., Okinawa Pref.; 42) *S. hisamatsui*, Okinoerabu-jima Is., Kagoshima Pref.; 43) *S. ishiharai*, Ishigaki-jima Is., Okinawa Pref.; 44) *S. nipponica*, Minokamo-shi, Gifu Pref., Honshu. Photographs by Y. Kamite (40, 44) and J. Nakajima (41–43).



Figs. 45–46: Habitats of two species of the *Stenelmis hisamatsui* species group; 45) Shirase-gawa, Kumejima Is., Okinawa Pref., type locality of *S. hikidai*; 46) Amata-gawa, Okinoerabu-jima Is., Kagoshima Pref., locality of *S. hisamatsui*. Photographs by Y. Kamite.



Figs. 47–48: Habitats of three species of the *Stenelmis hisamatsui* species group; 47) Aira-gawa, Iriomote-jima Is., Okinawa Pref., locality of *S. aritai* and *S. ishiharai*; 48) Iwatake-gawa, Fukuoka Pref., locality of *S. nipponica*. Photographs by Y. Kamite (47) and J. Nakajima (48).

DISTRIBUTION: Japan (Honshu, Shikoku (type locality), Kyushu, Tsushima Isls.), North Korea, South Korea.

DIFFERENTIAL DIAGNOSIS: This species differs from the other Japanese species in the combination of the following characteristics: body relatively large, weakly granulate; eyes large (Fig. 18); apex of prosternal process emarginate (Fig. 33); femora and tibiae slender; phallobase sparsely covered with setae dorsally; penis slender, apex rounded (Fig. 38); widely distributed in Japan (Honshu, Shikoku, Kyushu, Tsushima Isls.), but not found in the Ryukyu Isls.

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We thank to Mr. Naoyuki Hikida (Mito) who offered many interesting specimens and provided much useful advice in this study. We would also like to thank the Japan Air Self-Defense Force, Kumejima Sub Base for permitting the first author's collecting in the site and Mr. Hashimoto, who guided the first author in the site. We thank Dr. William D. Shepard (EMEC) and Dr. Manfred A. Jäch (NMW) for reading the manuscript. Thanks are also due to Mr. Masaru Aoyagi, Mr. Toshiya Ikeda, Mr. Hirofumi Fujimoto, Mr. Jun'ichi Fujiwara, Dr. Masakazu Hayashi, Mr. Itsurô Kawashima, Mr. Keisuke Kawano, Dr. Tadashi Kitano, Dr. Takashi Kurihara, Mr. Masato Mori, the late Mr. Takeshi Ogata, Mr. Noriyoshi Shimura, Mr. Hisahiro Torikai, Mr. Hiroaki Yokoi and Dr. Hiroyuki Yoshitomi for their help in various ways. Finally, hearty thanks are due to first author's wife Nami Kamite, who has continuously supported the field work of her husband in Japan.

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World Catalogue of Insects. Volume 14

Coleoptera: Elmidae, Protelmidae

The world catalogue of the families Elmidae and Protelmidae (Coleoptera) contains a complete list of subfamilies, tribes, subtribes, genera, subgenera, species and subspecies, and their synonyms described before 2015.

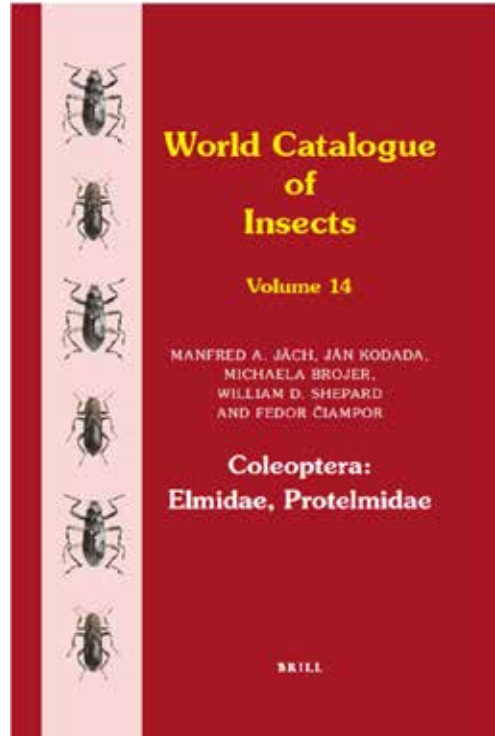
Protelmidae are elevated from tribal rank to family rank. Other new nomenclatorial and taxonomic acts include a new substitute name, seven new generic and specific synonymies, four new combinations, two designations of type species and seven mandatory corrections of incorrect original spellings.

Detailed information about the geographical distribution of each species is provided. The catalogue includes extant taxa (147 genera and 1498 species of Elmidae, four genera and six species of Protelmidae) as well as fossil taxa (two nominal genera and six species of Elmidae).

It is the first world catalogue of Elmidae published since 1910.

Unavailable names are also listed. Detailed explanations are provided concerning the availability and spelling of taxa names, identity and spelling of author names, publication dates, and type localities.

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