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Arge aruncus n. sp. (Hymenoptera, Argidae) Feeding on *Aruncus dioicus* in Japan

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Abstract *Arge aruncus* n. sp. is described from Hokkaido and Honshu, Japan. The larvae are gregarious leaf feeders on *Aruncus dioicus* (Walter) Fernald var. *kamtschaticus* (Maxim.) H. Hara. Descriptions of the immature stages and life history are also given. *Arge aruncus* is a multivoltine species with polymodal adult emergence. This is the first record of *Aruncus* as a host plant of argid sawflies.
Key words: Argidae, *Arge aruncus*, new species, *Aruncus*, Japan.

Introduction

Asian Goatsbeard, *Aruncus dioicus* (Walter) Fernald var. *kamtschaticus* (Maxim.) H. Hara, is a herbaceous plant of the Rosaceae, fairly common in northern and central Japan. It is an eastern Asian variety of the widespread Holarctic plant species *A. dioicus* (Walter) Fernald. In spite of its very wide distribution and rather common local occurrence, few sawflies utilize it as a host plant. Only the larvae of a tenthredinid sawfly, *Nematus* (*Pteronidea*) *spiraeae* Zaddach, 1883, from Europe to Siberia (Lorenz and Kraus, 1957; Zhelochovtsev and Zinovjev, 1995) and a pamphiliid sawfly, *Pamphilius daisenus* Takeuchi, 1938, from Japan and Korea (Shinohara and Kojima, 2011), have been recorded as external feeders on *A. dioicus*.

We recently discovered an undescribed species of *Arge* (Hymenoptera, Argidae), whose larvae gregariously feed on the leaves of *A. dioicus* var. *kamtschaticus* in Hokkaido and Honshu, Japan. This species is described here as *Arge aruncus* n. sp.

Materials and Methods

The material used in this work is kept in the National Museum of Nature and Science, Tsukuba, unless otherwise indicated. Abbreviations for the depositories are: HNC—H. Nagase Collection, Kamakura; 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; OPU—Osaka Prefecture University, Sakai.

Observations of morphology were made with a Leica MS5 stereo binocular microscope and measurements of each structure were taken with an ocular micrometer. Photographs were taken with digital cameras, Canon EOS Kiss Digital X, Konica Minolta DiMAGE A200 and Ricoh Caplio GX100, Keyence Digital Microscope VHX-900, and AnMo Electronics Dinolite digital 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 and Shintoku by Hara and in an air-conditioned room in Tokyo by Shinohara. In the rearing rooms in Bibai and Shintoku, the temperature and light were almost the same as in the open-air condition, but the hibernating individuals were moved in March into an air-conditioned room where the temperature was about 10–25°C. In the rearing room in Tokyo, the temperature was kept at 20–25°C and the light was usually on for about 16 hours a day during the feeding period; the larvae were kept indoors but without air-conditioning during winter.

Results

Arge aruncus n. sp.

[Japanese name: Kokuro-churenji]

(Figs. 1–5, Table 1)

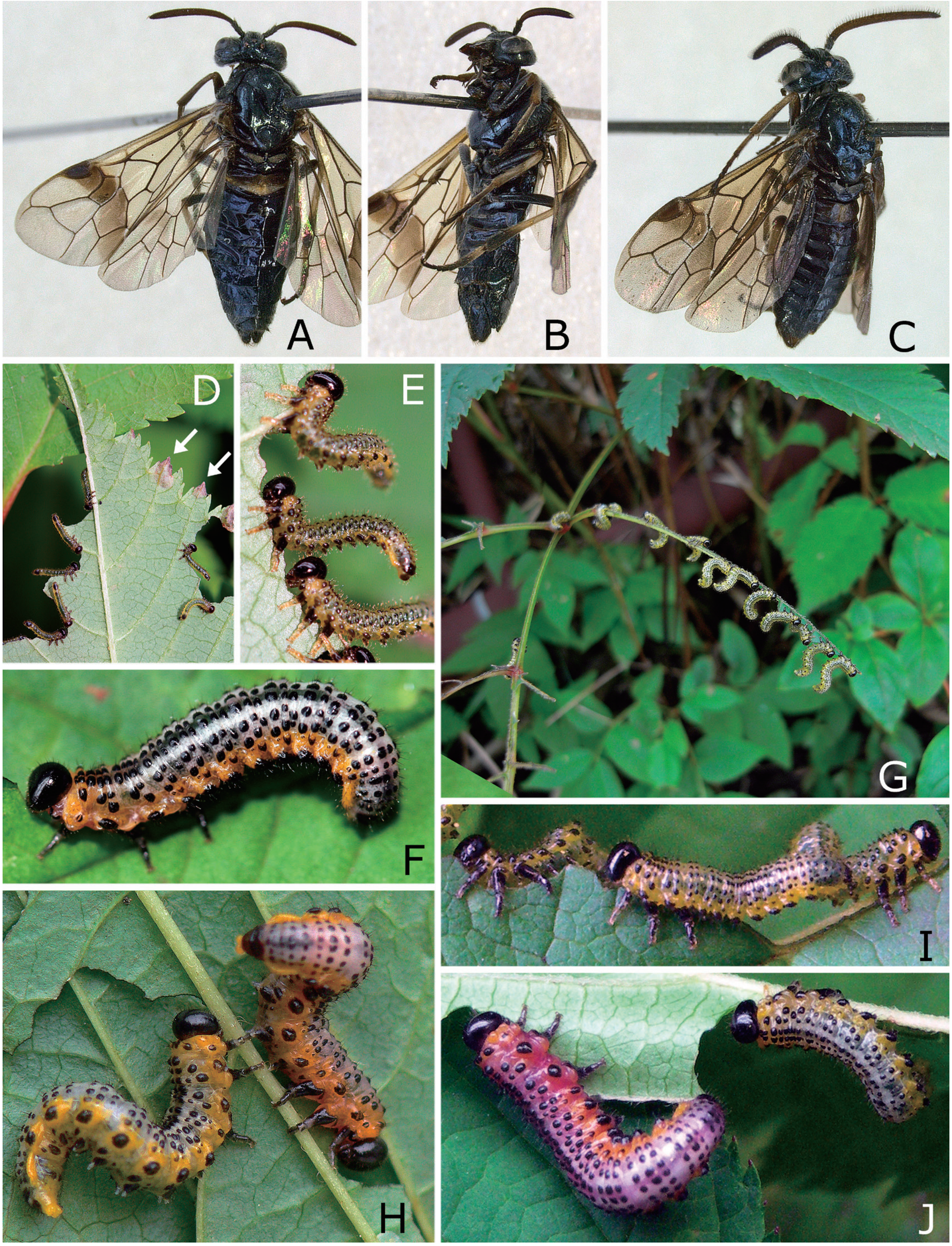
Arge jonasi: Naito *et al.*, 2004, p. 11 [part, not Kirby, 1882].

Female (Fig. 1A, B). Length 7.0–10.0 mm. Black, with weak blue or blue-green metallic reflection; basal and middle abdominal terga with weak violet metallic reflection; subanal area pale brown to black centrally. Flagellum brown to dark brown, rarely orange or black, with colorless reflection. Mandible apically reddish. Palpi dark brown to black. Legs black, with colorless reflection; in pale specimens, brownish on apex of fore femur, dark yellow on fore tibia except for base whitish and on first tarsomere, and yellowish white on middle and hind tibiae and first tarsomeres except for their apices (hind tibia pale on basal three-fourths); in dark specimens, yellowish white on basal third of hind tibia; tibial spurs dark brown to black; claws apically brown. Wings hyaline, yellowish basally, rarely slightly brownish apically; forewing with black band below stigma extending to posterior wing margin, covering almost all or most of cells Rs and 2M, very rarely not covering apical fourth of cell 2M; stigma and veins black, yellow to pale brown on C, Sc, part or most of section of R1 basal to stigma, and apical section of R1; vein C sometimes darkened basally on anterior margin. Setae whitish, brownish on sawsheath and its adjacent areas and sometimes on dorsa of thorax and abdomen; wings with setae blackish, yellowish on basal membranous areas.

Surface generally smooth and polished; punctures on anterior part of head relatively dense, generally separated from each other.

Head in dorsal view (Fig. 2A) slightly concave at outer orbits, with width across eyes about as long as or slightly narrower than width at genae. Distance between eyes 1.1–1.2 × vertical diameter of eye; eye with vertical diameter 1.7–1.8 × horizontal diameter. Postocellar area weakly convex, sometimes medially furrowed, with anterior furrow indistinct and lateral furrow indistinct, often distinct anteriorly (Fig. 2A). Ocellar area slightly concave between ocelli (Fig. 2D, E). Frontal area raised anteriorly, and medially not concave (Fig. 2D), or medially furrowed anteriorly and widely concave or nearly flat posteriorly (Fig. 2E); lateral ridges almost parallel. Distance between median fovea and front ocellus 1.9–2.7 × width of front ocellus. Median fovea deep (Fig. 2D, E), rarely not so deep and with small tubercle below. Interantennal carinae sharp, dorsally becoming blunt, and roundly curved inward and fused with each other (Fig. 2D) or becoming low and narrowly separated from each other (Fig. 2E), ventrally fused together into median supr-

Fig. 1. *Arge aruncus* n. sp. — A, B, Female, holotype, dorsolateral and ventrolateral views; C, male, paratype (brother of holotype), dorsolateral view; D, remains of egg shells (inside leaf tissues, arrowed) and first instar larvae (AS070826A), Minakami, photographed indoors on 2 September 2007; E, early instar larvae (AS070826A), photographed indoors on 6 September 2007; F, late instar larva (AS070826A), photographed indoors on 11 September 2007; G, middle instar larvae (AS090802K), photographed in Nikko on 2 August 2009; H, late instar larvae (HH080617A), photographed indoors on 16 July 2008; I, middle instar larvae (AS060826H), Shiga-kogen, photographed indoors on 27 August 2006; J, do, late instar, photographed on 3 September 2006. D–G, I, J, photographed by A. Shinohara; H, photographed by H. Hara.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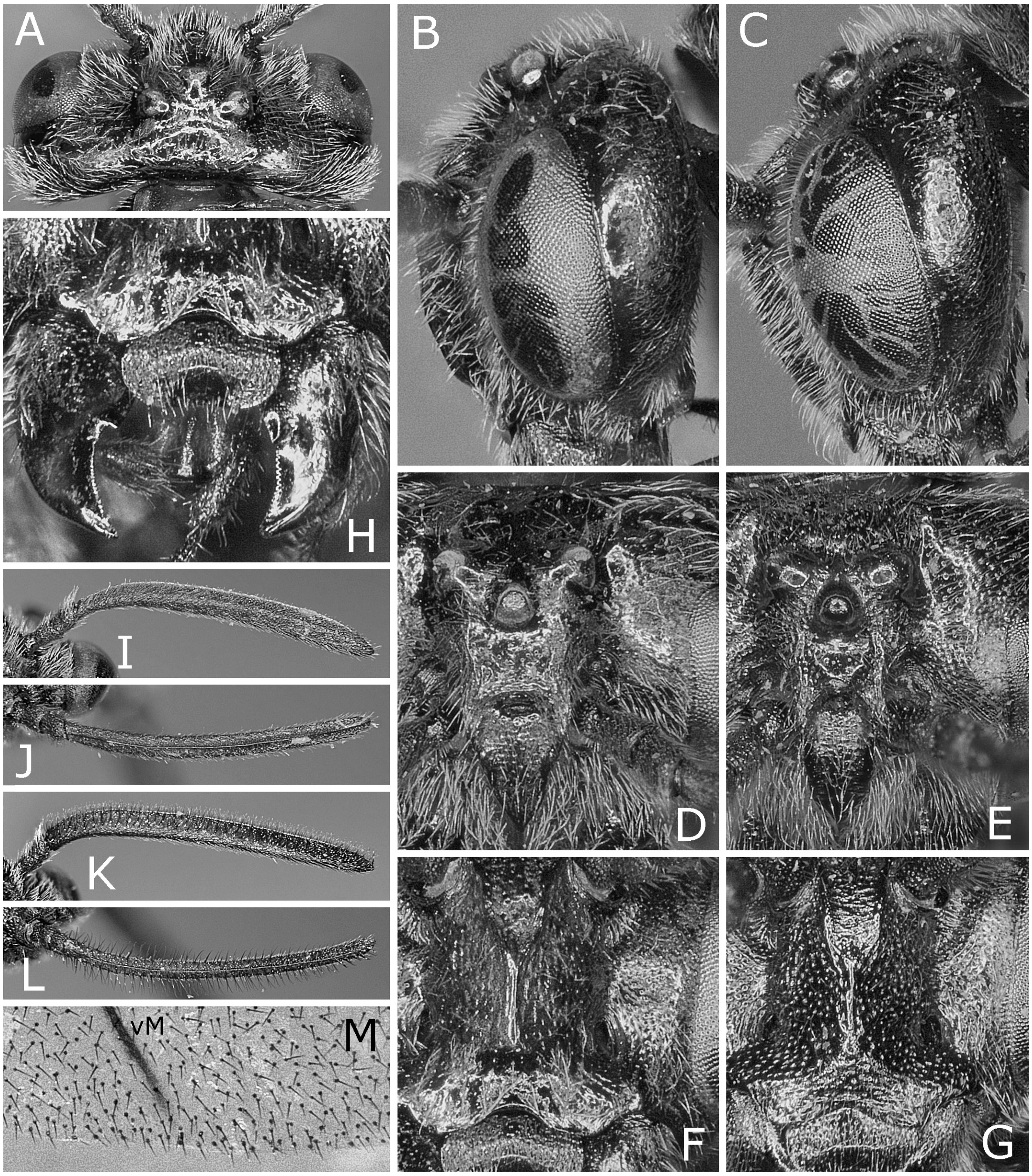

Fig. 2. A, Head, dorsal view; B, C, do, lateral view; D, E, ocellar and frontal areas, anterodorsal view; F, G, supraclypeal area and clypeus, anterior view; H, clypeus to mandibles; I, J, female antenna, inner lateral and ventral views; K, L, male antenna, inner lateral and ventral views; M, apical margin of forewing (vM: vein M). — A, B, D, F, H–J, M, Holotype; C, E, G, female paratype (mother of holotype); K, L, male paratype (brother of holotype).

aclypeal carina at middle of supraclypeal area (Fig. 2D–G). Supraclypeal carina sharp, very rarely rather blunt; side slope almost flattened or weakly rounded, nearly smooth or distinctly rugulose. Malar space 0.8–1.0 × width of front ocellus. Clypeus distinctly sunk below supraclypeal carina, then almost flattened ventrally (Fig. 2B, F), or gently sloping down (Fig. 2C,

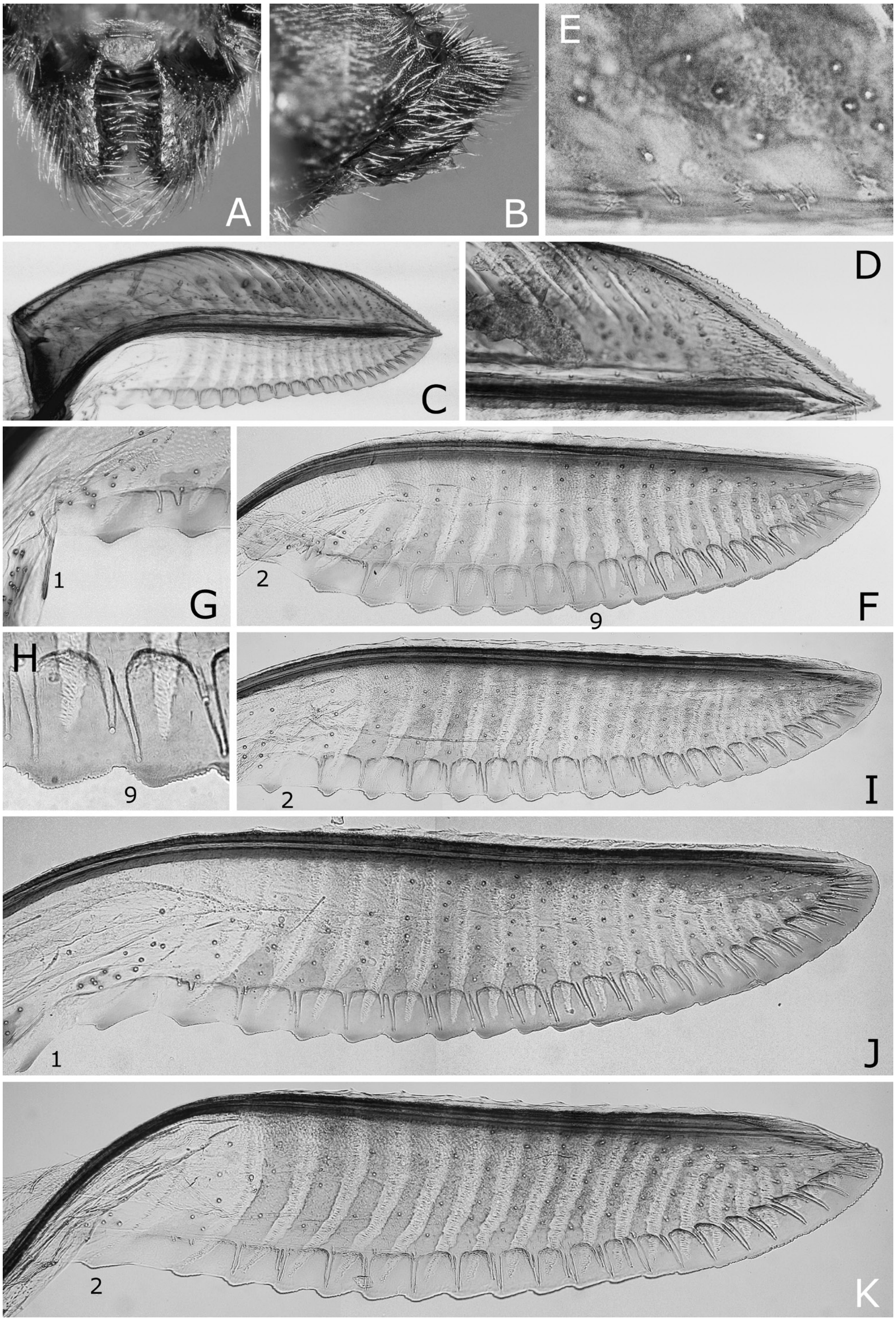

Fig. 3. A, B, Sawsheath, posterodorsal and lateral views; C, saw, lateral view; D, apical part of lance; E, ventral part of middle of lance; F, I–K, lancet; G, basal part of lancet; H, eighth and ninth serrulae. — A–H, Holotype; I, paratype (mother of holotype); J, paratype (AS090802K), Nikko; K, paratype, Mt. Daisen. Numerals in F–K each indicates serrula number.

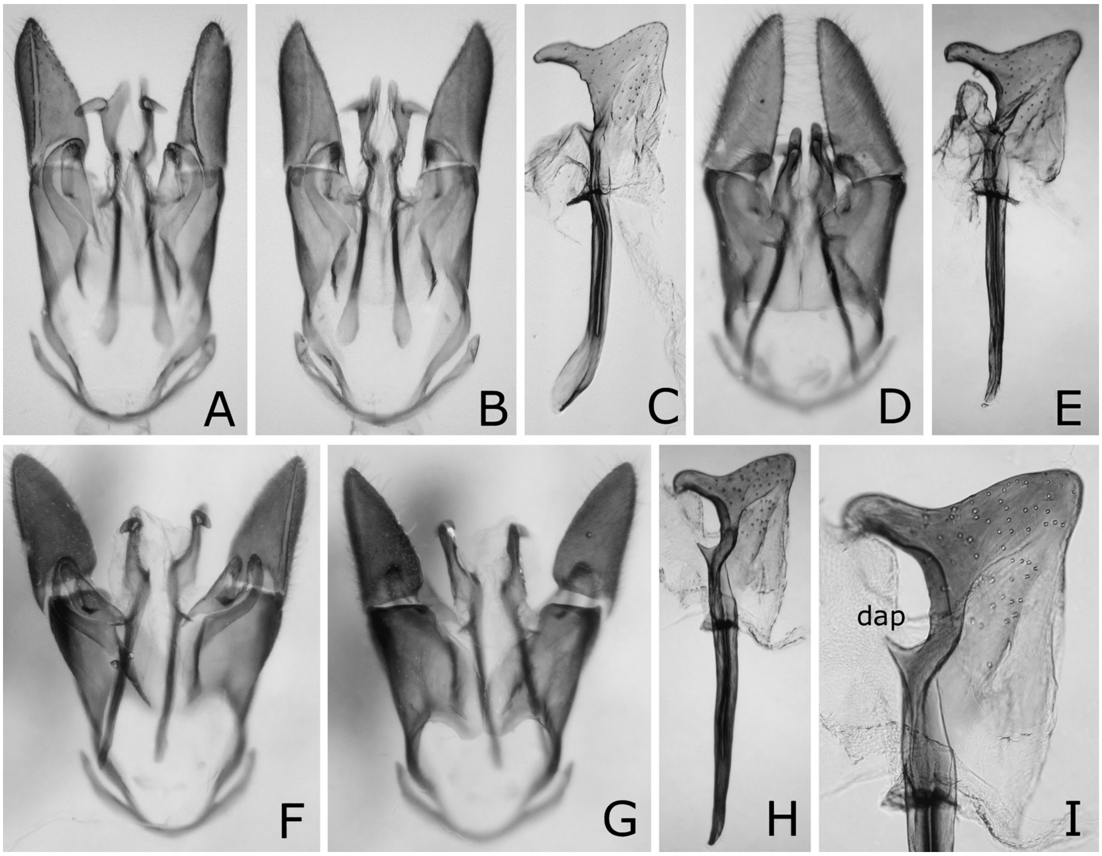

Fig. 4. Male genitalia, paratypes. — A, F, Dorsal view; B, D, G, ventral view; C, E, H, penis valve, lateral view (left dorsal); I, valviceps, lateral view (left dorsal). — A–C, Brother of holotype; D, E, Towada-ko; F–I, Shiga-kogen (AS070806Db) (dap: dorsal apodemal projection).

G); ventral margin roundly or somewhat angularly concave medially (Fig. 2F, G). Antennal length 1.3–1.6 × maximum head width; flagellum (Fig. 2I, J) slightly or hardly compressed, weakly curved basally and narrowly rounded or pointed at apex. Right mandible incised on inner margin (Fig. 2H).

In forewing, cell 1Rs2 with anterior length 1.0–1.3 × posterior length and crossvein 3r-m roundly curved (Fig. 1A), rarely curved angularly or almost straight; in both wings, wing margin between veins Rs and Cu ciliate, with marginal glabrous area narrower than width of vein M and length of marginal setae about 2 × width of vein M (Fig. 2M).

Abdomen with second to fourth terga nearly glabrous above; fifth tergum medially widely glabrous or largely setose; sixth and more posterior terga setose. Seventh sternum with posterior margin weakly roundly produced at middle. Saw-sheath in posterodorsal view (Fig. 3A) longer than wide, basally sunk, medially rounded or with narrow flattened surface along medial margin, with apical margin rounded, lateral margin nearly straight, medial margin basally edged, and basal median lobe small, in lateral view (Fig. 3B) with ventral margin, except for basal convexity, distinctly roundly convex at middle, slightly concave or straight midapically, dorsal margin nearly straight, and apex rounded; inner surface spinose.

Lance with several linear membranous areas (Fig. 3C, D) and groups of very minute setae along ventral margin at middle (Fig. 3E); apical crest finely serrate on dorsal margin (Fig. 3D).

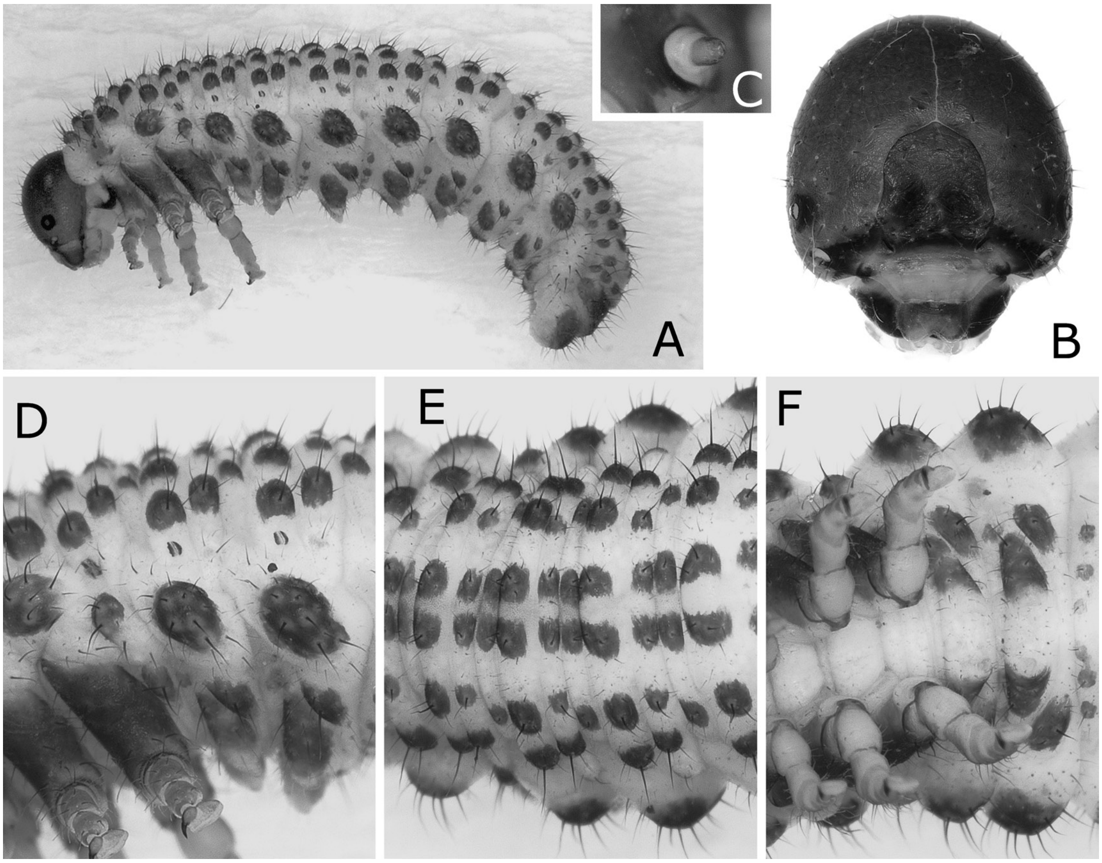

Fig. 5. Mature larva in cocoon (HH080617A). — A, Entire larva, lateral view; B, head, anterior view; C, antenna, ventral view; D–F, first to third abdominal segments, lateral, dorsal and ventral views.

Lancet with dorsal margin slightly roundly convex (Fig. 3F, I) or nearly straight (Fig. 3J, K), ventral margin roundly convex and strongly serrate except for apex, dorsoapically with narrow non-annulate area, and with about 20–24 serrulae; marginal sensillae long; dorsal membranous area narrow, with groups of minute setae at intervals; longitudinal rows of setae very narrow, absent or inconspicuous before first annulus; sclerotized part each on first and second annuli very small, far apart from dorsal margin of lancet; middle annuli each with three to six sensory pores except for ventral ones; basal annuli ventrally curved basally; middle annuli nearly straight; apical annuli nearly straight or slightly arched toward base of lancet; serrulae finely dentate (Fig. 3H), in basal and middle parts of lancet generally subtriangular with long posterior slope (Fig. 3F, I–K).

Male. Length 6.5–8.0 mm. Coloration as in female, but hind tibia sometimes entirely dark brown to black; wings often dark as in Fig. 1C and transverse band below stigma often weakened beyond vein M; genital capsule mostly dark brown. Head in dorsal view with width across eyes slightly longer than width at genae. Interantennal carinae dorsally often sharp and often angularly curved inward. Distance between eyes 1.0–1.2 × vertical diameter of eye; eye with vertical diameter 1.6–1.7 × horizontal diameter. Malar space 0.6–0.8 × width of front ocellus. Antennal length 1.4–1.7 × maximum head width; flagellum distinctly compressed (Fig. 2K, L). In forewing, cell 1Rs2 with anterior length 1.0–1.1 × posterior

Table 1. Summary of rearings.

Locality: Prefecture	Locality: Details	Larval group code*	Number of larvae	Found	Cocooned	Emerged (number and sex**)
Hokkaido	Haobi, 300 m, Shimizu, Tokachi	HH100819A	10	19.VIII.2010	23–26.VIII.	16.V.2011(1♀)
	Mt. Daisengen, 500 m	HH080617A	18 +	(eggs laid 18–21.VI.2008)	(hatched 29.VI.-2. VII.) 11–21.VII.	30.VII.-1.VIII.2008 (9♀9♂)
Tochigi	Hanaishi, 650 m, Nikko	AS090802J	7	2.VIII.2009	5–6.VIII.	15.IX.2009 (1♀)
		AS090802K	12	2.VIII.2009	8.VIII.	26.VIII.-8.X.2009 (5♀1♂), 15. IV.-6. V.2010 (2♀1♂)
		AS090813J	6	13.VIII.2009	dead before maturity	
		AS090922B	2	22.IX.2009	24–25.IX.	dead in cocoons
		AS100724A	several	24.VII.2010	dead before maturity	
		AS110731E	several	31.VII.2011	5.VIII.	dead in cocoons
Gunma	Nishikurozawa, 800 m, Minakami	AS070826A	8	(eggs 26.VIII.2007)	(hatched 2.IX.; moulted 4, 6, 8–9, 11.IX.) 14.IX.	4–17.XI.2007 (4♀1♂)
Nagano	Mt. Kasadake, 1680 m	AS060817A	3	17.VIII.2006	18–20.VIII.	dead in cocoons
		AS060818C	1	18.VIII.2006	20.VIII.	dead in cocoon
		AS110805D	1	5.VIII.2011	6.VIII.	dead in cocoon
	Shiga-kogen, 1600 m	AS060826F	6	26.VIII.2006	6–7.IX.	4–5.XI.2006 (2♀)
		AS060826G	4	26.VIII.2006	4.IX.	28.IX.2006 (1♀)
		AS060826H	8	26.VIII.2006	1–5.IX.	4.X.2006 (1♀)
		AS060902H	7	2.IX.2006	6–10.IX.	30.IX.2006 (1♀)
		AS060902I	7	2.IX.2006	4–10.IX.	4.X.2006 (1♀), 3.XI.2006 (1♀), 22.V.2007 (1♀)
		AS060902J	12	2.IX.2006	10–11.IX.	27.IX.-14.X.2006 (9♀), 7.XI.2006 (1♀)
		AS070806D	1	6.VIII.2007	10.VIII.	27.VIII.2007 (1♀; oviposited)
		AS070806Da (offspring of AS070806D)	7	(eggs laid 27.VIII.2007)	(hatched 7.IX.) 25.IX.	3.XII.2007 (1♂)
		AS070806Db (offspring of AS070806D)	5	(eggs laid 28.VIII.2007)	(hatched 8.IX.) 22–23.IX.	20.X.2007 (1♂)
		AS070904G	8	4.IX.2007	16.IX.	15.XI.2007 (1♀)
		AS090909B	3	9.IX.2009	10–11.IX.	dead in cocoons
	Tsugaike, 1830 m	AS060908D	1	8.IX.2006	13.IX.	dead in cocoon
Tottori	Yokotemichi, 850 m, Mt. Daisen	AS101002B	6	2.X.2010	6–9.X.	22.VII. 2011 (1♀)
	Daisenji, 780 m, Mt. Daisen	AS101004A	4	4.X.2010	5–6.X.	dead in cocoons
		AS101004B	1	4.X.2010	9.X.	dead in cocoon

* Reared by Hara in Bibai or Shintoku (HH) or by Shinohara in Tokyo (AS).

** Other specimens died or were fixed in larval stage.

length. Subgenital plate in ventral view with posterior margin rounded, narrowly truncate apically, or rarely narrowly slightly concave apically.

Genitalia as in Fig. 4; gonostipes in ventral view narrowing apically, with medial margin concave near apex and apical width about as wide as basal width of harpe (Fig. 4B, D, G). Harpe very long, about as long as or slightly longer than ventral medial length of gonostipes, in dorsal view widest near base, pointed apically. Valviceps in dorsal view (Fig. 4A, F) narrow, with narrow dorsal projection near apex projecting laterally, in lateral view (Fig. 4C, E, H, I) with dorsal projection narrow and long, apex narrowly rounded, and dorsal apodemal projection (dap) small.

Larva. Early to middle instars (Fig. 1D, E, G, I): Head black; legs yellow, basally black; trunk pale yellowish gray, laterally yellow, covered with many black spots; subspiracular lobe apically black; 10th abdominal tergum apically black. Late instar (Figs. 1F, H–J, 5) as in early to middle instars, but legs largely black; when matured, trunk becoming pale violet, laterally orange.

Structure (final instar): Length 15 mm; antenna conical or cylindrical (Fig. 5C); clypeus with two pairs of setae; labrum with two pairs of setae; mandible with three to six setae on outer surface; maxillary palp with four palpomeres; palpifer with four to six setae; labial palp with three palpomeres; first to ninth abdominal segments each with three annulets (Fig. 5); prolegs on second to sixth and tenth segments, those on second to sixth elongate; trunk largely setose; dorsal black spots each with several setae, small spots each with one to three setae; tenth tergum in dorsal view rounded apically (Fig. 1H); subanal lobe distinctly extending posteriorly beyond suranal lobe (Figs. 1H, 5A).

Cocoon. Creamy. Length 8–12 mm. Elongate oval, double walled; outer wall netted; inner wall parchment like.

Distribution. Japan (Hokkaido, Honshu).

Material examined. Holotype (Fig. 1A, B): ♀ labeled "JAPAN: HOKKAIDO, Matsumae, Foot of Mt. Daisengen-dake, em. 30. VII.–1. VIII. 2008, H. Hara" and "Part of HH080617A, Egg laid 18–21. VI. 2008, hatched 29. VI.–2. VII., made cocoon 11–21. VII., Host: *Aruncus dioicus* var. *kamtschaticus*". Deposited in the National Museum of Nature and Science, Tsukuba. Paratypes: HOKKAIDO—1♀, Shikaoi, Lake Shikaribetsu-ko, 26–29. VII. 1931, C. Watanabe (HU); 1♀, Tokachi, Shimizu, Haobi, from 10 gregarious larvae (HH100819A), coll. 19. VIII. 2010, made coc. 23–26. VIII., em. 16. V. 2011, Host: *Aruncus dioicus* var. *kamtschaticus*, H. Hara; 1♀, Kamikawa, Sounkyo, 19. VI. 1938, K. Sato; 1♀, Higashikawa, Asahidake-onsen, 25–28. VI. 2003, A. Shinohara; 1♀, do., but 22–23. VI. 2008, T. Naito; 1♀, Shinhidaka, Shizunai, Mauta, 26. VI. 1992, S. Itoh; 1♀ (mother of HH080617A), same locality as holotype, 17. VI. 2008, oviposited on *Aruncus dioicus* var. *kamtschaticus* 18–21. VI. 2008, A. Shinohara; 8♀9♂, same data as holotype. HONSHU—Aomori Pref.: 2♀, Mt. Hakkoda-san, 30. VII. 1955, H. Nagase (HNC); 1♂, Shingo, Mt. Herai-dake, 18. VII. 1987, M. Yamada (MYC); 1♂, Towada, Mt. Ohanabe-yama, 26. VII. 1964, M. Yamada (MYC); 2♀, do., but 15. VII. 1984 (MYC); 1♂, Lake Towada-ko, 2. VIII. 1955, H. Nagase (HNC); 1♂, Ajigasawa, 24. VII. 1994, M. Yamada (MYC). Iwate Pref.: 1♀, Mt. Hayachine-san, 4. VII. 1964, S. Takagi (HU). Akita Pref.: 1♂, Senboku, Nyuto-onsen, 6. VIII. 1956, O. Sato; 1♀, do., but 3. VIII. 1974, Y., T. & H. Suda (HSC). Miyagi Pref.: 1♀, Zao Mts., 25. VII. 1976, A. Shinohara. Tochigi Pref.: 1♀, Nikko, Hanaishi-cho, from larvae (AS090802J) coll. 2. VIII. 2009, made coc. 5. VIII., em. 15. IX. 2009, Host: *Aruncus dioicus* var. *kamtschaticus*, A. & N. Shinohara; 1♀, do., but from larvae (AS090802K) coll. 2. VIII. 2009, matured 8. VIII., em. 26. VIII. 2009; 1♀, do., but em. 9. IX. 2009; 1♀, do., but em. 4. X. 2009; 2♀, do., but em. 5. X. 2009; 1♂, do., but em. 8. X. 2009; 1♀, do., but em. 15. IV. 2010; 1♀, do., but em. 1. V. 2010; 1♂, do., but em. 6. V. 2010. Gunma Pref.: 1♂, Minakami, Nishikurozawa, from larvae (AS070826A) coll. 26. VIII. 2007, matured 14. IX., em. 4. XI. 2007, Host: *Aruncus dioicus* var. *kamtschaticus*, A. & N. Shinohara; 1♀, do., but em. 11. XI. 2007; 2♀, do., but em. 12. XI. 2007; 1♀, do., but em. 17. XI. 2007; 1♀, Minakami, Hoshi, 3. VIII. 1953, J. Yoshikawa; 1♀, Tsumakoi, Kazawa-onsen, 30. VII. 2010, H. Kojima. Niigata Pref.: 1♀, Yuzawa, Takanosu, 28. VII. 1951, T. Okada. Nagano Pref.: 1♀, Yamanouchi, Shiga-kogen, 23. VII. 1998, A. Shinohara; 1♀, same locality, from larvae (AS060826F) coll. 26. VIII. 2006, made coc. 6. IX., em. 4. XI. 2006, Host: *Aruncus dioicus* var. *kamtschaticus*, A. & N. Shinohara; 1♀, do., but made coc. 7. IX., em. 5. XI. 2006; 1♀, do., but from larvae (AS060826G) coll. 26. VIII. 2006, made coc. 4. IX., em. 28. IX. 2006; 1♀, do., but from larvae (AS060826H) coll. 26. VIII. 2006, made coc. 3. IX., em. 4. X. 2006; 1♀, do., but from larvae (AS060902H) coll. 2. IX. 2006, made coc. 6. IX., em. 30. IX. 2006; 1♀, do., but from larvae (AS060902I) coll. 2. IX. 2006, made coc. 7. IX., em. 4. X. 2006; 1♀, do., but matured. 4–10. IX., em. 3. XI. 2006; 1♀, do., but matured. 9. IX., em. 22. V. 2007; 2♀, do., but from larvae (AS060902J) coll. 2. IX. 2006, made coc. 10. IX., em. 27. IX. 2006; 1♀, do., but em. 28. IX. 2006; 1♀, do., but em. 11. X. 2006; 1♀, do., but em. 7. XI. 2006; 1♀, do., but made coc. 11. IX., em. 30. IX. 2006; 1♀, do., but em. 1. X. 2006; 1♀, do., but em. 3. X. 2006; 1♀, do., but em. 4. X. 2006; 1♀, do., but em. 14. X. 2006; 1♀, do., but from larva (AS070806D) coll. 6. VIII. 2007, matured 10. VIII., em. 27. VIII. 2007, oviposited 27–28. VIII.; 1♂, do., but offspring of AS070806D (AS070806Da), egg laid 27. VIII. 2007, hatched 7. IX., matured 25. IX., em. 3. XII. 2007; 1♂, do., but (AS070806Db), hatched 8. IX., matured 22–23. IX., em. 20. X. 2007; 1♀, do., but from larva (AS070904G) coll. 4. IX. 2007, matured 16. IX., em. 15. XI. 2007; 1♀, Togo, Jizo-toge, 30. VII. 2010, H. Kojima; 1♀, Mt. Asama-yama, 27–28. VII. 1972, M. Kuboki; 1♂, do., but 1. VIII. 1980, K. Mizuno; 1♀, Yatsugatake Mts., 23. VII. 1970, A. Shinohara; 2♀, Yatsugatake Mts., Minoto, 18. VII. 1980, A. Shinohara; 5♀, do., but 24–26. VII. 1980; 1♂, do., but 29. VII. 1982; 1♀, do., but 5. VIII. 1982; 1♀, do., but 29. VII.–3. VIII. 1986; 1♀, do., but 6–9. VIII. 1991; 1♂, Yatsugatake Mts., Akadake-kosen, 2. VIII. 1972, A. Shinohara; 1♀, Ogisawa, 23. VII. 1981, A. Shinohara; 1♀, Kamikochi, 12. VIII. 1951, S. Ito (OPU). Yamanashi Pref.: 1♀, Mt. Kinpu-san, 1. VII. 1963, T. Naito (KU). Ishikawa Pref.: 1♀, Mt. Haku-san, 24. VII. 1957, Takeuchi (OPU); 1♀, do., but "2. VIII. 196", T. Naito (KU). Hyogo Pref.: 1♀, Shin-onsen, Hataganaru, 28. V. 1954, T. Okutani [probably cited as *A. jonasi* by Naito *et al.*, 2004] (KU); 1♀, do., but 19–23. VII. 1959, K. Nagata (KU); 1♀, do., but 22. VI. 1999, T. Ikeda (MNHAH). Tottori Pref.: 1♀, Mt. Daisen, VI. 1920, N. Marumo (KU); 1♀, Mt. Daisen, Yokotemichi, from larvae (AS101002B) coll. 2. X. 2010, matured 6. X., em. 22. VII. 2011, Host: *Aruncus dioicus* var. *kamtschaticus*, A. Shinohara. Other material (larvae in ethanol, see Table 1 for collecting data): 5 late instar and mature larvae, part of HH080617A; 1 middle instar larva, part of AS060826H, fixed 27. VIII. 2006; 1 early instar larva, part of AS060902J, fixed 5. IX. 2006; 6 middle and late instar larvae, part of AS070806Da, b, fixed 20–25. IX. 2007; 4 late instar larvae, part of AS070904G, fixed 18. IX. 2007.

Etymology. The specific epithet, *aruncus*, refers to the host plant and is a noun in apposition.

Host plant. Rosaceae: *Aruncus dioicus* (Walter) Fernald var. *kamtschaticus* (Maxim.) H. Hara.

Field observations and rearing records. Rearings are summarized in Table 1. A group of eight eggs (AS070826A) were found in late August in the field. They were laid in a row on the margin of a leaflet (Fig. 1D). One field-collected female (mother of HH080617A) and one reared female (AS070806D) laid eggs in the same manner in the laboratory. Larvae found in the field were solitary or gregarious ($n = 1$–12). They fed on leaves, leaving thick veins (Fig. 1G), and when disturbed, they raised and often twisted their abdomens (Fig. 1E, G, H). The number of larval instars was five in the larval group AS070826A; the male larvae may have only four instars, but this has not been recorded. Larvae spun cocoons within soil or among leaves or paper in the laboratory.

In Hokkaido, the offspring of a female collected in middle June (HH080617A) became adults during July and August in the same year, and a larva of a group (HH100819A) found in middle August became an adult in May in the following year. In mountainous areas of Honshu, larvae were found for a long period from late July to early October, and they became adults (28♀3♂) from late August to middle November in the same year, except for five individuals (2♀1♂AS090802K, 1♀ of AS060902I, 1♀ of AS101002B) which became adults in April to May and July in the following year. The offspring of the female which emerged in late August (AS070806Da, b) became adults in October and December in the same year.

Under the rearing conditions, egg period lasted about 10 days, larval period about 12–19 days, and total immature period about 42–98 days without hibernation (HH080617A, AS070806Da, b). Cocoon period was 17–69 days in non-hibernating individuals and 255–289 days in hibernating individuals.

Discussion

Comparison with Related Species

Arge aruncus is one of the blue-black species having hyaline wings with a black transverse band on the forewing and a basally pale hind tibia, though the males sometimes have entirely dark tibiae. This species is characterized by the relatively slender and apically rounded sawsheath (Fig. 3A) in the female, and the very long harpe and the long and laterally curved dorsal projection of the valviceps (Fig. 4) in the male. A combination of the following characters is also useful to recognize this species: Setae mostly whitish laterally and ventrally; abdomen without pale areas; hind coxa to femur black; hind tarsus black, sometimes pale at base of first tarsomere; wings with stigma mostly black, veins dark except for C, Sc and apical section of R1 pale and section of R1 basal to stigma partly pale (vein C sometimes darkened basally on anterior margin); frontal area raised anteriorly; interantennal carinae sharp, dorsally fused or narrowly separated from each other, and ventrally fused into sharp supraclypeal carina; male antenna distinctly compressed, 1.4–1.7 × head width; right mandible with notch on inner margin; in both wings, wing margins between veins Rs and Cu distinctly ciliate, with marginal glabrous area narrower than width of vein M and marginal setae about 2 × width of vein M; in female, seventh sternum normal; lance with linear membranous areas; lancet ventrally serrate except for apex, with rows of setae between annuli very narrow; in male genitalia, gonostipes in ventral view narrowing apically.

In Gussakovskij's (1935) key, this species may run to *A. potanini* Jakowlew, 1891, "*A. fulvicornis* Mocs." (= *Spinarge fulvicornis* (Mocsáry, 1909)) or *A. jonasi* (Kirby, 1882). In Takeuchi's (1939) key, this species runs to *A. jonasi*. *Arge aruncus* has the legs not bluish and the female antenna 1.1–1.2 times as long as the mesonotum including the mesoscutellum, while *A. potanini* has the legs green blue and the antenna as long as the mesonotum (Jakowlew, 1891; Gussakovskij, 1935; see also Shinohara *et al.*, 2011). Wei *in* Wei and Nie (2003) described *A. sinensis* from China, a species similar to *A. potanini*. *Arge aruncus* is distinguished from *A. sinensis* by the sawsheath relatively slender and apically widely rounded, and the valviceps with a long dorsal projection near the apex (the sawsheath robust and apically narrowly rounded, and the valviceps without a distinct projection in *A. sinensis*, fig. 28–174 in Wei and Nie, 2003). For the differences of *Arge* and *Spinarge*, see Hara and Shinohara (2006). *Arge jonasi* is similar to *A. kobayashii* Takeuchi, 1931 and *A. solowiyofka* (Matsumura, 1911) (Hara *et al.*, 2007). All three species differ from *A. aruncus* in having a noncarinate or weakly carinate median supraclypeal ridge, non-ciliate apical wing margins and a robust sawsheath.

The larva of this species is easily distinguished from those of Japanese congeners by the host plant and the combination of the black head and legs (apically yellow in early instars) and the black spotted and rather densely setose trunk. The pale violet and orange ground color of the trunk of the mature larva is also quite characteristic.

Life History

In the field, the adults were collected in late May to middle August, and the larvae were found in late July to early October. This species probably has two or more generations a year, because the adult and larval seasons in the field are long and the minimum total immature period was about 40 days in the laboratory. Under rearing conditions, larvae collected in August and September partly became adults in the same year and partly in the following year. This was observed even in larvae of the same group (Table 1, AS090802K, AS060902I). Cocoon periods greatly varied, about 20–70 days in non-hibernating individuals and about 250–290 days in hibernating individuals. We regard the adult emergence of *A. aruncus* as polymodal, a common feature in multivoltine species of the genus (Shinohara and Hara, 2008, 2009; Shinohara *et al.*, 2009; Hara and Shinohara, 2011). Some adults emerged in November and December in the laboratory. In that season, no fresh leaves are available in the field and such late emergence apparently occurs only under laboratory conditions.

As noted in the introduction, only two sawfly species (*Nematus* (*Pteronidea*) *spiraeae* of the Tenthredinidae and *Pamphilius daisenus* of the Pamphiliidae) were known to feed on *Aruncus dioicus*. This is the first record of *Aruncus* as a host plant of argid sawflies.

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