

The *Arge jonasi* species group (Hymenoptera, Argidae)

Hideho Hara¹ and Akihiko Shinohara²

¹Forestry Research Institute, Hokkaido Research Organization,
Bibai, Hokkaido 079–0198, Japan
E-mail: hara-hideho@hro.or.jp

²Department of Zoology, National Museum of Nature and Science,
4–1–1 Amakubo, Tsukuba, Ibaraki 305–0005, Japan
E-mail: shinohar@kahaku.go.jp

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Abstract The *Arge jonasi* species group (Hymenoptera, Argidae) is proposed for the following three species from Japan and Korea: *A. jonasi* (Kirby, 1882) from Japan (Hokkaido, Honshu, Shikoku and Kyushu) and Korea, *A. aciculata* Hara and Shinohara, n. sp. from Japan (Honshu), and *A. impolita* Hara and Shinohara, n. sp. from Japan (Hokkaido, Honshu and Shikoku). This species group is characterized by the very wide harpe and the apically non-pigmented valviceps in the male genitalia. Descriptions of these species are given. *Sorbus commixta* Hedl. (Rosaceae) is a new host plant record for *A. jonasi*.

Key words: Hymenoptera, Argidae, *Arge jonasi*, *Arge aciculata*, *Arge impolita*, new species, East Asia.

Introduction

Arge jonasi (Kirby, 1882) (Hymenoptera, Argidae) is a well-known sawfly species in Japan, but its specific characters have not been described in detail. Japanese authors have often misidentified other species with *A. jonasi* (see Hara and Shinohara, 2006, 2012b; Hara *et al.*, 2007; Shinohara and Hara, 2008). Hara *et al.* (2007) gave a key to distinguish this species from two other similar-looking species, *A. solowiyofka* (Matsamura, 1911) and *A. kobayashii* Takeuchi, 1931. However, we have recently noticed an undescribed species indistinguishable from *A. jonasi* or *A. kobayashii* by the key. We have also discovered another undescribed species closely related to *A. jonasi*. In this paper, we redescribe *A. jonasi*, describe the two new species, and propose to treat them as composing a species group, the *A. jonasi* group.

Materials and Methods

The material used in this study is kept in the National Museum of Nature and Science, Tsukuba (NSMT), unless otherwise indicated. Abbreviations for the other depositories are: BMNH=The Natural History Museum, London; EU=Ehime University, Matsuyama; HSC=H. Suda Collection, Sakura; HU=Hokkaido University, Sapporo; KU=Kobe University, Kobe; MNHAH=Museum of Nature and Human Activities, Hyogo, Sanda; MYC=M. Yamada Collection, Kuroishi; OMNH=Osaka Museum of Natural History, Osaka; OPU=Osaka Prefecture University, Sakai; USNM=National Museum of Natural History, Washington, D. C.

Observations of morphology were made with a Leica MS5 stereo binocular microscope and an Olympus BH light microscope. Measurements of each structure were taken with an ocular micrometer. Photographs were taken with digital cameras, Nikon E990, Panasonic DMC-FZ730, SONY DSC-RX100 and Ricoh Caplio GX100,

Keyence Digital Microscope VHX-900, and AnMo Electronics Dinolite digital microscope mounted to BH light microscope. The digital images were processed and arranged with Adobe Photoshop Elements 7.0 ® software.

Rearings were done in a room without air-conditioning in Bibai by Hara. The temperature and light there were almost the same as in open-air conditions, but the hibernating individuals were moved in March or April into an air-conditioned room, where the temperature was about 10–25°C.

For the morphological terminology, we followed Viitasaari (2002).

Results and Discussion

Arge jonasi species group

Female and male. Distance between eyes 1.2–1.3×vertical diameter of eye (Fig. 2A–F). Eye with vertical diameter 1.6–1.8×horizontal diameter. Postocellar area moderately convex, with anterior margin shallowly or sometimes deeply furrowed (Fig. 3); lateral furrow indistinct, sometimes anteriorly sharp. Frontal area anteriorly with median furrow or concavity continuing to frontal pit. Distance between frontal pit and median ocellus about 2.0×width of median ocellus. Interantennal carinae dorsally separated from each other, fused with lateral ridges of frontal area. Supraclypeal area medially rounded or weakly carinate (Fig. 2A–F). Clypeus dorsally and medially widely or narrowly convex, ventrolaterally narrowly or widely flattened, with ventral margin roundly incised medially. Right mandible without notch on inner margin (Fig. 4N).

In fore wing, cell 1Rs2 with anterior length 1.0–1.1×posterior length (Fig. 1); crossvein 3r-m roundly or somewhat angularly curved. In both wings, margin between veins Rs and Cu glabrous, with marginal glabrous area about 1.5×width of vein M, and setae near apical wing margin shorter than or about as long as width of vein M (Fig. 4O).

In female abdomen (Fig. 5A, C, E), second to

fourth terga glabrous except for narrow setose lateral parts; fifth tergum medially widely glabrous, sometimes with sparse minute setae, laterally setose; sixth and more posterior terga setose. Seventh sternum with posterior margin roundly convex medially or nearly straight. Ovipositor sheath (Fig. 6) in posterodorsal view robust, with lateral margin concave near apex, sometimes straight; basal median lobe small; inner side spinose. Lance (Figs. 7A–C, 8A–B, 9A–B) with apical crest distinct and finely serrate on dorsal margin, dorsally with several very narrow membranous areas at middle or without membranous areas, and with groups of very minute or inconspicuous setae at intervals along ventral margin at middle (Fig. 7C). Lancet (Figs. 7D–H, 8C–G, 9C–H) with ventral margin rounded midapically, distinctly serrate throughout or except for apical part, dorsally membranous and setose at intervals, apically with narrow non-annulated area; marginal sensillae long; longitudinal row of minute setae (=ctenidium) absent before first annulus, very rarely rudimentary row present.

In male abdomen (Fig. 5B, D, F), second to fourth terga glabrous, laterally narrowly setose; fifth and more posterior terga setose; setae on wide medial part of fifth and medial parts of sixth to seventh or eighth minute or short. Subgenital plate with posterior margin in ventral view rounded or nearly truncate apically. In male genitalia (Fig. 10), basiparamere in ventral view widened apically, with apical width about 2.0× basal width of harpe. Harpe in ventral view with inner margin very strongly roundly convex. Valviceps not pigmented narrowly at apex, in dorsal view roundly convex basally and nearly triangularly convex near apex, in lateral view with triangular dorsal projection near apex, basally with low ventral lobe (part shown as vl in Fig. 10L), and with very small dorsal apodemal projection (dap in Fig. 10L).

Larva and cocoon. Described under *A. jonasi*.

Remarks. The species of the *A. jonasi* group are characterized by the very wide harpe and the presence of the non-pigmented area at the apex of the valviceps (Fig. 10). These characters are

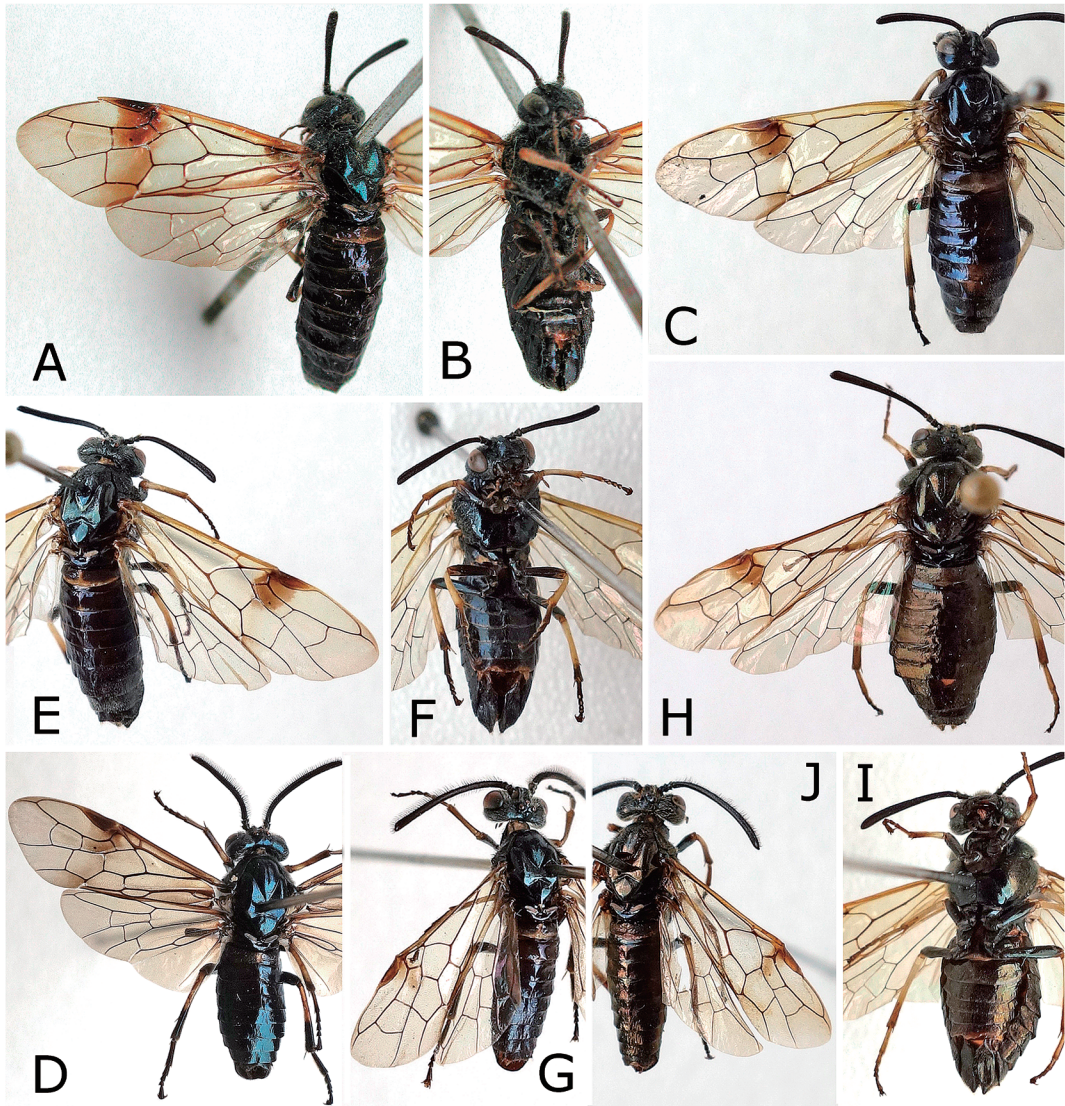


Fig. 1. *Arge jonasi* (A–C, female; D, male), *A. aciculata* (E–F, female; G, male) and *A. impolita* (H–I, female; J, male). — A, C–E, G–H, J, Dorsolateral or dorsal view; B, F, I, ventrolateral view. A–B, Lectotype of *Hylo toma japonica*; C, Asahikawa; D, Yokohama; E–F, Hino; G, holotype; H–I, holotype; J, Niihama.

probably unique to the species group in the Argidae (cf. Smith, 1989, 1992; Hara and Shinohara, 2006, 2008a, b, 2012a, b, 2013; Hara *et al.*, 2012; Shinohara and Hara, 2008, 2009, 2010, 2012, 2013; Shinohara *et al.*, 2008, 2009, 2011, 2012) and support the monophyly of the species group.

The members of the *A. jonasi* group will be recognized by the combination of the following

features in addition to the characteristic male genitalia: Black, with distinct blue metallic or bronze reflection (Fig. 1); setae on mesepisternum whitish; antenna wholly black; coxae to femora black, except for apices of fore and middle femora brownish; hind tibia basally yellowish white, darkened apically; wings yellowish, brownish or clear hyaline, with dark spot or band below stigma (sometimes inconspicuous in

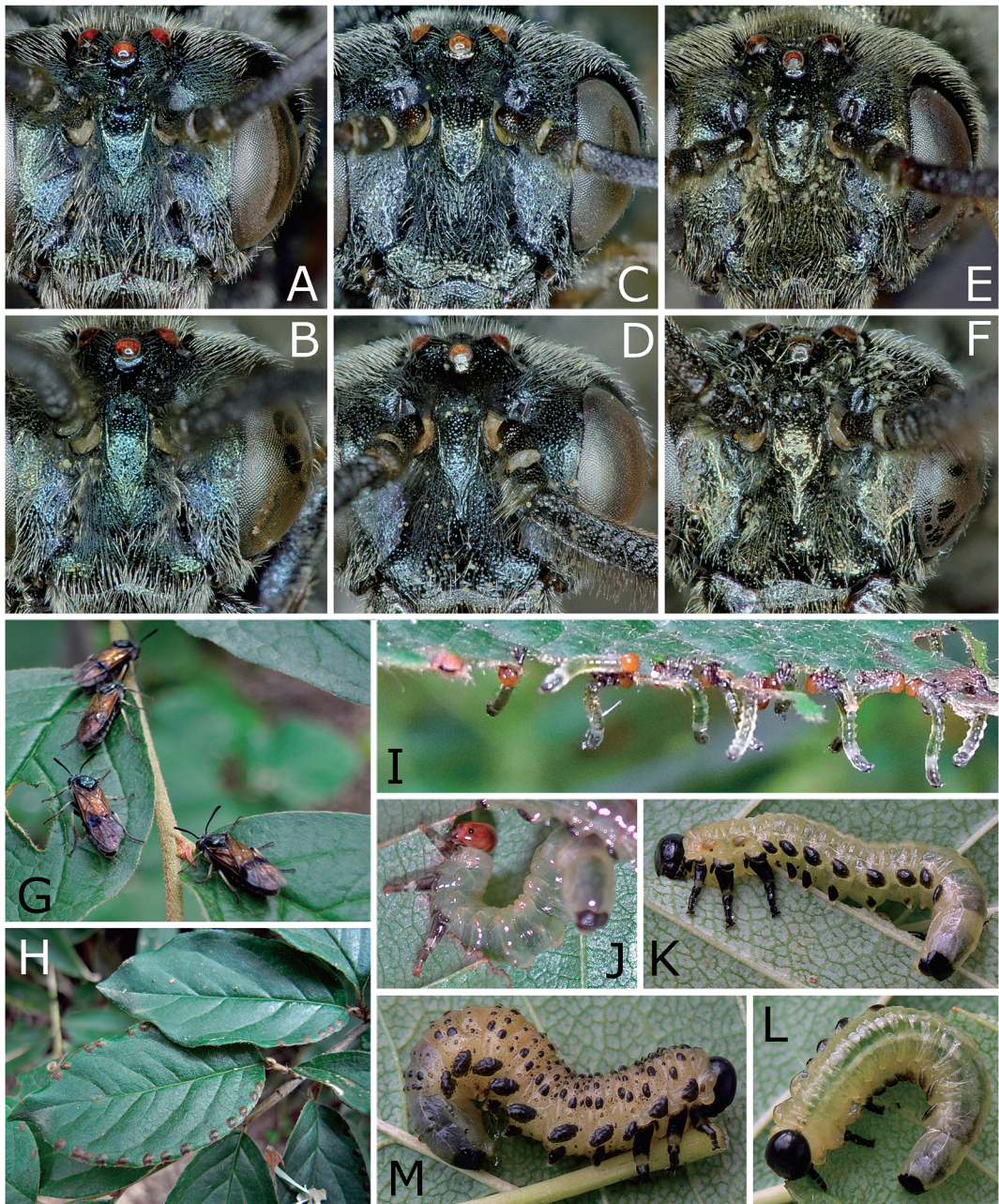


Fig. 2. A–F, Head, anterior view: *Arge jonasi* (A, female; B, male), *A. aciculata* (C, female; D, male) and *A. impolita* (E, female; F, male); G–M, *A. jonasi* (G, females on *Cotoneaster* sp.; H, eggs on *C. sp.*; I, early instar larvae on *C. sp.*; J, middle instar larva on *Aria alnifolia*; K–L, semifinal instar larva on *Crataegus chlorosarca*; M, final instar larva on *C. chlorosarca*). — A, Sapporo; B, Sapporo; C, Hino; D, holotype; E, holotype; F, Kai-zuka; G, Sapporo, 21 June 2009; H, do., 27 June 2008; I, do., 6 July 2010; J, Bibai, 27 July 2003 (HH030720B); K–L, Bibai, 31 July 2007 (HH070730A); M, do., 7 August 2007. G–I photographed by A. Shinohara, J–M by H. Hara.

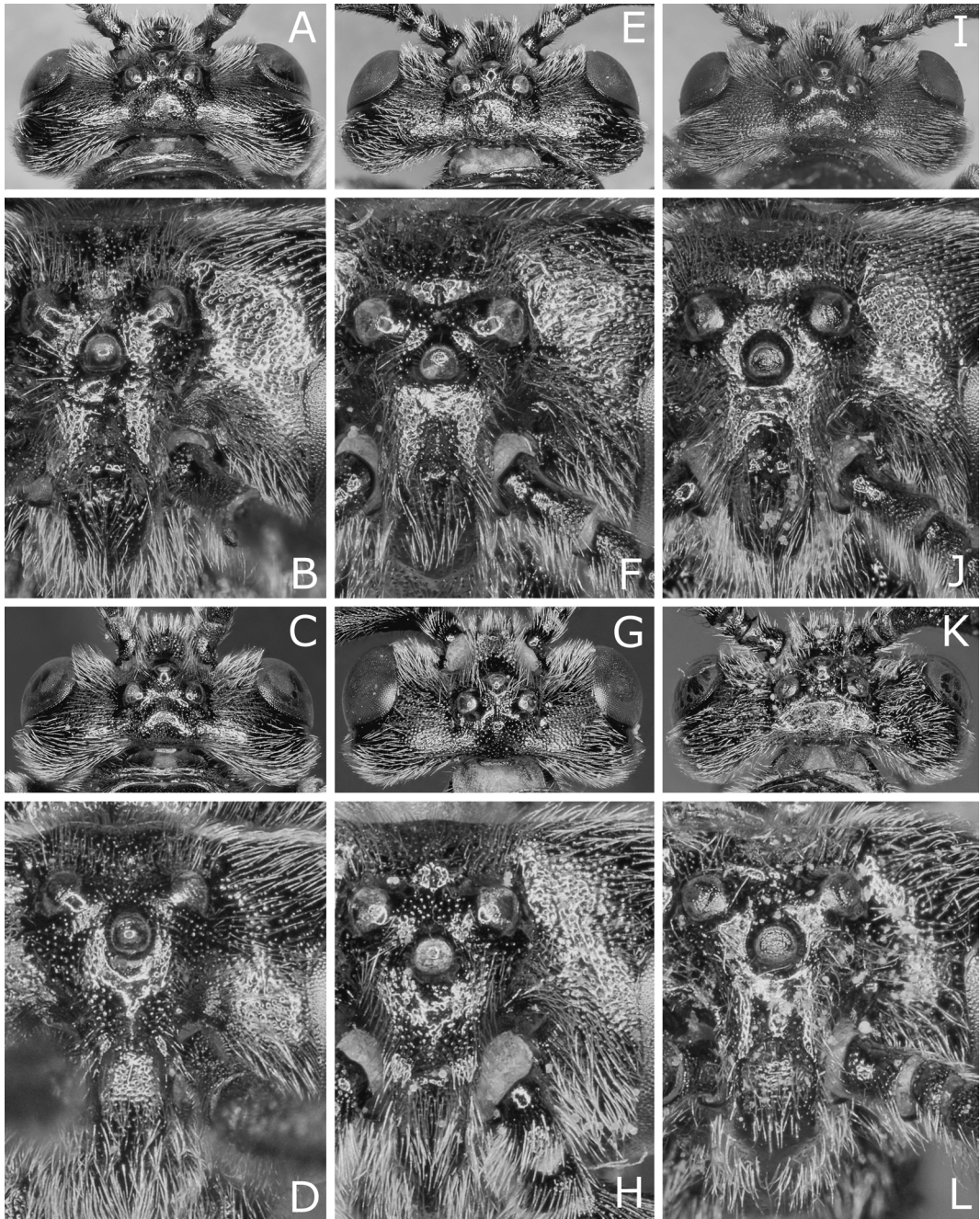


Fig. 3. Head, dorsal and anterodorsal view: *Arge jonasi* (A–B, female; C–D, male), *A. aciculata* (E–F, female; G–H, male) and *A. impolita* (I–J, female; K–L, male). — A–B, Sapporo; C–D, Sapporo; E–F, Hino; G–H, holotype; I–J, holotype; K–L, Kaizuka.

male); veins C and Sc of fore wing yellow (sometimes brown in male) throughout, distinctly paler than vein R; frontal area not or slightly raised

anteriorly (sometimes distinctly raised anteriorly in male) (Fig. 4M); interantennal carinae dorsally separated from each other (Fig. 3B, F, J, D, H,

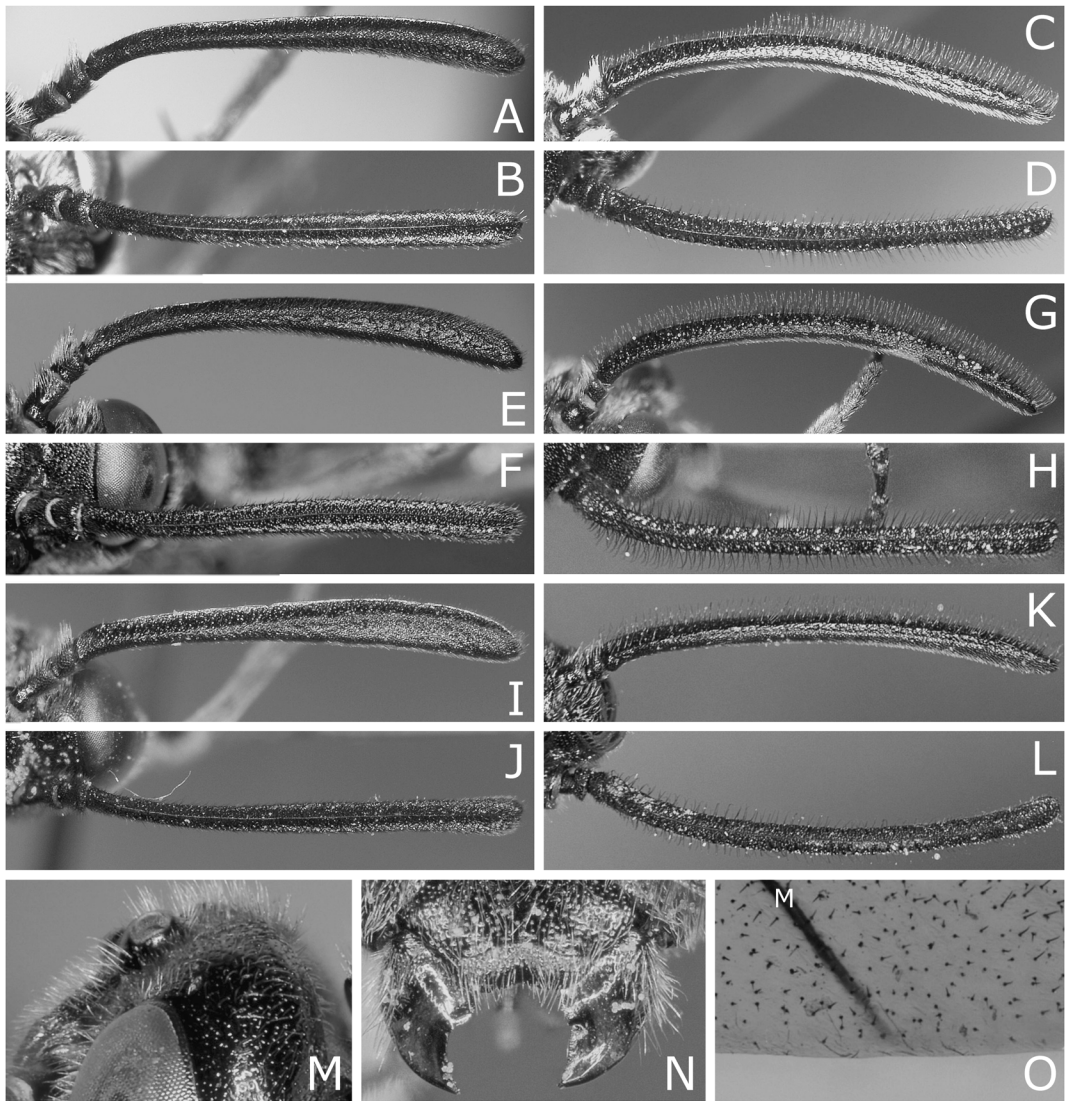


Fig. 4. A–L, Antenna, lateral and ventral view: *Arge jonasi* (A–B, female; C–D, male), *A. aciculata* (E–F, female; G–H, male) and *A. impolita* (I–J, female; K–L, male); M, dorsal part of head, lateral view, *A. aciculata*, male; N, mouth part, anterior view, *A. aciculata*, male; O, fore wing around apex of vein M, dorsal view, *A. impolita*, female (small M showing vein M). — A–B, Sapporo; C–D, Kawanishi; E–F, Hino; G–H, M–N, holotype; I–J, O, holotype; K–L, Kaizuka.

L); supraclypeal area medially rounded or bluntly carinate (Fig. 2A–F); wing margins glabrous, not ciliate (Fig. 4O); lance with membranous areas very narrow or absent (Figs. 7A–B, 8A–B, 9A–B).

Arge solowiyofka and *A. kobayashii* resemble *A. jonasi* (see Hara *et al.*, 2007). However, those two species do not belong to the *A. jonasi* group,

because their males have the narrower harpe and the wholly pigmented valvices.

Smith (1989) divided *Arge* into four species groups, *A. ochropa* group, *A. humeralis* group, *A. pectoralis* group and *A. clavicornis* group. The *A. jonasi* group has much in common with the *A. clavicornis* group in general appearance and in having the wide basiparamere in the male genital-

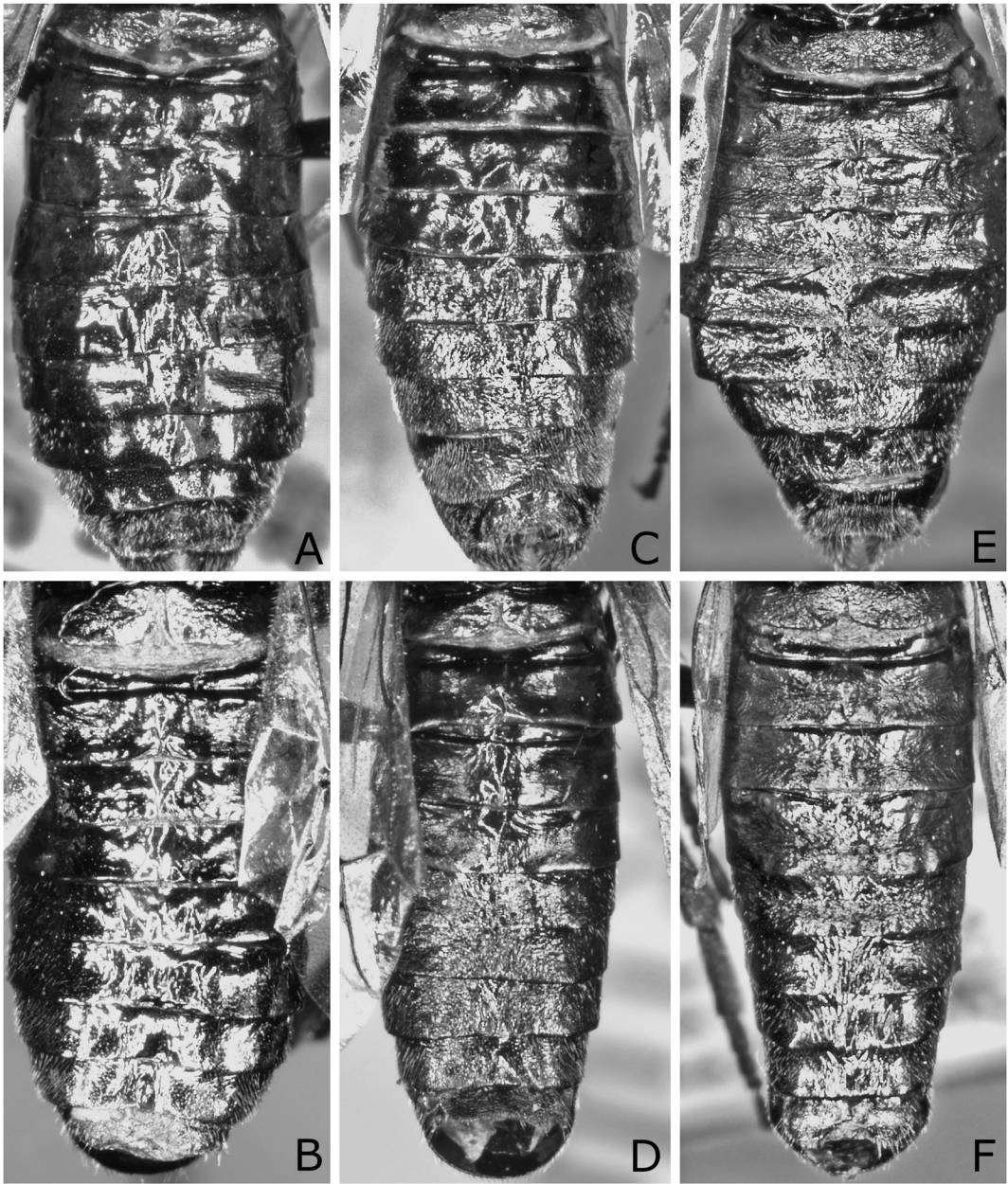


Fig. 5. Abdomen, dorsal view: *Arge jonasi* (A, female; B, male), *A. aciculata* (C, female; D, male) and *A. impolita* (E, female; F, male). — A, Niihama; B, Kawanishi; C, Hino; D, holotype; E, holotype; F, Niihama.

lia. Their larvae are also similar in having the seventh abdominal segment with a pair of prolegs and the tenth abdominal tergum with a squared posterior margin in dorsal view. However, the males of the *A. clavicornis* group have a narrower harpe and an entirely pigmented valviceps with a

large horizontal lateral lobe at apex, and the larvae have a flat antenna (see Smith, 1989).

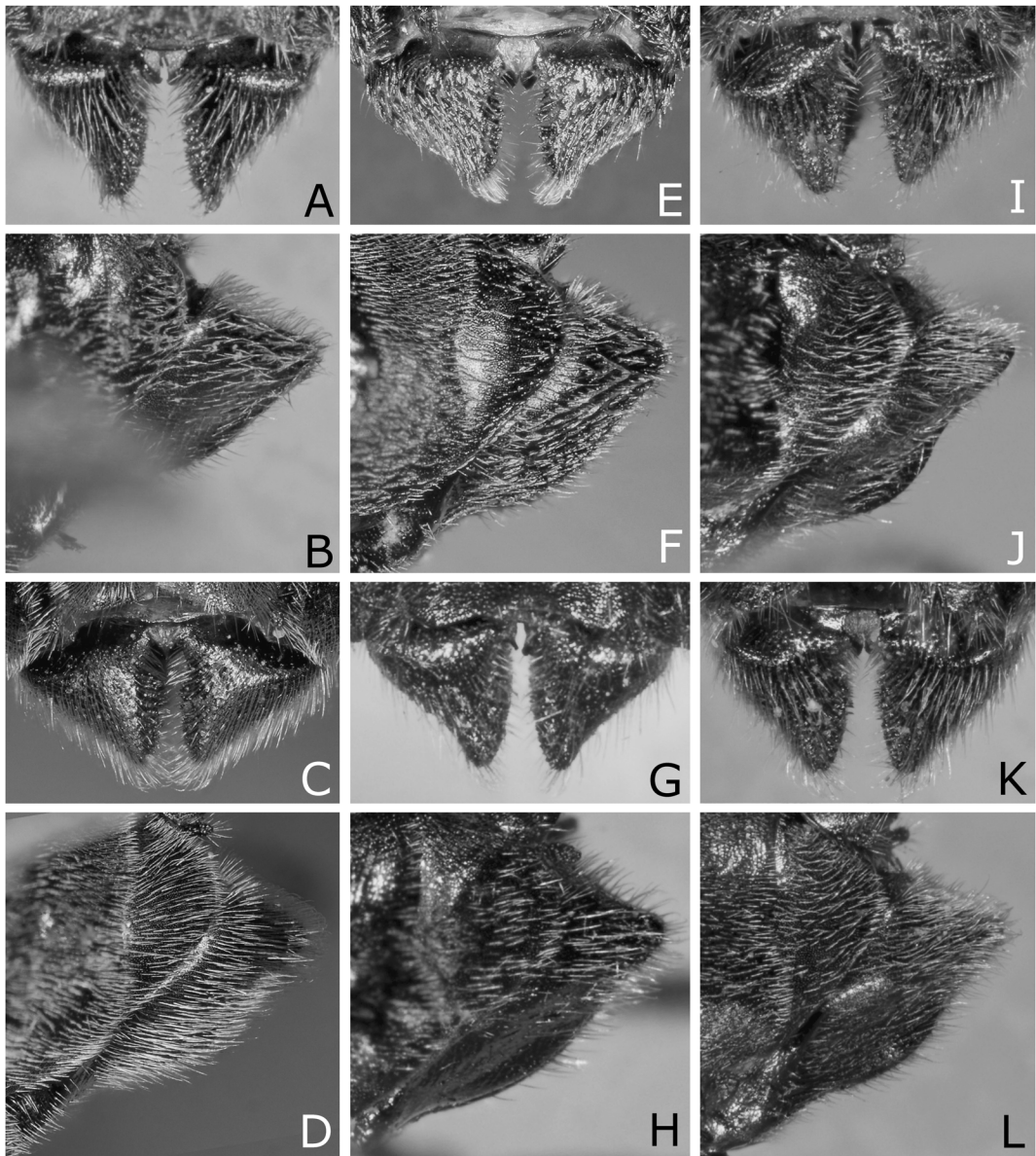


Fig. 6. Ovipositor sheath, posterodorsal and lateral view: A–D, *Arge jonasi*; E–H, *A. aciculata*; I–L, *A. impolita*. — A–B, Niihama; C–D, Sapporo; E–F, Hino; G–H, Otsuki; I–J, holotype; K–L, Mizunami. B, Reversed.

***Arge jonasi* (Kirby, 1882)**

[Japanese name: Unmon-chûrenji]

(Figs. 1A–D, 2A–B, G–M, 3A–D, 4A–D, 5A–B, 6A–D, 7, 10A–F, 11)

Hylotoma nigratarsis Smith, 1874: 374 [primary homonym of *Hylotoma nigratarsis* Klug, 1834=*Arge melanochroa* (Gmelin, 1790)]; Matsumura, 1912: 34; Matsumura, 1931: 85; Matsumura, 1932: 35; Shinohara

and Hara, 2007: 128.

Hylotoma jonasi Kirby, 1882: 61 [replacement name for *Hylotoma nigratarsis* Smith, 1874]; Nakagawa, 1899: 201; Nakagawa, 1902: 90; Shinohara and Hara, 2007: 131.

Hylotoma jonasi: Dalla Torre, 1894: 336.

Hylotoma japonica Marlatt, 1898: 504 [part]; Hara *et al.*, 2012: 141.

Arge japonica: Konow, 1905: 19; Rohwer, 1910: 118.

Arge jonasi: Konow, 1905: 19; Konow, 1905–1908: 188;

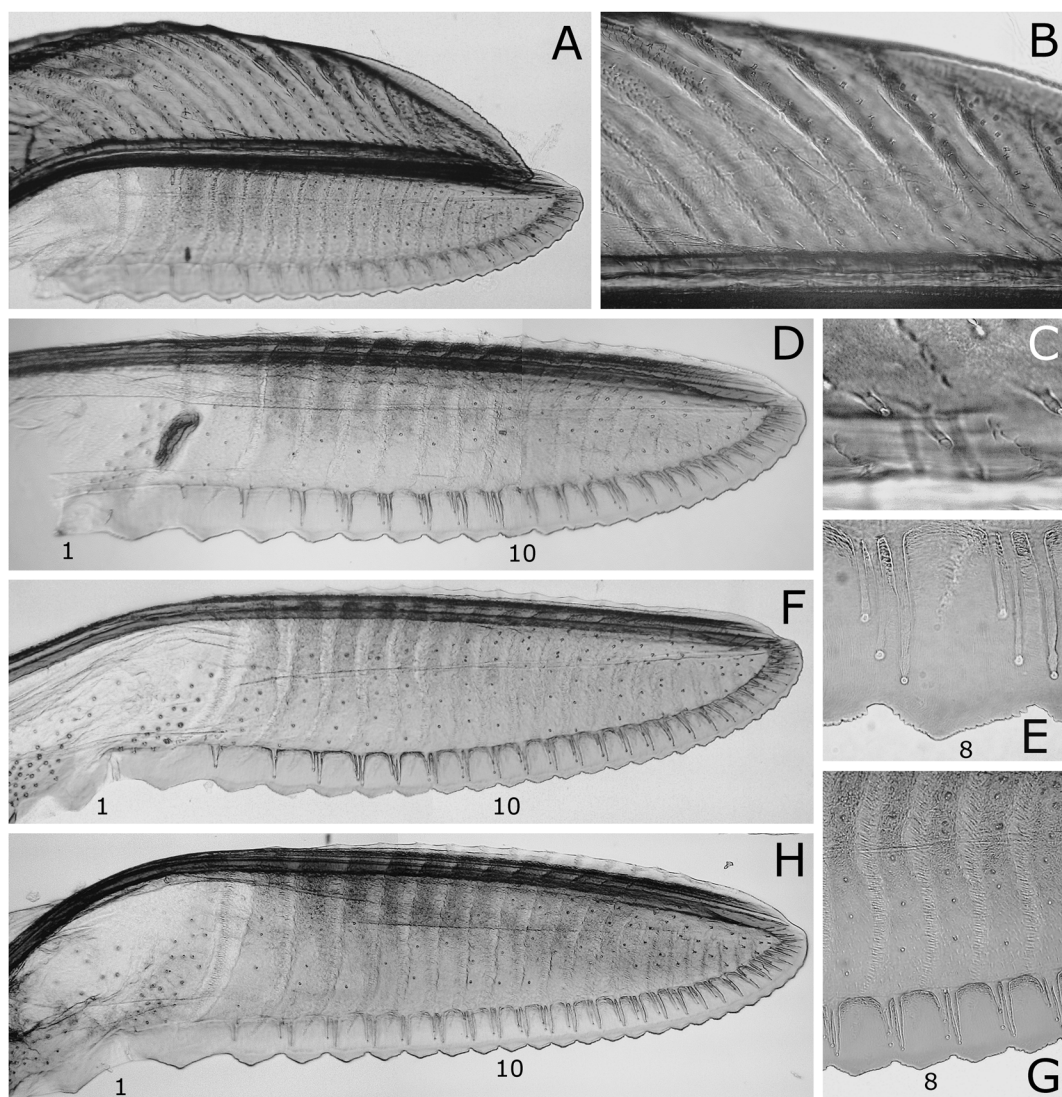


Fig. 7. Ovipositor of *Arge jonasi*: A, Lance, lateral view; B, middle part of lance, lateral view; C, do., along ventral margin; D, F, H, lancet; E, eighth serrula; G, middle part of lancet. — A–B, D–E, Lectotype of *Hylotoma japonica*; C, Niihama; F–G, Shimashima-dani; H, Suwon. D–E, Reversed.

Takeuchi, 1932: 37 [part]; Yano, 1932: 465; Gussakovskij, 1935: 284, 408, 426; Takeuchi, 1936: 164; Takeuchi, 1939: 408; Takeuchi, 1949: 50; Takeuchi, 1950: 1360; Okutani, 1954: 76; Takeuchi, 1955: 128, pls. 57, 889; Kim, 1963: 279; Togashi, 1965d: 254; Okutani, 1967: 46; Kim, 1970: 718; Okutani, 1973: 23; Okutani, 1977: 295; Abe and Togashi, 1989: 543; Togashi, 1998a: 253; Takahashi and Shiraishi, 1998: 3; Takahashi and Shiraishi, 2003: 3; Naito *et al.*, 2004: 11 [part]; Yoshida, 2006: 24; Hara *et al.*, 2007: 88; Lelej and Taeger, 2007: 943; Togashi, 2008: 501; Yoshida, 2009: 22; Yoshida, 2010: 21; Hara, 2010: 57; Taeger

et al., 2010: 131; Lelej, 2012: 64.

Arge jonasii: Rohwer, 1910: 118; Takeuchi, 1919: 188.

Arge (Hylotoma) nigratarsis: Matsumura, 1915: 259.

Hylotoma (Arge) nigratarsis: Matsumura, 1930: 70.

Female (Fig. 1A–C). Length 10.0–13.0 mm. Black, with metallic blue or greenish-blue reflection; reflection usually metallic violet on basal abdominal terga, brassy on inner orbital area, clypeus and base of mandible (Fig. 2A), often also on frontal area, interantennal area, malar

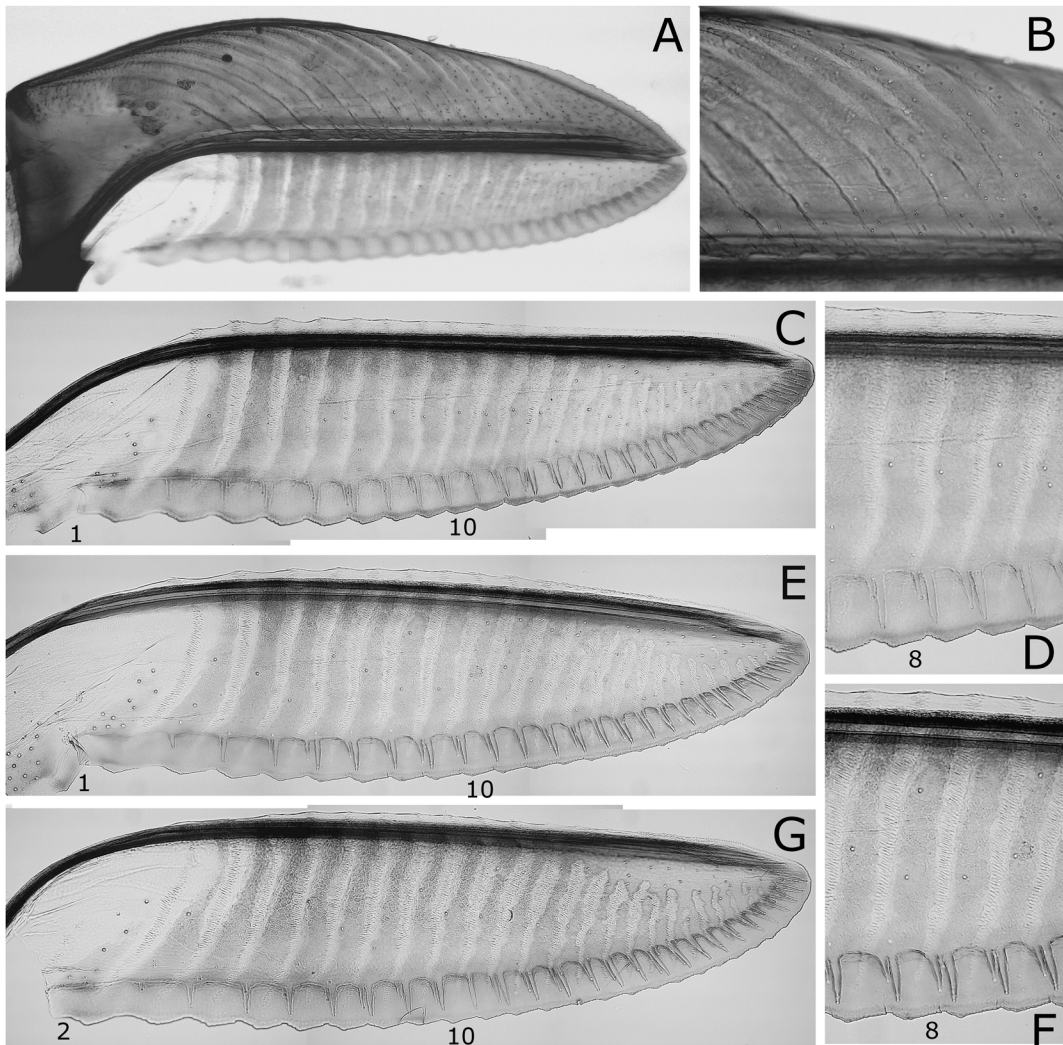


Fig. 8. Ovipositor of *Arge aciculata*: A, Lance, lateral view; B, middle part of lance, lateral view; C, E, G, lancet; D, F, middle part of lancet. — A–D, Hino; E–F, Hakone; G, Kamikochi. C–F, Reversed.

space and labrum; subanal area black, sometimes brown. Flagellum black (rarely dark brown), with colorless reflection. Mandible brown to black, apically reddish brown. Palpi dark brown, basally black. Legs black, with metallic blue reflection on black areas; apices of fore and middle femora brownish; tibiae yellowish white, narrow apices of fore and middle tibiae somewhat darkened and apical third to fourth of hind tibia black; fore tarsus brown, darkened apically; middle and hind tarsi black, brown on first tarsomeres except for apices; hind first tarsomere sometimes black, not

or slightly pale basally; tibial spurs pale yellow to brown; claws apically widely brown. Wings hyaline, yellowish basally and slightly brownish apically on fore wing, and slightly brownish on hind wing, with dark brown band below stigma; this band usually extending to posterior wing margin, becoming pale and narrowing beyond vein M (Fig. 1A), rarely disappearing in cell 2M, but base of cell 3Cu dark (Fig. 1C); stigma dark brown, with narrow apex pale; veins dark brown to black, C, Sc and most of section of R1 basal to stigma yellow, apical section of R1 pale brown,

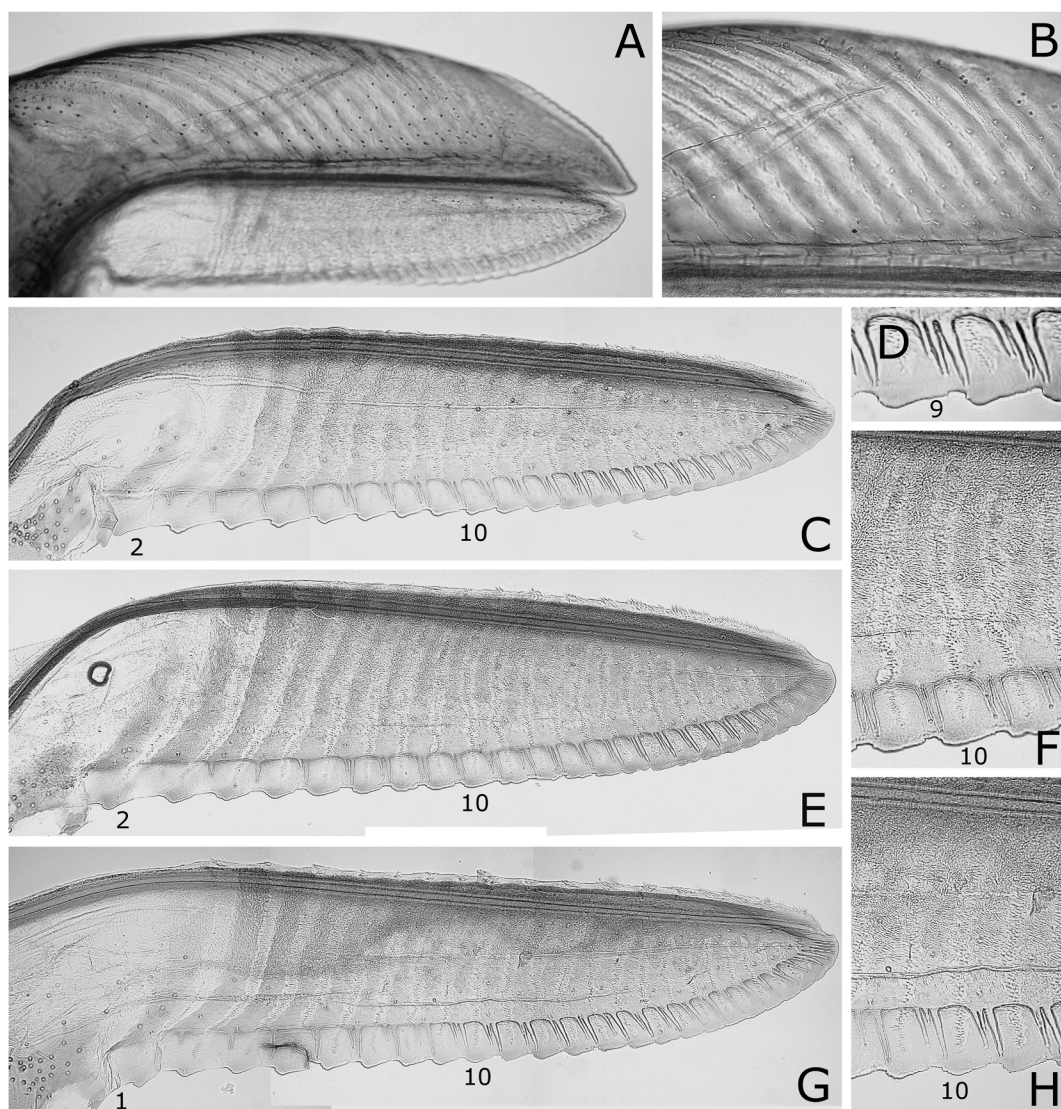


Fig. 9. Ovipositor of *Arge impolita*: A, Lance, lateral view; B, middle part of lance, lateral view; C, E, G, lancet; D, ninth and 10th serrulae; F, H, middle part of lancet. — A–D, Holotype; E–F, Chitose; G–H, Mizunami. C–D, G–H, Reversed.

and basal part of A usually yellow. Setae whitish, sometimes brownish on dorsal areas and apex of abdomen; those on wings blackish, but generally yellowish in basal parts.

Surface generally smooth and polished; punctures on anterior part of head relatively dense and distinct, predominantly separated from each other (Figs. 2A, 3A–B). Abdomen (Fig. 5A) with second to fourth terga smooth, sometimes sparsely wrinkled and/or weakly or distinctly micro-

sculptured; fifth and more posterior terga smooth between fine punctures (=sockets of setae), sometimes sparsely wrinkled.

Head in dorsal view swollen behind eyes (Fig. 3A); eye shorter than gena. Median ocellus slightly raised; glabrous and polished area around median ocellus narrow (Fig. 3B). Frontal area nearly flat or medially concave in posterior part, not or slightly raised in anterior part as in Fig. 4M and with deep furrow continuing to frontal pit in

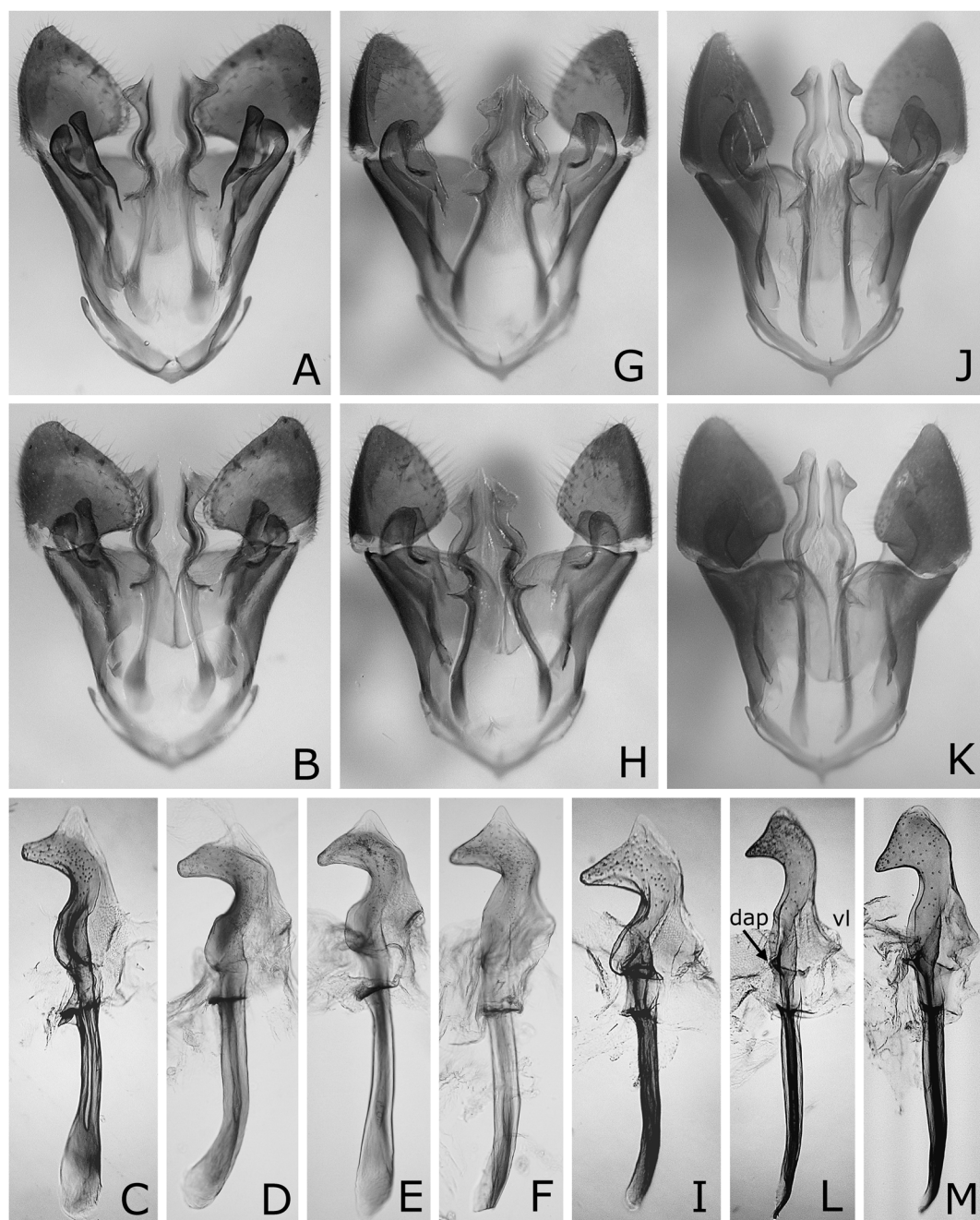


Fig. 10. Male genitalia: A–F, *Arge jonasi*; G–I, *A. aciculata*; J–M, *A. impolita*. A, G, J, Male genitalia, dorsal view; B, H, K, do. ventral view; C–F, I, L–M, penis valve, lateral view (left dorsal) (dap and vl in L meaning dorsal apodemal projection and ventral lobe respectively). — A–C, Bibai (HH030720B); D, Tsugaru; E, Kawanishi; F, Seoul; G–I, holotype; J–L, Kaizuka; M, Niihama.

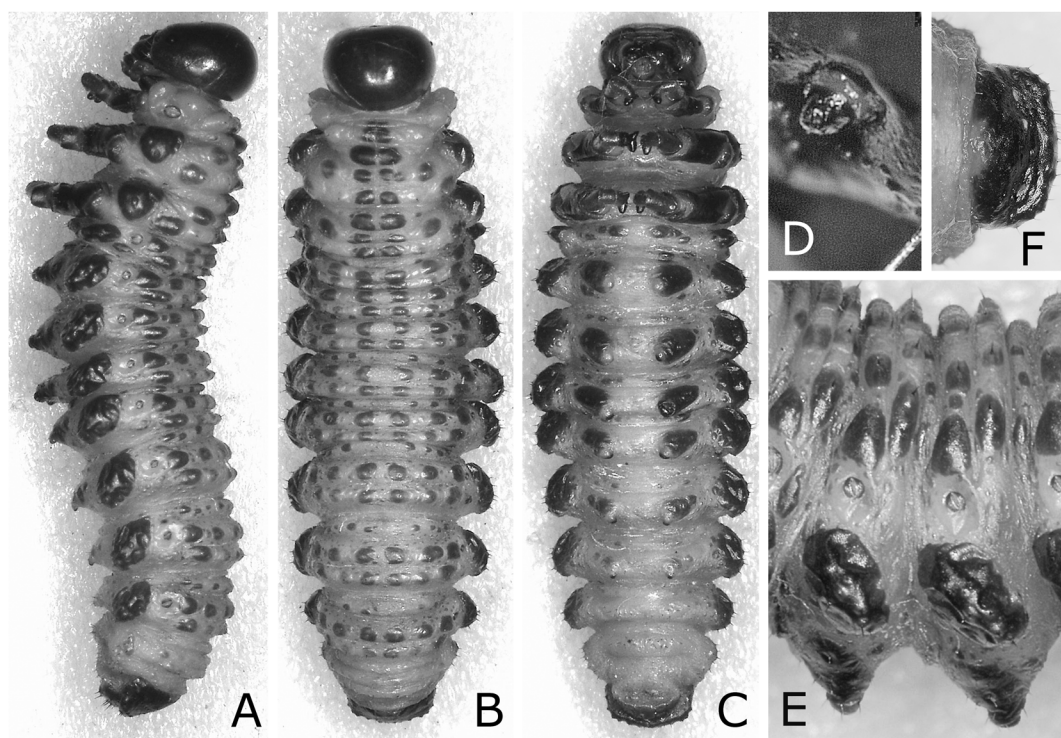


Fig. 11. Final instar larva of *Arge jonasi*, Bibai (HH070730A). — A, Lateral view; B, dorsal view; C, ventral view; D, antenna, lateral view; E, second and third abdominal segments, lateral view; F, 10th abdominal tergum, dorsal view.

anteromedial part (Fig. 3B). Frontal pit deep, sometimes shallow, often with small tubercle below. Interantennal carinae somewhat sharp (Fig. 2A), ventrally weakened and separated from each other. Supraclypeal area with median ridge rounded; side slope rounded, distinctly rugulose. Malar space $0.9\text{--}1.2 \times$ width of median ocellus. Antennal length $1.4\text{--}1.5 \times$ maximum head width; flagellum (Fig. 4A–B) not compressed, rounded at apex.

Ovipositor sheath in posterodorsal view (Fig. 6A, C) about as long as or somewhat longer than wide, basally sunk, dorsally weakly rounded, with lateral margin concave near apex, sometimes straight, apex nearly pointed and medial margin not edged, in lateral view (Fig. 6B, D) with ventral margin, except for basal convexity, roundly convex at middle, nearly straight or slightly concave near apex, dorsal margin nearly straight, and apex narrowly rounded or nearly

pointed.

Lance with several very narrow membranous areas at middle (Fig. 7A–B). Lancet with dorsal margin slightly roundly convex or nearly straight (Fig. 7D, F, H), ventral margin distinctly serrate throughout, and with about 23–25 serrulae; basal and middle rows of setae ventrally curved basally; middle rows of setae dorsally curved apically; sclerotized part on first annulus well developed, dorsally extending to or near dorsal margin of lancet, with 14 to 25 sensory pores; middle annuli each with one to six sensory pores except for ventral marginal ones; serrulae triangular, finely dentate (Fig. 7E); basal serrulae each with basal slope not much shorter than apical slope.

Male. Length 7.0–10.5 mm. As in female, except for usual sexual differences. Wings distinctly dark brownish, sometimes yellowish, with dark marking below stigma (Fig. 1D); pale parts

of veins brownish yellow to brown; hind tibia black on apical third to half; genital capsule dark brown to black.

Head in dorsal view slightly swollen behind eyes (Fig. 3C); eye about as long as or slightly longer than gena. Frontal area as in female, or flat and anteriorly distinctly raised laterally and furrowed medially. Interantennal carinae sharp, often fused ventrally with each other and continuing to weak median carina of supraclypeal area. Median ridge of supraclypeal area not or weakly carinate. Malar space $0.7\text{--}0.9 \times$ width of median ocellus. Antennal length $1.7\text{--}2.0 \times$ maximum head width; flagellum not compressed (Fig. 4C–D), rarely slightly compressed.

In genitalia, harpe in ventral view about as long as wide, with apex rounded and inner margin very strongly roundly convex (Fig. 10B). Valvaceps in lateral view (Fig. 10C–F) nearly pointed apically.

Larva. Early to middle instars (Fig. 2I–J): Head brown or black; legs black; trunk pale greenish gray, black on cervical sclerite, surpedal lobes of thorax, tenth abdominal tergum and subanal lobe, sometimes also on subspiracular lobes of first to eighth abdominal segments and lateral sides of prolegs as in Fig. 2K. Semifinal instar (Fig. 2K–L): As in early to middle instars, but trunk greenish creamy, dorsally with pair of white longitudinal stripes. Final instar (Figs. 2M, 11): Head black; trunk creamy white, black on legs, surpedal lobes of thorax, subspiracular lobes of thorax and first to eighth abdominal segments, lateral sides of prolegs, tenth abdominal tergum and subanal lobe, and covered with small black or brown spots dorsally, sometimes also with minute black dots dorsally and ventrally.

Structure (final instar). Length 20–25 mm. Antenna conical (Fig. 11D). Clypeus with four pairs of setae. Mandible with eight to 15 setae on outer surface. Palpifer with three to five setae. Labrum with two pairs of setae. Maxillary palp four-segmented. Labial palp three-segmented. First to ninth abdominal segments each with three annulets (Fig. 11A, E). Second and third annulets of each of first to ninth abdominal segments with

setae. Setae on trunk generally short and sparse. Prolegs on second to seventh and tenth segments (eighth often with rudimental proleg). Subspiracular lobes distinctly convex. Black spots on dorsum of trunk weakly convex. Tenth tergum in dorsal view nearly truncate apically (Fig. 11F). Subanal area not extending beyond suranal area posteriorly (Figs. 2M, 11A).

Cocoon. Creamy white to pale brown. Length 14–15 mm in female, 12 mm in male. Elongate oval, double walled; outer wall netted; inner wall parchment like.

Type material examined. Lectotype of *Hylotoma nigratarsis* Smith, 1874: ♀, “♀ Type” “B.M.TYPE, HYM. 1.72” “*Hylotoma nigratarsis*, Type Smith” “H. jonasi, Type” “Hiogo, Japan” “/4/11”. Deposited in BMNH. For more information, see Shinohara and Hara (2007). Lectotype of *Hylotoma japonica* Marlatt, 1898 (Fig. 1A–B): ♀, “22, 5, 20 [Gifu] (in Japanese) ♀” “Japan Mitsukuri” “*Hylotoma japonica* Marlatt ♀” and “♀ Type No. 3838 U.S.N.M.”. Paralectotypes of *Hylotoma japonica*: 1 ♀, “22, 5, 9 [Gifu] ♀” “Japan Mitsukuri” and “♂ Type No. 3839 U.S.N.M.”; 1 ♀, “26, 5, 25 [Gifu] ♀ #25”. All deposited in USNM. For more information, see Hara *et al.* (2012).

Other material examined. JAPAN—HOKKAIDO: 1 ♀, Asahikawa, Kamuikotan, 1. VII. 2006, laid 39 eggs on *Aria alnifolia*, H. Hara; 2 ♀, Horokanai, Takadomari, from group of 51 middle instar larvae on *Aria alnifolia* (rearing code HH070701P), coll. 1. VII. 2007, coc. 31. VII., em. 21–23. IV. 2008, H. Hara; 3 ♀, Bibai, from group of larvae on *Aria alnifolia* (HH960812A), coll. 10. VIII. 1996, coc. 12–14. VIII., em. 27–28. IV. 1997, H. Hara; 1 ♀, same data but em. 24. IV. 1997; 1 ♀, Bibai, Tomei, from group of larvae on *Aria alnifolia* (HH030713A), coll. 13. VII. 2003, coc. 8–9. VIII., em. 18. IV. 2004, H. Hara; 1 ♂, Bibai, Tomei, from group of 20 larvae on *Aria alnifolia* (HH030720B), coll. 20. VII. 2003, coc. ?, em. 20. IX. 2003, H. Hara; 2 ♀, Bibai, Koshunai, 3. VII. 2006, near eggs on *Aria alnifolia*, H. Hara; 3 ♀, Bibai, Koshunai, from group of 4 old larvae

- on *Crataegus chlorosarca* (HH070730A), coll. 30. VII. 2007, coc. 5–7. VIII., em. 22–26. IV. 2008, H. Hara; 1 ♀, same locality, 22. VI. 2008, H. Hara; 1 ♀, Sapporo, 6. VII. 1954, M. Konishi (HU); 1 ♀, Sapporo, Maruyama, 26. VI. 1916, Kuwayama (OPU) [probably cited by Takeuchi, 1932]; 1 ♀, Sapporo, Hokkaido University Campus, 28. VI. 2007, A. Shinohara; 3 ♀, same data but Hokkaido University Botanical Garden; 11 ♀, same data but 26. VI. 2008; 12 ♀ 2 ♂, same data but 21. VI. 2009; 4 ♀, same data but 1. VII. 2009; 4 ♀, same data but 26. VI. 2012; 2 ♀ 2 ♂, Sapporo, Hokkaido University, from group of larvae on *Cotoneaster* sp. (HH070707C), coll. 7. VII. 2007, coc. 3–16. VIII., em. 26. IV. – 8. V. 2008, H. Hara; 4 ♀, same data but from group of larvae (HH070804A), coll. 4. VIII. 2007, coc. 10–18. VIII., em. 22. IV. – 5. V. 2008; 1 ♀, Tomakomai, Kasuga, 26. VI. 2008, H. Hara. **HONSHU:** **Aomori Pref.:** 3 ♀, Tsugaru, Kokeyati, Shariki, 10. VI. 1990, M. Yamada (MYC); 6 ♀ 4 ♂, same locality, 20. V. 1991, M. Yamada (MYC); 1 ♂, Takko, Takinomata, 26. VII. 1987, M. Yamada (MYC). **Iwate Pref.:** 1 ♀, “Iwate, Ogasawara” (HU). **Yamagata Pref.:** 1 ♀, Tamagawa-dani, 20. VI. 1974, Y. Kurosawa. **Fukushima Pref.:** 2 ♀, Hanawa, H. Hamaji. **Tochigi Pref.:** 1 ♀, Yaita, Happogahara, 19. VI. 1988, T. Saito; 1 ♀, Nikko, Kujira-cho, reared from egg deposited by female collected on 1. VI. 2009, em. 22. V. 2010, host: *Sorbus commixta*, T. Saito; 1 ♂, same data but em. 19. VI. 2010; 1 ♀, Nakagawa, Bato, from larva on *Pourthiaea villosa*, coll. 6. VII. 2011, mat. 7. VII., em. 5. V. 2012, S. Ibuki; 2 ♀, Nakagawa, Wami, on *Pourthiaea villosa*, 25. V. 2013, S. Ibuki; 3 ♀, Nasukarasuyama, Sarukubo, from group of larvae on *Pourthiaea villosa*, coll. 30. VI. 2012, mat. 4. VII., em. 1–2. V. 2013, S. Ibuki; 1 ♂, Nasukarasuyama, Arakawa-chûgaku-mae, from larva on *Pourthiaea villosa*, coll. 30. VI. 2012, mat. 3. VII., em. 2. V. 2013, S. Ibuki. **Gunma Pref.:** 1 ♀, Katashina, Mt. Hodaka-yama, 3. VII. 2004, S. Tsuyuki. **Saitama Pref.:** 1 ♀, Urawa, “2600 5–9”. **Chiba Pref.:** 1 ♀, Funabashi, Narashinohara, 17. V. 1960, H. Suda (HSC); 1 ♀, same data (KU); 1 ♂, Narashino, 14. V. 1931, S. Fujii; 1 ♀, same data but 17. V. 1931; 1 ♀, Ichinomiya, 4. VI. 2005, K. Kubo; 1 ♀, Abiko, 1929, T. Oguma (HU); 1 ♀, Matsudo, “2600 5–30”. **Tokyo Met.:** 1 ♀, “[Tokyo]” “[7]” “[Kuromon-chûrenji]”, Hylo-toma nigritarsis Sm.” (HU) [probably cited by Matsumura, 1912]; 1 ♂, Shibuya, 1. V. 1921, K. Sato; 1 ♀, Setagaya, Kinuta, 16. V. 1932; 1 ♀, Hachioji, Mt. Takao-san, “27-5-17”, E. Gallois (HU). **Kanagawa Pref.:** 1 ♀, Yokohama, Shinohara-cho, V. 1950, K. Sato; 1 ♀, Yokohama, Sakae, Enkaizan-area, 12. VI. 2005, K. Kubo; 1 ♀, Yamakita, Mt. Hirugadake, 24. VI. 1979, S. Tsuyuki; 1 ♀, Hakone, 21. VI. 1937, Takeuchi (OPU); 1 ♀, Hakone, Kowakidani, 25. V. 1974, A. Shinohara; 1 ♀, Hakone, Mt. Komagatake, 1100m, 20. VI. 2000, H. Nagase; 1 ♀, same data but 1100–1300m, 5. VI. 2004; 1 ♂, Mt. Sekiro, 27. V. 1934, A. Yoshida (KU). **Niigata Pref.:** 1 ♀, Sadogashima Is, Mt. Kinpoku-san, 25. V. 1936, K. Baba (OPU) [presumably cited by Takeuchi, 1936, although he wrote “Two females from Mt. Kinpoku, May 22, 1936 (K. Baba)”]; 1 ♂, “Takizawa-toge, N-Echigo”, 4. VIII. 1965, K. Baba (KU) [cited by Okutani, 1973]. **Toyama Pref.:** 1 ♀, Kurobe, 21. VI. 1931, Takeuchi (OPU) [probably cited by Takeuchi, 1932]. **Yamanashi Pref.:** 1 ♀, Mts. Yatsugatake, Utsukushinomori, 5–8. VII. 2000, A. Shinohara. **Nagano Pref.:** 1 ♀, Karuizawa, 28. VI. 1934, K. Sato; 1 ♀, Mts. Yatsugatake, Minoto, 30. VII. 1982, A. Shinohara; 1 ♀, Fujimi, Mt. Nyûgasayama, 27. VI. 1988 (MNHAH); 1 ♀, Shimashima-dani, 30. VI. 1976, A. Shinohara; 1 ♀ 1 ♂, Takayama, Yamanokami (along Ken-do Manza-sen), 1510m, from 20 larvae (part of group of 58 larvae) on *Sorbus commixta*, coll. 28. VII. 2010, mat. 9–12. VIII., em. 5. V. 2011, H. Kojima; 2 ♀, Takayama, Nakahikage-rindo, 1320m, from group of five larvae on *Sorbus commixta*, coll. 28. VII. 2010, mat. 30. VII. –2. VIII., em. 5. V. 2011, H. Kojima. **Gifu Pref.:** 2 ♀, Gifu, 5. V. 1919, Takeuchi (OPU) [probably cited by Takeuchi, 1932]; 1 ♀, “Katayama, 10. V. 1919, Takeuchi”, “[Kamatsukanochûrenji]”, (OPU) [probably cited by Takeuchi, 1932; photograph in Takeuchi,

- 1955, pl. 57, 889]. **Shizuoka Pref.:** 1 ♀, Shimizu, Tokura, 26. V. 1990, M. Nishimura; 1 ♀, Fujinomiya, 29. V. 1990, M. Nishimura. **Aichi Pref.:** 1 ♀, Nagoya, V. 1946, Takeuchi, T. Nakane (OPU). **Mie Pref.:** 1 ♀, Iga, Ueno-sinrin-koen, 6. V. 2013, F. Ito. **Shiga Pref.:** 1 ♀, “Yuzurio–Happūdani, Eigenji-machi, Kanzaki-gun”, 360 m, 15. VI. 1996, O. Tominaga (OMNH). **Kyoto Pref.:** 1 ♀, Sasari-toge, 12. VI. 1988, M. Yagi; 1 ♀, “Kyoto, Kiyotaki”, 10. V. 1954, Takeuchi (OPU); 1 ♀, Sugi pass, 22. VII. 1990, H. Ohishi (OMNH); 1 ♀, Yase, 10. V. 1936, T. Kimura (KU). **Nara Pref.:** 1 ♀, Mt. Kasuga-yama, 11. VI. 1989, H. Ohishi (OMNH). **Osaka Pref.:** 1 ♀, Hirakata, Sonenji, 3. VI. 2013, A. Koyama; 1 ♀, Minoo, 27. V. 1983, H. Matsuura; 1 ♀, Minoo, Mt. Minoo-yama, 8. VI. 1929, C. Teranishi; 1 ♀, Nose, 29. IV. 1982, H. Nishida; 3 ♀, “Nose, Sasabe”, 11. V. 1974, K. Mizuno; 1 ♀, Kaizuka, Mt. Izumikatsuragi-san, 22. V. 2000, R. Matsumoto (OMNH) [cited by Yoshida, 2006]; 1 ♀, Chihayaakasaka, Mt. Kongo-zan, 4. VI. 1994, K. Harusawa (OMNH). **Hyogo Pref.:** 1 ♂, Kawanishi, Sasabe, 15. V. 1982, S. Hashimoto; 2 ♀, Takarazuka, Onohara, 7. VI. 1993, K. Futai (MNHAH) [cited by Naito *et al.* 2004]; 7 ♀, Takarazuka, Takedao-onsen, 13. VI. 1993, T. Morita (MNHAH) [cited by Naito *et al.* 2004]; 1 ♀, Takarazuka, Nishitani-Kôzuki, 17. V. 1992, Y. Nishimoto; 1 ♀, Sasayama, 10. VI. 1952, K. Iwata (KU) [cited by Okutani, 1954]; 1 ♀, same locality, 4. VI. 1982, A. Hosomi (KU); 1 ♀, Sasayama, Fujioka, 13. VI. 1951, K. Iwata (KU); 1 ♀, same locality, 12. VI. 1955, E. Fujita (KU); 1 ♀, same locality, 15. V. 1959, T. Okutani (KU) [cited by Okutani, 1977, pl. 56 fig. 1011]; 1 ♀, Hyonosen (Tazima), 28. V. 195?, T. Okutani (KU); 1 ♀, same locality, 5. VI. 1956, T. Okutani (KU); 1 ♀, Mt. Oginosen, 17. V. 1996, T. Naito (KU); 1 ♀, Kato, Lake Tojo-ko, 3. V. 1964, S. Kinoshita (EU); 1 ♀, Kamikawa, Sengamine, 11. VI. 1967 (MNHAH); 1 ♀, “Harima”, 8. V. 1912, Takeuchi, coll. Iguchi (OPU) [probably cited by Takeuchi, 1932]. **Wakayama Pref.:** 1 ♀, Koya, Mt. Koya-san, 1932, F. Wada (HU); 1 ♀, Kushimoto, Kii-Oshima Is., 21–24. V. 1964, T. Kumata (HU). **Okayama Pref.:** 1 ♀, Kagamino-cho, 200 m, 2. V. 1994, Y. Nishimoto. **Hiroshima Pref.:** 1 ♀, “Aki, Mt. Kanmuri”, 1. VI. 1953, Takeuchi (OPU). **Yamaguchi Pref.:** 2 ♀, Yamaguchi, 19. V. 1904 (KU). **SHIKOKU: Tokushima Pref.:** 1 ♀, Mt. Tsurugi-san, 3. VI. 1930, Takeuchi (OPU) [probably cited by Takeuchi, 1932, 1939]. **Ehime Pref.:** 1 ♀, Niihama, Besshiyama, 17. VII. 2005, M. Shiraishi; 1 ♀, Saijyo, Mt. Ishizuchi-yama, 10. V. 1997, M. Shiraishi [cited by Takahashi and Shiraishi, 1998]; 1 ♀, same locality, 9. VIII. 1952, E. Fujimoto (EU); 1 ♀, Nanokawagoe, Mt. Ishizuchi-yama, 11. VII. 2011, A. Shinohara; 1 ♀, Kamijima, Ikina, 6. V. 2001, M. Shiraishi [cited by Takahashi and Shiraishi, 2003]; 1 ♀, Matsuyama, Dogo, 10. V. 1940, K. Sato; 1 ♀, Matsuyama, Komenono, 23. V. 1999, N. Ohbayashi (EU). **KYUSHU: Nagasaki Pref.:** 1 ♀, “Mt. Kunimi near Sasebo”, 16. VI. 1950, T. Shirozu (OPU). Japan, locality undetermined: 1 ♀, “[Fukumi-mura]”, 9. V. 1948, T. Ko (EU); 1 ♀, Kurokabe, 16. V. 1948 (OPU); 2 ♀, “[Terayama]”, 6. VI. 1962, R. Inomata (MNHAH). **KOREA—Seoul:** 1 ♀, 13. V. 1924, W. S. Youn; 1 ♀ 1 ♂, 11. V. 1935, K. Sato. **Gyeonggi-do:** 1 ♀, Suwon, VI. 1922, K. Sato; 13 ♀ 1 ♂, Suwon, Hakwanggyo-dong, 8. VI. 2009, A. Shinohara.
- Larvae in ethanol: 1 Final instar larva (part of HH070730A); 4 final instar larvae (part of HH070804A).
- Distribution.** Japan: Hokkaido (Takeuchi, 1932), Honshu (type locality: “Hiogo”), Shikoku (Takeuchi, 1932), Kyushu (Togashi, 1972a). Korea (Kim, 1963).
- Forsius (1927) recorded *A. jonasi* from China, but Gussakovskij (1935) considered Forsius’ specimens to be *A. dimidiata* (Fallén, 1808). Matsumura (1932) also included China in the distribution of his “*Hylotoma nigritarsis*” without any comments. The record from China needs confirmation.
- Takeuchi (1932; see also Lelej and Taeger, 2007 and Lelej, 2012) included Sakhalin in the distribution of *A. jonasi*, because he regarded *A. solowiyofka* described from the island as a synonym of this species. However, *A. solowiyofka* is

a distinct species (see Hara *et al.*, 2007). A female specimen of *A. solowiyofka* in OMNH is labeled “Anfg. Aug. 1924, Saghalien, T. Kano” and “*Arge jonasi* Takeuchi, Takeuchi, 1932, KES”, suggesting that it was part of the material used for Takeuchi’s 1932 paper, which was published in Transactions of the Kansai Entomological Society (probably abbreviated as KES on the label). A female specimen recorded from Sakhalin by Gussakovskij (1935) may belong to *A. solowiyofka*, because he also synonymized *A. solowiyofka* with *A. jonasi*. We have not seen any specimens of *A. jonasi* from Sakhalin. Lelej and Taeger (2007) and Lelej (2012) included *A. jonasi* in the fauna of the Russian Far East, but these authors apparently followed the previous Sakhalin record discussed above.

As a distribution of *A. jonasi*, Gussakovskij (1935) noted “Япония, Сахалин” (=Japan, Sakhalin) on p. 284 and “Mongolien, Sachalin, Japan” on p. 408. “Mongolien” may be a clerical error, and subsequent records from Mongolia apparently based on Gussakovskij’s note (e.g., Lelej and Taeger, 2007; Lelej, 2012) need confirmation.

Although we have not examined specimens recorded by Togashi (1972a) from Kyushu and by Kim (1963, 1970) and Togashi (1973, 1997b) from Korea, we were able to examine other specimens from these areas.

Host plants. Rosaceae: *Pourthiaea villosa* (Thunb.) Decne. var. *villosa* (Takeuchi, 1932); *Aria alnifolia* (Siebold et Zucc.) Decne., *Cotoneaster* sp. and *Crataegus chlorosarca* Maxim. (Hara, 2010); *Sorbus commixta* Hedl. (new record).

Life history. Adults were collected in a relatively short period in Hokkaido and Honshu, namely from late June to early July in Hokkaido, from late April to late June in the lowlands of Honshu, and from late June to early August in the mountainous regions of Honshu. In Hokkaido, larvae were found from early July to early August, and they became adults in the following year in rearing conditions. Although one male emerged in late September from the larva col-

lected in July of the same year (rearing code HH030720B), it is probably due to the unusual rearing condition because there is usually frost in early October in Hokkaido. In Honshu, larvae were collected in June to early July in the lowlands of Tochigi Prefecture and in late July in the mountainous regions in Nagano Prefecture, and they became adults in the following year. These facts show that this species has a univoltine life cycle. Okutani (1977) and Yoshida (2006) noted that this species had two generations a year, but they gave no evidence. On the other hand, in Shikoku, adults were collected in a long period from early May to early August, possibly suggesting a multivoltine life cycle.

According to Hara (2010), a female usually lays several tens of eggs in rows along leaf margins of one or several adjacent leaves; females are often found near eggs; larvae are gregarious in all instars, and feed on adjacent leaves successively, leaving main veins; a larval group usually consists of 20 to 50 larvae; mature larvae span cocoons in the soil. Larvae sometimes severely defoliate trees of *Aria alnifolia* in Hokkaido (Hara, 2010) and *Pourthiaea villosa* var. *villosa* and *Sorbus commixta* in Honshu. Shinohara observed a group of three to six females staying together on adjacent leaves of *Cotoneaster* sp. (Fig. 2G) in Sapporo, Hokkaido. The reason for or the function of this gathering behavior of the females is unknown.

Comparative notes. In the keys by Gussakovskij (1935) and Takeuchi (1939), *A. jonasi* would run to “*A. jonasi*”. However, specimens without distinct band below stigma in the fore wing (Fig. 1C) would not run to any species in both keys.

After the papers by Gussakovskij (1935) and Takeuchi (1939), many species were described from East Asia, especially from China and Japan (Wei *et al.*, 2006; Taeger *et al.*, 2010). No Chinese species agree with *A. jonasi* or *A. aciculata* described below. Wei and Nie (1998) noted that *A. melanocephalia* Wei and Nie, 1998 was similar to *A. jonasi*, but the species is separated from *A. jonasi* and *A. aciculata* by the blackish brown

vein C and the different configuration of the ovipositor sheath and penis valve (see Wei and Nie, 1998, figs. 23–25).

Among the Japanese congeners, *A. jonasi* is very similar to *A. kobayashii* and *A. aciculata* in having the combination of the following characters: Head, thorax and abdomen with distinct blue metallic reflection; antenna black, with colorless reflection; in fore wing, vein C uniformly yellow (sometimes brown in male, but paler than vein R), and cell 2M not or basally darkened; frontal area anteriorly with median furrow continuing to frontal pit; median ridge of supraclypeal area rounded or bluntly carinate; in both wings, margins between veins Rs and Cu glabrous, not ciliate; in female, seventh sternum normal and ovipositor sheath in posterodorsal view with apex nearly pointed. The characters separating *A. jonasi* and *A. kobayashii* were discussed in our previous paper (Hara *et al.*, 2007), but some of them show wide intraspecific variations in the material obtained thereafter. The most reliable characters distinguishing *A. jonasi* from *A. kobayashii* are in the lancet and male genitalia as follows [conditions of *A. kobayashii* in brackets]: Lance with membranous areas very narrow (Fig. 7A–B) [relatively wide]; middle annuli of lancet weakly sinuate or nearly straight (Fig. 7D, F, H) [arched toward base of lancet]; valviceps apically with non-pigmented area (Fig. 10A–F), in dorsal view apically pointed with relatively small and dorsolaterally projecting lobe near apex [valviceps pigmented throughout, with large and laterally projecting lobe at apex]; harpe in ventral view about as long as wide [longer than wide]. The following external features are usually useful: Median ocellus slightly raised (glabrous area around median ocellus narrow) [rather strongly so (glabrous area around median ocellus wide)]; in female, frontal area not or slightly raised anteriorly, furrowed anteromedially [frontal area rather strongly raised anterolaterally, therefore furrow formed between anterolateral convex areas]; in male, wings distinctly yellowish or brownish [nearly clear hyaline], and antenna usually less than twice as long as head width [usu-

ally more than twice]. For the differences between *A. jonasi* and *A. aciculata*, see the latter species.

The larva of *A. jonasi* is somewhat variable in coloration, but is easily distinguished from the known larvae of other Japanese species by the combination of the following characters: Trunk creamy white, with setae generally inconspicuous; clypeus with four pairs of setae; antenna conical; mandible with eight to 15 setae on the outer surface; prolegs on second to seventh (sometimes also on eighth, but rudimentary) and tenth segments; tenth tergum in dorsal view nearly truncate apically. Large-sized, whitish *Arge* larvae gregariously feeding on *Pourthiaea*, *Aria*, *Cotoneaster*, *Crataegus* or *Sorbus* in Japan are likely to belong to this species.

Remarks. In addition to the references given in the list of synonymy above, *A. jonasi* has been cited in many papers as follows: Kato, 1934; Iwata, 1957, 1958; Sato, 1965; Sato and Tosawa, 1967; Okutani, 1974, 1982; Jôroku *et al.*, 1976; Kondo and Miyake, 1976; Otsuka, 1984; Murota and Kurokawa, 1985; Miyoshi, 1988; Taguchi, 1988; Nakamura and Enoki, 1997; Haneda *et al.*, 1998; Nambu, 1998; Katayama, 2000, 2010; Takahashi and Shiraishi, 2000, 2002; Murakami, 2004; Nagase, 2004, 2007; Tanaka and Tanaka, 2007; Togashi, 1960, 1965a, b, c, 1970, 1971, 1972a, b, 1975, 1978, 1983, 1997a, b, 1998b, 2002; Togashi and Yamamoto, 2000; Tosawa, 1932; Watanabe, 1937. Because some related species previously have not been clearly differentiated from *A. jonasi*, the identity of the species actually treated in each of the above papers should be confirmed by examining the original material. As noted by Hara and Shinohara (2006), one of the specimens determined as *A. jonasi* by Nakamura (2003) was *Spinarge fulvicornis* (Mocsáry, 1909). We have examined two females identified with *A. jonasi* by Togashi (1998c) and found them to be *Arge solowiyofka* and *Arge aruncus* Hara and Shinohara, 2012b.

Arge aciculata n. sp.

[Japanese name: Hime-unmon-chûrenji]

(Figs. 1E–G, 2C–D, 3E–H, 4E–H, M–N, 5C–D, 6 E–H, 8, 10G–I)

Female (Fig. 1E–F). Length 9.0–10.5 mm. Black, with weak metallic blue or greenish-blue reflection; reflection metallic violet on basal abdominal terga, faint brassy on frontal area and inner orbital area, often also on interantennal area, malar space, clypeus, labrum and base of mandible (Fig. 2C); subanal area brown to dark brown. Flagellum black, with colorless reflection. Mandible dark brown to black, apically reddish. Palpi dark brown, basally black. Legs black, with reflection on black areas faint metallic blue; apices of fore and middle femora brownish; tibiae yellowish white, narrow apices of fore and middle tibiae somewhat darkened and apical fourth of hind tibia black; tarsi basally brown, but hind tarsus usually entirely black; tibial spurs yellow to brown; claws apically widely brown. Wings hyaline, faintly yellowish, with dark brown marking below stigma extending to vein M (Fig. 1E); base of cell 3Cu faintly brownish; stigma dark brown, with narrow apex pale; veins dark brown to black, C, Sc, wide basal part of A, and most of section of R1 basal to stigma yellow, and apical section of R1 pale brown. Setae generally whitish, brownish on apex of abdomen; those on wings blackish, but generally yellowish in basal parts.

Surface generally smooth and polished; punctures on anterior part of head relatively dense and distinct, generally separated from each other (Figs. 2C, 3F). Abdomen (Fig. 5C) with second to fourth terga smooth, sometimes weakly and sparsely wrinkled and/or micro-sculptured; fifth to eighth terga rough, distinctly and densely wrinkled and often micro-sculptured.

Head in dorsal view (Fig. 3E) swollen behind eyes, rarely not swollen; eye about as long as gena. Median ocellus raised; glabrous area around median ocellus wide (Fig. 3F). Frontal area nearly flat or medially shallowly concave in posterior part, not or slightly raised in anterior

part, and with deep furrow continuing to frontal pit in anteromedial part. Frontal pit rather deep, often with small tubercle below. Interantennal carinae rather sharp (Fig. 2C), ventrally weakened and separated from each other. Supraclypeal area with median ridge rounded; side slope rounded, distinctly rugulose. Malar space 1.1–1.4×width of median ocellus. Antennal length 1.4–1.6×maximum head width; flagellum (Fig. 4E–F) not compressed, rounded at apex.

Ovipositor sheath in posterodorsal view (Fig. 6E, G) about as long as wide, basally sunk, dorsally weakly rounded, with lateral margin concave near apex, rarely straight, apex nearly pointed and medial margin not edged, in lateral view (Fig. 6F, H) with ventral margin, except for basal convexity, roundly convex at middle, nearly straight or concave near apex, dorsal margin nearly straight, and apex narrowly rounded or nearly pointed.

Lance without membranous areas (Fig. 8A–B). Lancet with dorsal margin nearly straight or slightly rounded (Fig. 8C, E, G), ventral margin distinctly serrate, but with middle and apical serrulae low, with about 25–28 serrulae; basal rows of setae ventrally curved towards base of lancet, middle rows nearly straight; sclerotized part on first annulus small, dorsally far apart from dorsal margin of lancet, with 8 to 13 sensory pores; middle annuli each with one to three sensory pores or without pores, except for ventral marginal ones; serrulae triangular, finely dentate (Fig. 8D, F); basal serrulae each with basal slope not much shorter than apical slope.

Male. Length 8.5 mm. As in female, except for usual sexual differences. Wings nearly clear hyaline (Fig. 1G), with small pale brown marking below stigma; pale parts of veins not yellow, pale brown to brown; legs black, fore and middle tibiae brown, apically darkened; hind tibia yellowish white on basal half; tarsi black, fore tarsus basally brown; genital capsule dark brown to black.

Head in dorsal view slightly swollen behind eyes (Fig. 3G); gena shorter than eye. Frontal area slightly raised anteriorly (Fig. 4M), posteri-

only shallowly concave medially, anteriorly with median furrow (Fig. 3H). Interantennal carinae sharp, almost fused ventrally with each other (Fig. 2D). Median ridge of supraclypeal area weakly carinate. Malar space $1.1 \times$ width of median ocellus. Antennal length $1.9 \times$ maximum head width; flagellum not compressed, rounded at apex (Fig. 4G–H).

In genitalia, harpe in ventral view somewhat longer than wide, with apex narrowly rounded and inner margin strongly roundly convex (Fig. 10H). Valviceps in lateral view thick, pointed at apex, with large dorsal projection near apex (Fig. 10I).

Material examined. Holotype: ♂, “[Nishitanzawa Otanasawa (Yamakita), Kanagawa P., 8. V. 2005, Takakuwa, M. leg.” Deposited in NSMT.

Paratypes: JAPAN—HONSHU: **Tochigi Pref.:** 1 ♀, Kinugawa-onsen, 11. V. 1997, N. Shinohara. **Chiba Pref.:** 1 ♀, Ichikawa, “2620 429”, J. Yoshioka. **Tokyo Met.:** 1 ♀, Hino, Hodokubo, 22. IV. 2003, H. Takahashi; 1 ♀, same data but 26. IV. 2003. **Kanagawa Pref.:** 1 ♀, Hakone, Mt. Komagatake, 2. VI. 1974, A. Shinohara. **Yamanashi Pref.:** 1 ♀, Otsuki, Magi-Nigioka-okuyama, 11. V. 1976, H. Suda (HSC). **Nagano Pref.:** 1 ♀, Kamikochi, 10. VI. 1918, K. Sato. **Shiga Pref.:** 1 ♀, “Mt. Hira”, 29. V. 1956, O. Sato. **Wakayama Pref.:** 1 ♀, “[Chikai]”, 25. V. 1940, Takeuchi, Tokunaga (OPU).

Etymology. The species epithet is from the Latin *aciculatus*, meaning “marked with very fine irregular streaks”, referring to the dorsally widely aciculated abdomen.

Distribution. Japan (Honshu).

Host plant. Unknown.

Life history. In the lowlands of Honshu, adults were collected in a short period from late April to middle May. This sawfly probably has a univoltine life cycle.

Comparative notes. *Arge aciculata* is very similar to *A. jonasi* and *A. kobayashii* as discussed under *A. jonasi*, and is distinguished from those two as follows [conditions of the latter two in brackets]: Dorsal surface of fifth to seventh terga rough between fine punctures (Fig. 5C–D)

[almost smooth in the latter two as in Fig. 5A–B]; median ocellus distinctly raised and glabrous area around median ocellus wide (Fig. 3F, H) [slightly so in *A. jonasi* (Fig. 3B, D) (glabrous area around median ocellus narrow)]; ovipositor sheath in posterodorsal view with lateral margin usually slightly concave near apex (Fig. 6E, G) [always straight or slightly rounded in *A. kobayashii*]; lance without membranous areas [with very narrow membranous areas in *A. jonasi* (Fig. 7A–B); with distinct membranous areas in *A. kobayashii*]; middle annuli of lancet nearly straight, rather oblique and each with no or one to three sensory pores except for ventral marginal ones (Fig. 8C–F) [not so oblique, with one to five sensory pores in *A. jonasi* (Fig. 7D, F–H); arched toward base of lancet in *A. kobayashii*], and middle and apical serrulae low (Fig. 8C, E, G) [relatively high in *A. jonasi* (Fig. 7D, F, H)]; in male, wings nearly clear hyaline (Fig. 1G) [distinctly dark brownish or yellowish in *A. jonasi* (Fig. 1D)], antenna slightly shorter than twice of head width [usually more than twice in *A. kobayashii*], harpe in ventral view strongly convex on inner margin (Fig. 10H) [relatively weakly so in *A. kobayashii*], and valviceps apically with non-pigmented area, in dorsal view nearly pointed apically, with dorsolateral projection near apex, in lateral view robust, with dorsal projection near apex (Fig. 10I) [in lateral view relatively narrow in *A. jonasi* (Fig. 10C–F); pigmented throughout, in dorsal view with large lateral projection at apex, in lateral view without dorsal projection in *A. kobayashii*].

In coloration, the male is similar to those of *A. longicornis* Kuznetsov-Ugamskij, 1927 and *A. takanebara* Hara and Shinohara, 2013 among the Japanese congeners, but is recognized by the vein C of the fore wing entirely pale brown, the frontal area not distinctly raised anteriorly, the apical margins of the wings not ciliate, and the posterior abdominal terga distinctly and densely wrinkled. Their male genitalia are quite different (cf. Shinohara *et al.*, 2012; Hara and Shinohara, 2013).

In Gussakovskij's (1935) key to Palaearctic

species of the genus, *A. aciculata* may run to *A. fuscipes* (Fallén, 1808) but differs from it in having the basally yellowish-white hind tibia and the yellow or pale brown vein C of the fore wing (both are dark in the latter according to Enslin, 1917). In Takeuchi's (1939) key to East Asian species of the genus, *A. aciculata* runs to *A. kobayashii*. The differences are noted above.

Arge impolita n. sp.

[Japanese name: Tsuyakeshi-akagane-chûrenji]

(Figs. 1H–J, 2E–F, 3I–L, 4I–L, O, 5E–F, 6I–L, 9, 10J–M)

Female (Fig. 1H–I). Length 10.5–12.0 mm. Black, with bronze, partly brassy reflection; pro- and mesothoraces ventrally and metathorax with faint metallic blue or colorless reflection. Flagellum black, with colorless reflection. Mandible black, apically reddish. Palpi brown to dark brown, basally darkened. Legs black, with faint metallic blue or colorless reflection on black areas; apices of femora narrowly brownish; tibiae yellowish white, with apices of fore and middle ones brown and apical fourth of hind tibia dark brown; tarsi yellowish brown to brown, apically darkened; tibial spurs yellow or brown; claws brown, often darkened basally. Wings faintly brownish, with brown marking below stigma extending to vein M; stigma brown, with narrow apex yellowish; veins dark brown to black, C and Sc, basal part of A, and most of section of R1 basal to stigma yellow, and apical section of R1 pale brown. Setae mostly whitish, yellowish at apex of abdomen; those on wings brownish, but generally yellowish in basal parts.

Head and thorax dorsally rather densely covered with fine punctures; punctures on anterior part of head predominantly separated from each other (Fig. 3J). Dorsum of abdomen distinctly and densely wrinkled and micro-sculptured (Fig. 5E).

Head in dorsal view swollen behind eyes; eye shorter than gena (Fig. 3I). Median ocellus raised; glabrous area around median ocellus wide (Fig. 3J). Frontal area posteriorly nearly flat, not raised

anteriorly as in Fig. 4M and anteromedially concave (Fig. 3J) or medially concave throughout as in Fig. 3L. Frontal pit shallow, ventrally with small tubercle. Interantennal carinae blunt (Fig. 2E), ventrally weakened and almost fused with each other. Supraclypeal area with median ridge not or weakly carinate; side slope nearly flat, distinctly rugulose. Malar space $1.3\text{--}1.6\times$ width of median ocellus. Antennal length $1.5\text{--}1.7\times$ maximum head width; flagellum slightly compressed or not compressed, rounded at apex (Fig. 4I–J).

Ovipositor sheath in posterodorsal view (Fig. 6I, K) slightly longer than wide, basally sunk, dorsally rounded or dorsomedially flattened, with lateral margin concave near apex, apex nearly pointed and medial margin basally edged or not edged; in lateral view (Fig. 6J, L) with ventral margin, except for basal convexity, roundly convex at middle, concave or nearly straight midapically, dorsal margin slightly concave, and apex narrowly rounded or nearly pointed.

Lance without distinct membranous areas (Fig. 9A–B). Lancet with dorsal margin nearly straight or slightly rounded (Fig. 9C, E, G), ventral margin distinctly serrate, but very slightly so apically, with about 25 serrulae; basal rows of setae straight, ventrally curved basally; middle and apical rows of setae slightly arched toward base of lancet; sclerotized part on first annulus not extending to dorsal margin of lancet, with six to eight sensory pores; middle annuli each with one to three sensory pores, except for ventral marginal ones (Fig. 9F, H); basal and middle serrulae triangular, each with basal slope much shorter than apical slope (Fig. 9C–D, G–H) (serrulae severely worn in Fig. 9E–F).

Male. Length 8.0–9.0 mm (Fig. 1J). As in female, except for usual sexual differences. Genital capsule dark brown to black.

Sixth to more posterior abdominal terga relatively smooth (Fig. 5F).

Head in dorsal view not or slightly swollen behind eyes; eye about as long as gena (Fig. 3K). Interantennal carinae sharp (Fig. 2F). Malar space $1.1\text{--}1.4\times$ width of median ocellus. Antennal length $1.8\text{--}2.0\times$ maximum head width; flagellum

not compressed, gently curved (Fig. 4K–L).

In genitalia, harpe in ventral view longer than wide, with apex narrowly rounded or nearly pointed, and inner margin strongly roundly convex (Fig. 10K). Valviceps in lateral view narrow, apically rounded, with apical non-pigmented area relatively narrow (Fig. 10L–M).

Material examined. Holotype: ♀, “[JAPAN: Honshu], Hataganaru, Onsen, Hyogo, 21. V. 1999, A. Shinohara.” Deposited in NSMT.

Paratypes: JAPAN—HOKKAIDO: 1 ♀, Ebetsu, Nopporo, 10. VI. 1928, H. Kono; 1 ♀, Chitose, Izumisawa, 29. VI. 1985, Y. Nishijima. HONSHU: **Ishikawa Pref.**: 1 ♀, “Mt. Iozen, Kaga”, 26. V. 1971, H. Kurahashi. **Gifu Pref.**: 1 ♀, Mizunami, Hosokute, 14. V. 1994, H. Takahashi. **Shiga Pref.**: 1 ♂, Hira Mountains, SE slope of Mt. Bunagatake, 900 m alt., 28. V. 1995, H. Ohishi (OMNH). **Kyoto Pref.**: 1 ♀, Kyoto, “[Haccho-daira]”, 26. V. 1940, Takeuchi (OPU). **Osaka Pref.**: 1 ♂, Kaizuka, Mt. Izumikatsuragisan, 18. VI. 1982, H. Hara. SHIKOKU: **Ehime Pref.**: 1 ♂, Niihama, Besshiyama, 15. V. 2005, M. Shiraishi.

Etymology. The species epithet is from the Latin *impolitus*, meaning unpolished, referring to the dorsally unpolished abdomen.

Distribution. Japan (Hokkaido, Honshu, Shikoku).

Host plant. Unknown.

Life history. The adults were collected in May to June. This species is most probably univoltine.

Comparative notes. *Arge impolita* is easily distinguished from the other Japanese congeners by the bronze reflection and the rough and dull surface of the abdominal terga. *Arge aenea* Hara and Shinohara, 2008 also has the bronze reflection, but the surface is smooth and polished (Hara and Shinohara, 2008a). The hind tibia and tarsus are yellowish white, apically distinctly darkened in *A. impolita*, but the hind tibia is whitish yellow, apically orange and the hind tarsus is uniformly orange in *A. aenea*. The stigma is brown in *A. impolita*, while it is black in *A. aenea*. They are also quite different in structure

(see Hara and Shinohara, 2008a for details).

In Gussakovskij's (1935) key to Palaearctic species of the genus, *A. impolita* goes to the couplet 172/175, but disagrees with both halves. In Takeuchi's (1939) key to East Asian species, *A. impolita* may run to couplet 25, though the apex of the hind tibia and the tarsus are not very black. *Arge impolita* agrees with neither of the two halves of couplet 25 (for *A. kobayashii* and *A. jonasii*).

Arge lingi Wei, 1997 from China is similar to *A. impolita* in coloration, but the body is “shining and impunctate” and the stigma is “blackish brown” in the former species, and the ovipositor sheath and the penis valve in the two species are quite different (see Wei and Wen, 1997, figs. 4, 7).

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