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Arge meliosmae n. sp. (Hymenoptera, Argidae) Feeding on *Meliosma myriantha* in Japan

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Abstract *Arge meliosmae* Shinohara and Hara, n. sp., is described from Honshu, Japan. It belongs to a group of species characterized by the strongly produced and medially deeply incised hypopygium in the female and the presence of a long dorsal process at the apex of the valviceps in the male. The late instar larva is a conspicuous, largely orange yellow gregarious leaf-feeder on *Meliosma myriantha* Siebold et Zucc. (Sabiaceae). This is the first record of *Meliosma* as a host plant for *Arge* species and the first record of Sabiaceae as a host plant for sawflies in the Old World.

Key words : Hymenoptera, Argidae, *Arge meliosmae,* new species, *Meliosma myriantha,* life history.

During our revisional works on the sawfly genus *Arge* (Hymenoptera, Argidae) of Japan, one very peculiar, brilliantly colored and apparently undescribed species came to our attention several years ago. The species was left undescribed mainly because of the paucity of material. We were able to examine only one female collected in Onikobe Spa in Miyagi Prefecture in 1965 and one male collected in Toriiji-Ohasumi in Yamanashi Prefecture in 1988, both localities in Honshu. No additional material of this argid became available in spite of our extensive search for the species.

On September 30, 2009, Ibuki found a group of young argid larvae feeding gregariously on a leaf of *Meliosma myriantha* Siebold et Zucc. (Sabiaceae) in Bicchuzawa at an altitude of 125 meters in Tochigi Prefecture, Honshu. Sawflies feeding on *Meliosma* were unknown in Japan, and we were not able to identify the larvae because attempts to rear them and a few additional larvae collected thereafter failed. Beginning in early May 2010, Ibuki continuously paid close attention to several *Meliosma* trees at the same and nearby localities to rediscover the sawfly. The efforts were in vain until August 11, when he found a group of the same larvae on exactly the same tree as in 2009. Several additional groups of larvae were found thereafter and rearing them finally succeeded. On September 12, 2010, the first female adult emerged, and it was conspecific with the argid previously known from a pair of adults from Miyagi and Yamanashi Prefectures.

Here, we describe this species under the name *Arge meliosmae* and give notes on its life history mainly based on the rearings and observations by Ibuki.

Materials and Methods

The material used in this work is kept in the National Museum of Nature and Science, Tokyo.

Most of the larvae were collected in Bicchuzawa (125–140 m alt., ca. N36-45-50 E140-9-33), a small and undisturbed valley in Wami, Nakagawa Town, Tochigi Prefecture, Honshu. Rearings were made by Ibuki in a room without air-conditioning at Bambi Farm in Wami (230 m), Nakagawa, except for a few rearings made by Shinohara in Kuramae (2 m), Tokyo Metropolis. The day length in the rearing rooms was not regulated, but the light was usually on for about 16 hours a day. We follow Viitasaari (2002) for larval morphological terminology.

Arge meliosmae Shinohara and Hara, n. sp.
[Japanese name: Awabuki-churenji]
(Figs. 1A–D, G, H, J, K, M–O, 2A, C, D, F–I, 3, 4, 5A–E, 6, 7; Tables 1–4)

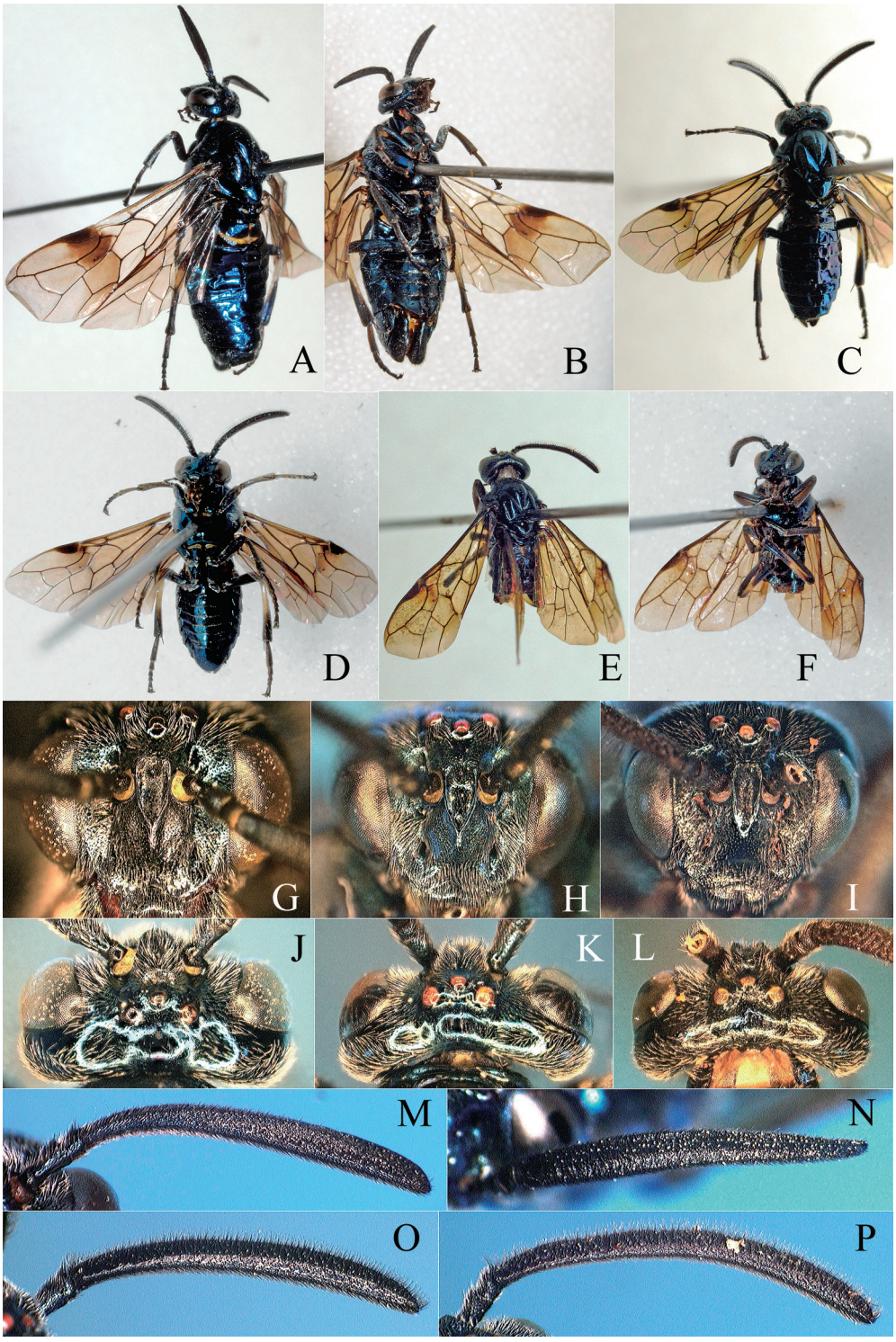
Female (Fig. 1A, B). Length about 10.5–12 mm. Black, with vivid bluish reflection. Antenna black, without distinct metallic reflection; mandible bluish black basally and dark ferruginous apically. Legs black with bluish reflection; only basal half of hind tibia (except for extreme base) creamy white. Wings hyaline, slightly infuscated, with distinct blackish band below stigma, covering base of cell 2R1, and most of cells Rs, 2M and 3Cu; stigma and veins blackish brown, with extreme base of stigma and adjacent areas of vein C and basal section of vein R1 and anterior part of crossvein 1r-rs creamy white; veins C and Sc mostly brownish white. Subanal area (areas between sawsheath and apical tergum and between cerci) usually mostly yellowish white (Fig. 2G).

Surface generally smooth and shining; punctures on anterior part of head fine and distinct, generally separated from each other. Head and thorax covered with silvery hairs.

Head in dorsal view (Fig. 1J) not dilated behind eyes. Distance between eyes 1.1× vertical diameter of eye; eye with vertical diameter 1.6× horizontal diameter. Postocellar area very weakly convex, anterior and lateral furrows defined as obscure slight depression. Ocellar area scarcely concave between ocelli. Frontal area anterolaterally raised and widely and shallowly depressed along mid line (Fig. 1J); this depression separated anteriorly from median fovea by low horizontal ridge, which is medially notched and marks dorsal margin of interantennal area. Interantennal area rather shallow, with rounded bottom, with lateral carinae sharply defined, dorsal ends bent inwards, becoming blunt and low and connected with each other to form low and broadly notched horizontal ridge, and ventrally fused with each other above middle of supraclypeal area (Fig. 1G). Supraclypeal area with median ridge bluntly carinate, with side slope weakly convex (Fig. 1G). Malar space 0.9–1.0× width of front ocellus. Clypeus flattened ventrally, with ventral margin rather deeply roundly incised medially (Fig. 1G). Antennal length 1.6–1.8× maximum width of head; flagellum (Fig. 1M, N) laterally compressed in apical half, weakly curved basally and narrowly rounded at apex in lateral view, with four longitudinal carinae, dorsal one blunt and obsolete basally, ventral one (seam line) sharp and entire, and anterior and posterior ones rather blunt and obsolete near apex.

In forewing, cell 1Rs2 with anterior length 1.0–1.3× posterior length, and crossvein 3r–m broadly roundly curved; in both wings, wing margin between veins Rs and Cu ciliate, with marginal glabrous area much narrower than width of vein M and marginal setae much longer than width of vein M (Fig. 2C); marginal setae shortly protruding beyond wing margin.

Fig. 1. *Arge meliosmae* (A–D, G, H, J, K, M–O) and *A. curvatantenna* (E, F, I, L, P). — A, Female, holotype, dorsal view; B, do., ventral view; C, male, paratype, Bicchuzawa (Group F), dorsal view; D, do., ventral view; E, male, holotype, dorsal view; F, do., ventral view; G, head, female, paratype, Bicchuzawa (Group E), frontal view; H, do., male, paratype, Bicchuzawa (Group F), frontal view; I, male, holotype, frontal view; J, same as G, dorsal view; K, same as H, dorsal view; L, same as I, dorsal view; M, antenna, female, holotype, dorsal view; N, do., frontal view; O, do., male, paratype, Bicchuzawa (Group F), dorsal view; P, do., male, holotype, dorsal view.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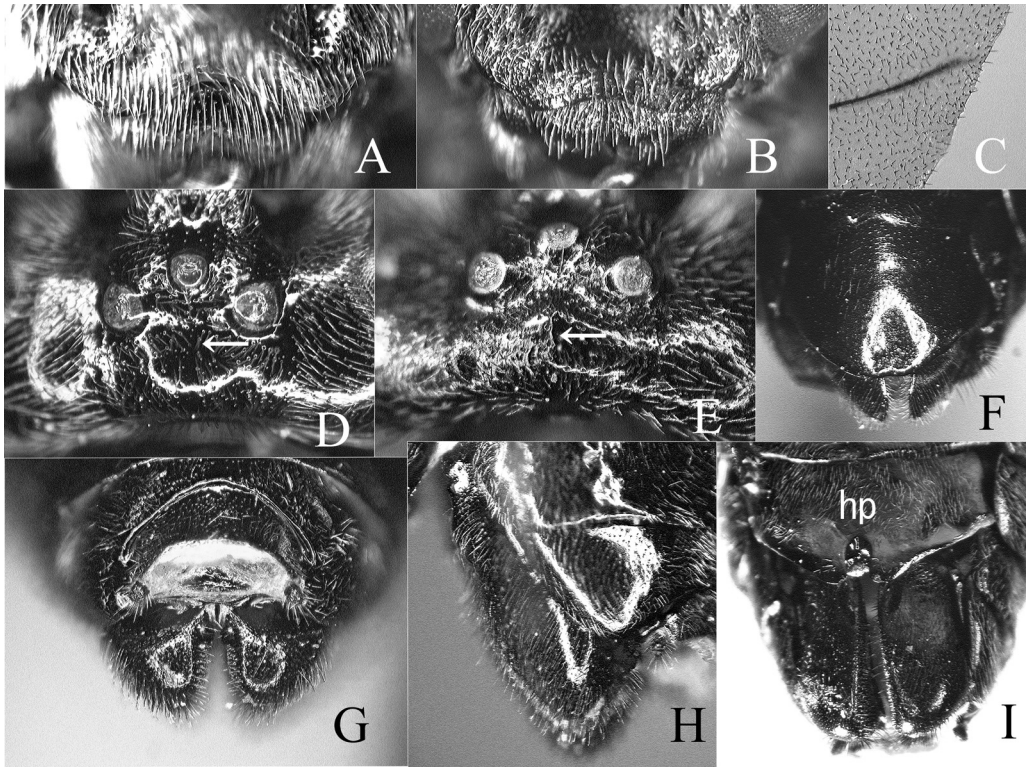

Fig. 2. *Arge meliosmae* (A, C, D, F–I) and *A. curvatantenna* (B, E). — A, Clypeus, male, paratype, Bicchuzawa (Group F), frontal view; B, do., male holotype, frontal view; C, outer margin of forewing near vein M, female, holotype; D, ocellar and postocellar areas, male, paratype, Bicchuzawa (Group F), dorsal view (very weakly convex anterior part of postocellar area arrowed); E, do., male, holotype, dorsal view (strongly convex and bluntly ridged anterior part of postocellar area arrowed); F, subgenital plate, male, paratype, Bicchuzawa (Group F), ventral view; G, caudal part of abdomen and sawsheath, female, paratype, Bicchuzawa (Group E), posterodorsal view; H, do., lateral view; I, do., ventral view (hp: hypopygium with strongly produced and medially deeply incised posterior margin).

Abdominal terga glabrous, except for lateral parts; sixth and more posterior terga also dorsally sparsely setose. Hypopygium with posterior margin strongly subtriangularly produced and very deeply roundly incised at middle, thus appearing bilobed at apex (Fig. 2I). Sawsheath in posterodorsal view (Fig. 2G) with lateral margin weakly rounded, apex very broadly rounded, and medially not distinctly incised; dorsomedial ridge blunt and its lateral slope weakly rounded; in lateral view (Fig. 2H), ventral margin, except for basal convexity, very weakly roundly convex, dorsal margin weakly rounded, and apex very broadly rounded; inner surface spinose.

Lance strongly sclerotized and pigmented, with distinct annuli and some linear membranous areas midapically; apical crest developed, with dorsal margin finely serrate and not swollen dorsally (Fig. 3A). Lancet (Figs. 3B, 4) with dorsal margin nearly straight and ventral margin roundly convex, with 23–24 serrulae and narrow nonannulate area dorsoapically; dorsal marginal membranous area well developed, broadest midapically, with rather long marginal setae; marginal sensilla very long; longitudinal rows of setae between annular plates present from apical margin of second or third annulus; annular plates in basal three annuli present only ventrally; fourth annular plate narrowed dorsally but reaching dorsal margin; fifth to 15th to 17th annular

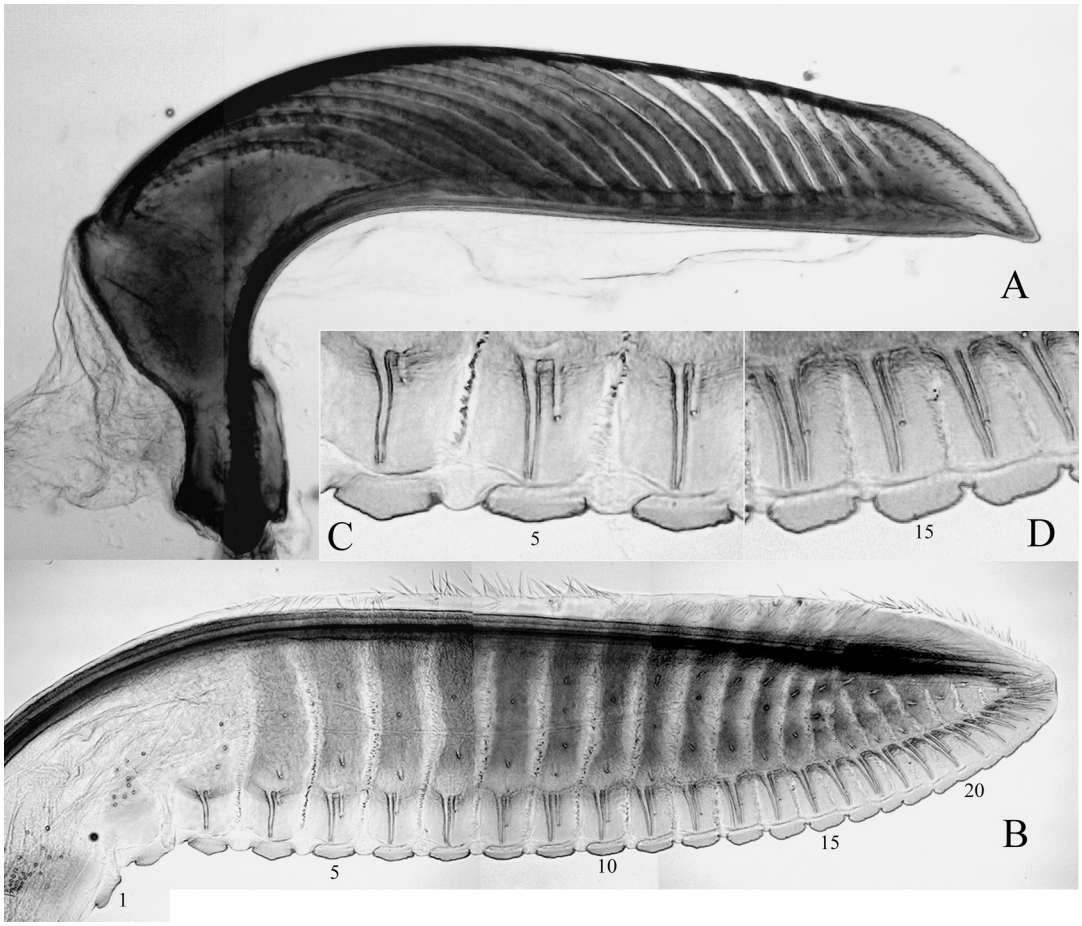

Fig. 3. Lance and lancet, *Arge meliosmae*, holotype. — A, Lance, lateral view; B, lancet, lateral view; C, 4th to 6th serrulae; D, 14th to 16th serrulae.

plates fully developed but more apical annular plates more or less fused; third and more apical annular plates each with one to three pores of sensilla in addition to ventral marginal sensilla; serrulae rather flat, and, except those in apical part of lancet, apparently separated from (or segmented to) main body of lancet (Fig. 3C, D).

Male (Fig. 1C, D). Length about 8.5–9.5 mm. Color similar to that of female. Wings infuscated, with cloud below stigma obscure, not recognizable posteriorly to vein M; veins blackish brown, with most of vein C and adjacent areas of basal section of vein R1 dark yellow.

Structure similar to that of female. Distance between eyes 1.0–1.1× vertical diameter of eye; eye with vertical diameter 1.5–1.6× horizontal diameter. Malar space 0.7× width of front ocellus. Antennal length 1.5–1.7× maximum width of head; flagellum compressed, with sharp ventral carina (Fig. 1O). In forewing, cell 1Rs2 with anterior length 1.1–1.2× posterior length. Subgenital plate (Fig. 2F) with posterior margin broadly rounded. Gonostipes in ventral view slightly widened apically, with median margin very slightly concave, apical margin subtruncate or very shallowly concave, with apical width much broader than basal width of harpe (Fig. 5A, B). Harpe gradually narrowing towards apex. Penis valve with valviceps flat in dorsal view (Fig. 5A, B), with long dorsolateral process at apex directing anteriorly, and elongate ventral process at middle (Fig. 5A–E).

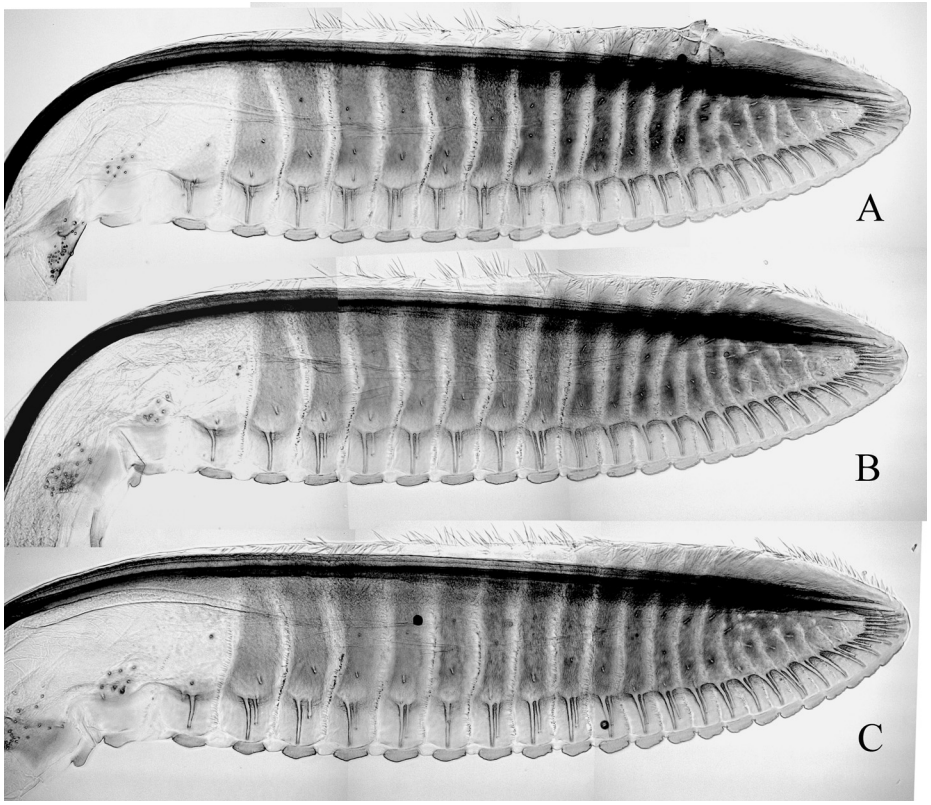

Fig. 4. Lancets, *Arge meliosmae*, paratypes, Bicchuzawa. — A, Group E (Table 1); B, same data; C, Group C (Table 1).

Larva (Figs. 6D–H, 7). Male with four instars. First instar (Fig. 6F): Greenish white (infested greenish leaf inside visible from outside), with black head; prothoracic shields, cervical sclerite, coxae of thoracic legs, subspiracular lobes, prolegs, and scattered small spots on each segment of trunk brownish; head and trunk covered with long dark hairs. Second and third (middle) instars (Figs. 6G, 7H): Pale yellow, with black head; coxae of thoracic legs, tarsal claws, and scattered spots on dorsum of each segment of trunk dark brownish; posterior dorsal areas of trunk more or less darkened. Fourth (last) instar (Figs. 6H, 7A–G): Length about 20–25 mm; orange yellow, with dorsal part of trunk (except for 10th abdominal segment) more or less dark grayish; small area including stemmatum, narrow anterior base of mandible, cervical sclerite, and large markings on dorsal grayish area of trunk (rather irregular transverse marking on each annulus) black; antenna, labrum, palpi, and spiracles dark brown. Hairs on pale areas pale brownish to orange and those on dark areas blackish. Antenna conical (Fig. 7C); clypeus with two pairs of setae; labrum with two pairs of setae; mandible with eight setae on outer surface; maxillary palp four-segmented; palpifer with seven setae; labial palp three-segmented; first to ninth abdominal segments each with three annulets and subspiracular lobe angularly convex; prolegs on second to sixth and 10th segments, those on second to sixth elongate; 10th tergum in dorsal view broadly rounded apically (Fig. 7E, F).

Cocoon (Fig. 6I). Length 12.5–13.5 mm in female, 10.5–11.5 mm in male. Pale ochreous. Elongate oval, double walled; outer wall netted and inner wall parchment like.

Holotype. ♀, Bicchuzawa, 125 m, N36-45-50

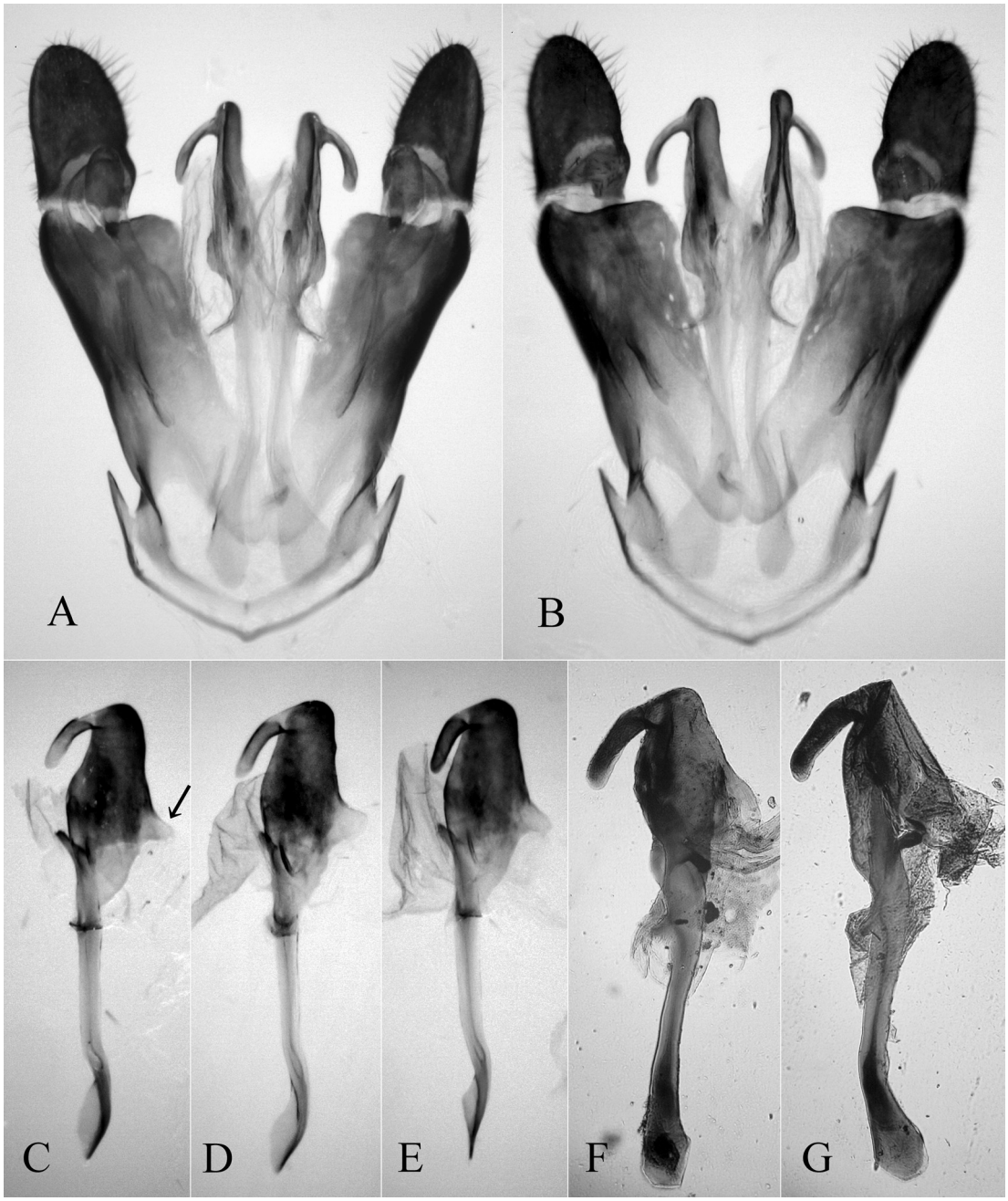

Fig. 5. Male genitalia, *Arge meliosmae*, paratypes, Bicchuzawa (Group E) (A–E) and *A. curvatantenna*, holotype (F, G). — A, Genital capsule, dorsal view; B, do., ventral view; C, penis valves, left dorsal (ventral process arrowed); D, do.; E, do., same specimen as A and B; F, G, right and left penis valves, mounted on slide (depressed and distorted).

E140-9-33, Wami, Nakagawa, Tochigi Pref., larva coll. 18. VIII. 2010 (Group E; mother of E2a, b, Table 2), mat. 27. VIII., em. 14. IX. 2010, Host: *Meliosma myriantha* Siebold et Zucc., S. Ibuki.

Paratypes. Miyagi Pref.: 1♀, Onikobe spa, 24.

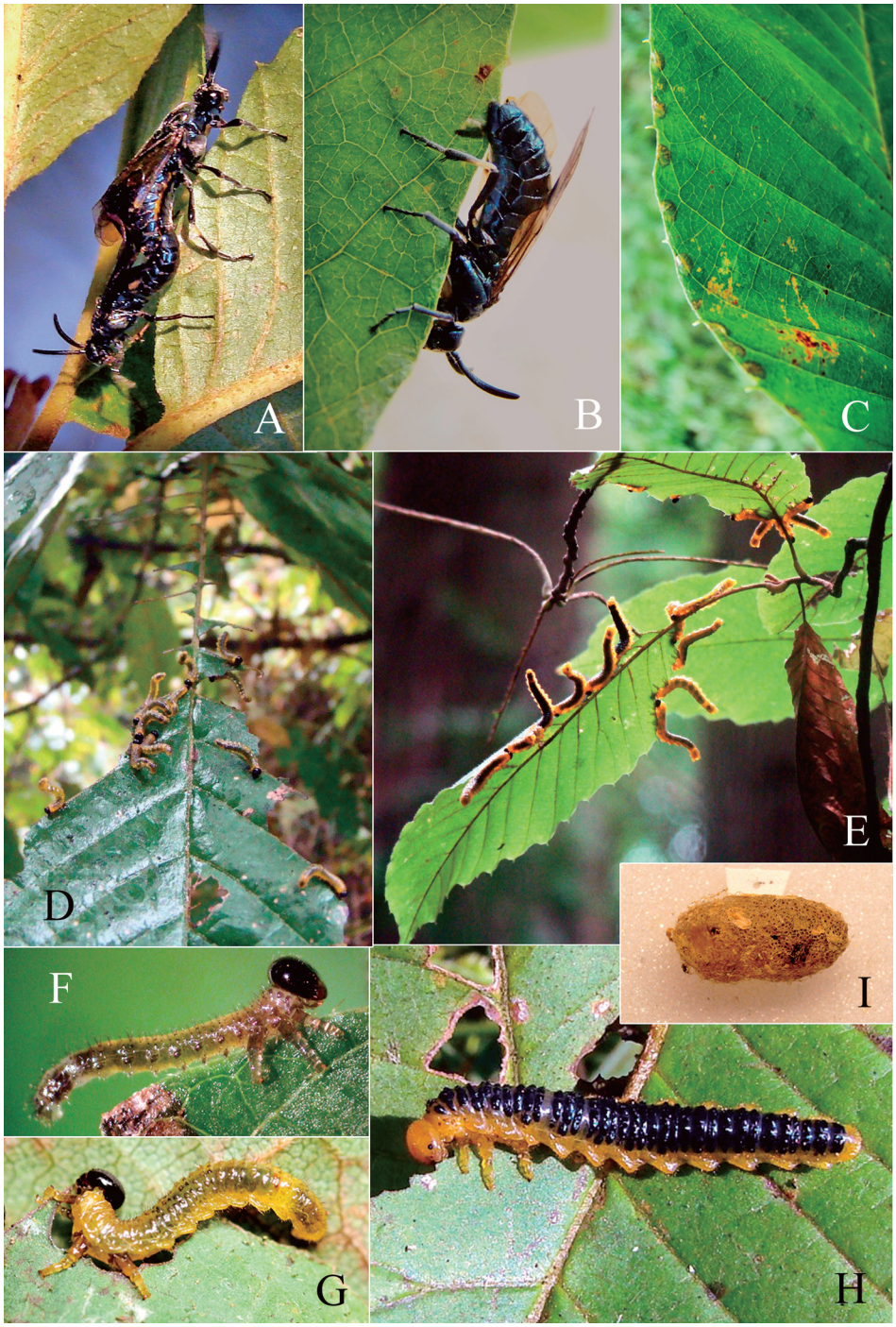

Fig. 6. *Arge meliosmae*, adults (A, B), eggs inserted into margin of a leaf (C), larvae (D-H), and cocoon (I), photographed by Ibuki in Nakagawa in 2010, unless otherwise stated. — A, Copulating pair, September 18; B, ovipositing female, mother of Group E1a, b (Table 2), September 14; C, Group E2a (Table 2), September 16; D, early instar larvae, September 30, 2009; E, group of 16 middle and late instar larvae, Group C (Table 1), August 15; F, first instar larva, Group E2a (Table 2), October 6; G, middle instar larva, photographed by Shinohara in Tokyo on October 2, 2009; H, last instar larva, October 15, 2009.

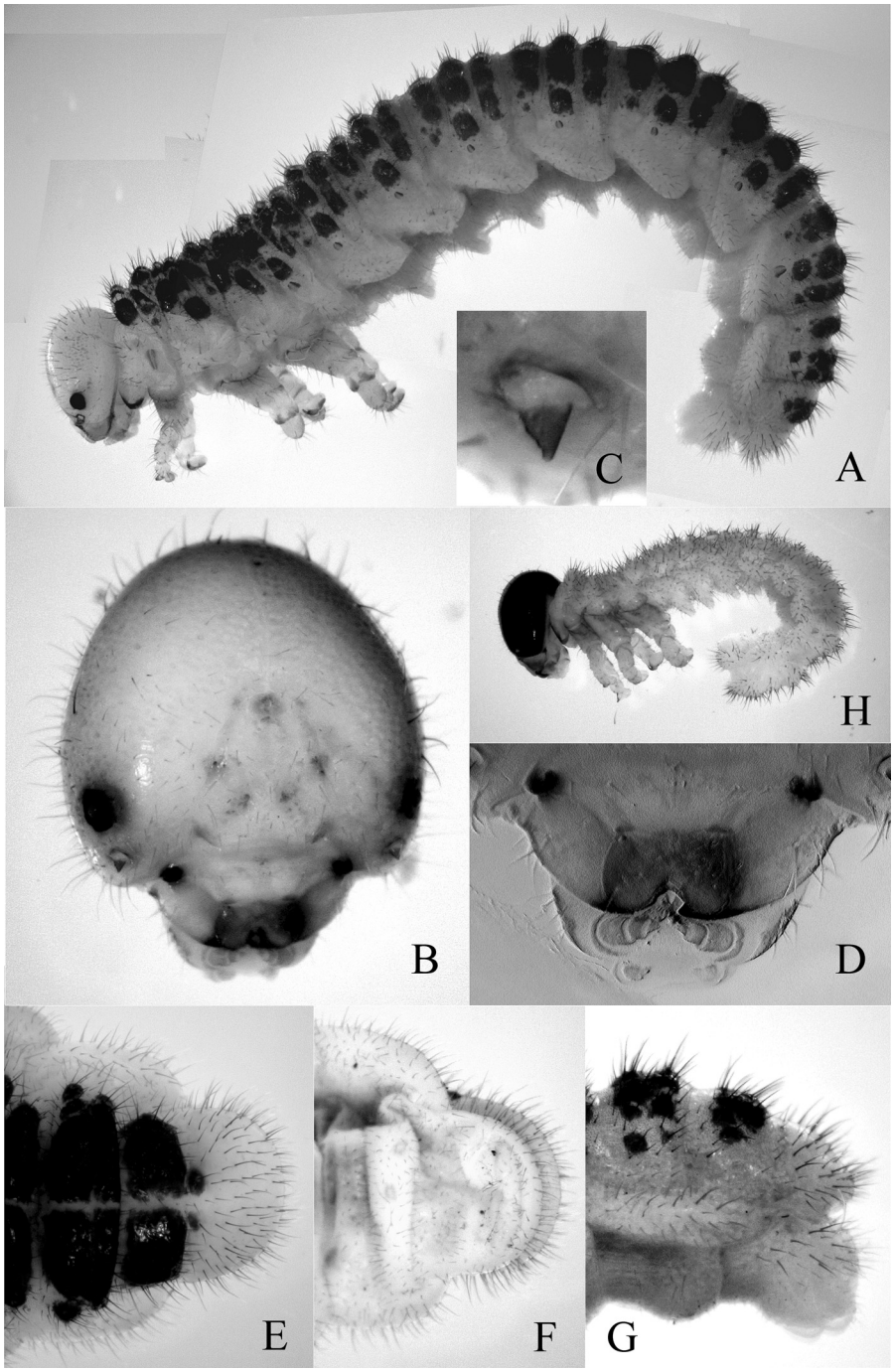

Fig. 7. *Arge meliosmae*, last (fourth) instar (A–G) and middle instar (H) larvae. — A, Group E2b (Table 2), fixed October 26, 2010; B, Group B (Table 1), dead and fixed August 17, 2010, head, frontal view; C, do., antenna, frontal view; D, do., mouth parts, frontal view; E, do., caudal part of abdomen, dorsal view; F., do., ventral view; G, same specimen as A, caudal part of abdomen lateral view; H, Group E (Table 1), dead and fixed August 18, 2010.

Table 1. Groups of larvae collected in the field in 2010.

Group	Number of larvae	locality	Larvae collected	Matured (number of individuals)	Adults emerged in 2010	Remarks
A	13	Bicchuzawa	Aug. 11	Aug. 18–22 (11)		
B	5	Bicchuzawa	Aug. 15	Aug. 18 (2)		
C	16	Bicchuzawa	Aug. 15	Aug. 21–23 (3)	Sept. 12 (1♀)	
D	4	Bicchuzawa	Aug. 18	Aug. 19–22 (4)		
E	18	Bicchuzawa	Aug. 18	Aug. 25–28 (10)	Sept. 13–18 (3♀5♂)	3♀oviposited
F	5	Bicchuzawa	Sept. 29	Oct. 6 (1)	Nov. 2 (1♂)	
G	6	Akasai-keikoku	Oct. 12	Oct. 13 (5)		

Table 2. Date of oviposition, hatching, 1st to 3rd molts, and maturation of seven clutches of eggs laid by three females of group E.

Group*	Eggs laid	n	Eggs hatched	n	1st molt	n	2nd molt	n	3rd molt	n	Matured	n
E1a	Sept. 14	11	Oct. 5	10	Oct. 10	10	Oct. 14	10	Oct. 18	10	Oct. 24–28	8
E1b	Sept. 18	3	Oct. 9	3	Oct. 14	3	Oct. 18	3	Oct. 25	3	Nov. 2	2
E2a	Sept. 15	15	Oct. 5–6	15	Oct. 11	15	Oct. 14–15	13	Oct. 18	13	Oct. 25–28	11
E2b	Sept. 18	9	Oct. 8	7	Oct. 13	7	Oct. 16	7	Oct. 20	7	Oct. 27	2
E3a	Sept. 18–19	8	Oct. 9	8	Oct. 14	8	Oct. 17	8	Oct. 22	8	Oct. 31	6
E3b	Sept. 19	22	Oct. 10	20	Oct. 14–15	20	Oct. 18	20	Oct. 22	18	Oct. 31	7
E3c	Sept. 21	23	Oct. 12–13	20	Oct. 16–18	20	Oct. 21	18	Oct. 26	17	Nov. 3	12
Total		91		83		83		79		76		48

* E1, E2, E3: Three females emerged from larvae of Group E. a. b and c: 1st, 2nd and 3rd clutches of eggs laid by each female.

VIII. 1965, R. Kano and K. Kaneko. Tochigi Pref.: 1♀, Bicchuzawa, 140 m, N36-45-39 E140-9-38, Wami, Nakagawa, larva coll. 15. VIII. 2010 (Group C), mat. 21. VIII., em. 12. IX. 2010, Host: *Meliosma myriantha*, S. Ibuki; 2♀5♂, same locality as for holotype, larvae coll. 18. VIII. 2010 (Group E), mat. 25–27. VIII., em. 13–18. IX. 2010, Host: *Meliosma myriantha*, S. Ibuki; 1♂, Bicchuzawa, 125 m, N36-45-44 E140-09-29, Wami, Nakagawa, larva coll. 29. IX. 2010 (Group F), mat. 6. X., em. 2. XI. 2010, Host: *Meliosma myriantha*, S. Ibuki. Yamanashi Pref.: 1♂, Toriiji–Ohasumi, Fujiyoshida City, 23. VIII. 1988, H. Suda.

Other material examined (larvae in ethanol). Tochigi Pref.: 2 larvae, Bicchuzawa, Wami, Nakagawa, 11. VIII. 2010 (Group A), dead and fixed 12, 16. VIII., S. Ibuki; 3 larvae, same data, except 15. VIII. 2010 (Group B; Fig. 7 B–F), dead and fixed 17. VIII.; 13 larvae, same data, except 15. VIII. 2010 (Group C), dead and fixed 17–20. VIII.; 8 larvae, same data, except 18. VIII. 2010 (Group E; Fig. 7 H), dead and fixed 18. VIII.–11. IX.; 4 larvae, same data, except 29. IX. 2010 (Group F), dead and fixed 3–6. X.; 1 larva, same locality, egg laid 18. IX. 2010 (Group E1b), hatched 9. X., dead and fixed 7. XI.; 3 larvae, same locality, eggs laid 18. IX. 2010 (Group E2b; Fig. 7 A, G), hatched 8. X., dead and fixed 26. X.–5. XI.; 4 larvae, same locality, eggs laid 19. IX. 2010 (Group E3b), hatched 10. X., dead and fixed 20–29. X.; 4 larvae, same locality, eggs laid 21. IX. 2010 (Group E3c), hatched 21. IX. 2010, dead and fixed 14–18. X. Hyogo Pref.: 1 larva, Akasai-keikoku, ca. 500 m, Shiso, 12. X. 2010, A. Shinohara.

Etymology. The species epithet, *meliosmae*, refers to the host plant.

Host plant. *Meliosma myriantha* Siebold et Zucc. (Sabiaceae).

Distribution. Japan (Honshu: Miyagi, Tochigi, Yamanashi and Hyogo Prefectures).

Rearing records. In 2009–2010, Ibuki found several groups of larvae in Tochigi Prefecture and Shinohara found one group of larvae in Hyogo Prefecture, as outlined below.

1. On September 30, 2009, Ibuki discovered a group of 15 early or middle instar larvae feeding on a leaf of *Meliosma myriantha* in Bicchuzawa, Tochigi Prefecture (Fig. 6D). Only two larvae reached maturity, one on October 11 and the other on October 21, but they died during the following winter.

2. On October 15, 2009, Ibuki found two late instar larvae on one leaf of the same plant in Sukusuku-no-mori Park, Bato, Nakagawa, Tochigi Prefecture. They cocooned on October 17 but died thereafter.

3. On October 18, 2009, Shinohara found one middle instar larva in Bicchuzawa, but it died soon.

4. Group A (Table 1). On August 11, 2010, Ibuki found a group of 13 middle instar larvae in Bicchuzawa, a mixture of probably four 2nd instar and nine 3rd instar larvae. By August 13, four smaller larvae molted and all the larvae apparently became 3rd instar. Eleven larvae molted on August 14–17, while two larvae died. From August 18 to 22, all 11 larvae matured and cocooned. Two braconids emerged on October 14 and 20, 2010, but no sawfly adults emerged in 2010.

5. Group B (Table 1). On August 15, 2010, Ibuki found a group of five late instar larvae, each about 25 mm long, in Bicchuzawa. By August 18, four died and one cocooned. No adult emerged in 2010.

6. Group C (Table 1, Fig. 6E). On the same day, Ibuki found another group of 16 middle and late instar larvae on a different tree of *Meliosma myriantha* in the same locality. Three larvae cocooned on August 21–22, whereas the others died by August 22. One female adult emerged on September 12 from a cocoon made on August 21.

7. Group D (Table 1). On August 18, 2010, Ibuki found a group of four late instar larvae, each about 20 mm long, in another site in Bicchuzawa. The four larvae matured and cocooned on August 19 to 22. One braconid emerged on October 10, 2010, but no sawfly adults emerged in 2010.

8. Group E (Table 1). On August 18, 2010, Ibuki found a group of 18 middle instar larvae, each about 11 mm long, in Bicchuzawa. A total of nine larvae matured and cocooned on August 25–28, while nine died. Five male adults emerged on September 13–18 from the cocoons made on August 25 and three female adults emerged on September 14 and 17 from the cocoons made on August 27. The three females laid seven groups of eggs (total 91) in captivity on September 14–21 (Table 2). Eighty-three eggs hatched on October 5–13 and 48 larvae matured and cocooned on October 24 to November 3 after molting three times (Table 2). Others died. No adults emerged in 2010.

9. Group F (Table 1). On September 29, 2010, Ibuki found a group of five middle instar larvae, each about 12–13 mm long, in Bicchuzawa. One larva cocooned on October 6, while the others died with mold. A male adult emerged on November 2, 2010.

10. Group G (Table 1). On October 12, 2010, Shinohara found a group of six late instar larvae on one leaf of *Meliosma myriantha* in Akasaikeikoku, Shiso, Hyogo Prefecture. One of them was fixed in ethanol on October 12, while the other five matured and made cocoons on October 13. No adults emerged in 2010.

Observations on life history. We obtained four female and six male adults by rearing (Table 1; E1, E2 and E3 in Tables 2, 3). After emergence, one of the females (E3) and one male were kept in the same container and they readily copulated in back-to-back position (Fig. 6A). Three females oviposited; eggs laid by E1 and E2 (E1a, b, E2a, b in Tables 2, 3) were all unfertilized and thus males, whereas the eggs laid by E3 were males or females. The female inserts eggs into the leaf edge (Fig. 6B) at irregular intervals (Fig. 6C). Newly emerged females laid three to 23

Table. 3. Duration of egg and feeding larval periods (days) and number of instars of seven clutches of eggs laid by three females of group E (see text for more explanation).

Group*	Egg	Larva, instars I–IV, and total					Number of instars
		I	II	III	IV	total	
E1a	21	5	4	4	6–10	19–23	4
E1b	21	5	4	6–7	8	24	4
E2a	20–21	5–6	3–4	4	6-9	20-23	4
E2b	20	5	3	4	7-8	19	4
E3a	20–21	5	3–4	5	8	22	4
E3b	21	4–5	4	4–7	8	21	4
E3c	21–22	4–5	4	5	8	21–22	4

* E1, E2, E3: Three females emerged from larvae of Group E. a. b and c: 1st, 2nd and 3rd clutches of eggs laid by each female.

eggs per leaf in our experiments (Table 2), and each group of larvae found in the field consisted of four to 18 individuals (Table 1). The larvae are gregarious in all instars (Fig. 6D, E). According to our rearing records (Tables 2, 3), the egg period was 20–22 days and the larval period was 19–24 days. There were four instars in the larval stage. These larvae may possibly be all males, though one of the three females (E3 in Tables 2, 3) once copulated as mentioned above. On maturity, the larvae cocooned solitarily in the soil usually after searching for preferred sites at least for several hours in the container. They often failed to make cocoons (thus died) probably because of the lack of good cocooning sites. The emergence of the adults was 16–24 days after making cocoons in August/September and 27 days in October/November (Table 1), when they did not enter prolonged diapause.

Discussion

Comparative comments

Arge meliosmae belongs to a group of species related to *A. thaumatopygia* Wei, 1997 (in Wei and Wen, 1997), and *A. curvatantenna* Wei, 2003 (in Wei and Nie, 2003), both Chinese species characterized by the bluish-black body and legs at most with only the base of the hind tibia whitish, the strongly produced and medially deeply incised hypopygium in the females, and the presence of a long dorsal process at the apex of the valviceps in the males. *Arge thaumatopygia* was described from two females from Jiangxi and *A. curvatantenna* was described from a male holotype from Hunan and a female paratype from Fujian. Examination of the type series of *A. curvatantenna* revealed that the paratype female is not conspecific with the holotype male and does not belong to this group of species. *Arge thaumatopygia* is thus known only from the female and *A. curvatantenna* only from the male (see Shinohara *et al*., in preparation, for more discussion).

In females, *A. meliosmae* differs from *A. thaumatopygia* in the hyaline and black-banded forewing, the almost entirely whitish basal half of the hind tibia (Fig. 1A, B), and usually mostly yellowish-white subanal area. The entire forewing is blackish infuscated, the hind tibia is at most only obscurely whitish, and the subanal area is mostly blackish in *A. thaumatopygia*. In males, the deeply incised clypeus (Fig. 2A), the flattened anterior part of the postocellar area (Fig. 2D), the narrow postocular area (Fig. 1K), and the narrow and high ventral process of the valviceps (Fig. 5C, arrowed) will distinguish *A. meliosmae* from *A. curvatantenna*. The clypeus of *A. curvatantenna* is rather shallowly incised (Fig. 2B), the postocellar area is conspicuously convex anteriorly (Fig. 2E), the postocular area is broad (Fig. 1L) and the ventral process of the valviceps is broad and low (Fig. 5F, G).

In Takeuchi (1932, 1939), the new species would key to *Arge fulvicornis* Mocsáry, 1909 (= *Spinarge fulvicornis*), from Japan, Sakhalin, Korea and northern China (Hara and Shinohara, 2006), but the black (not pale brown) antenna, besides the generic characters, will easily separate *A. meliosmae* from *S. fulvicornis*. In Gussakovskij's (1935) key, *A. meliosmae* may run to *A. potanini* Jakovlev, 1892, from China and the Russian Far East (Gussakovskij, 1935), but *A. potanini* is a much smaller species (7–9 mm in females, erroneously noted as males in the key,

Table 4. Lengths of egg and larval stages and number of larval instars in ten species of *Arge.*

Species	Egg stage (days)	Larval stage (days)	Number of larval instars	References
Arge enodis	8	17–21	5 in ♂	Shinohara *et al.* (2007)
Arge indicura	8–12	14–17	5 in ♂/5 or 6 in ♀	Shinohara and Hara (2009)
Arge nigronodosa		11–17 (June, August) 14–22 (October)	5 or 6 in ♂ and ♀	Tokunaga and Tsujita (1951)
Arge nipponensis		13–17	6 in ♂/6 or 7 in ♀	Tokunaga and Tsujita (1951)
Arge pagana		13–17	5 in ♂/5 or 6 in ♀	Petre *et al.* (2007)
Arge pullata	10	21–35		Takizawa (1962), Hara and Shinohara (2008)
Arge similis	8–11	15–22 (May-August) 20–48 (September)	4 or 5 in ♂/5 or 6 in ♀	Ii (1934)
Arge suspicax	6–7	13–19	5 in ♂/6 in ♀	Shinohara *et al.* (2008)
Arge suzukii	10	15–16	5 in ♂	Shinohara and Hara (2008)
Arge meliosmae	20–22	19–24	4 in ♂ (?and ♀)	present work

see Shinohara *et al*., 2011) with partly brownish antennal flagellum.

The immature stages of *A. meliosmae* are easily distinguished from the other congeners by the host plant and the peculiar color pattern of the last instar larva. *Arge meliosmae* is the only *Arge* species known to feed on *Meliosma,* and the last instar larva is orange yellow with the dorsum largely blackish (Fig. 6H). Such a larval color pattern is known only for the new species within the genus.

Host plants

So far as is known, sawflies seldom utilize the plant family Sabiaceae as hosts. An argid, *Themos mayi* Smith, 2003 (in Smith and Janzen, 2003) from Costa Rica, belonging to the subfamily Dielocerinae, is the only known sawfly species associated with the Sabiaceae. The larva of *T. mayi* is a solitary external feeder on the leaf of *Meliosma idiopoda* S. F. Blake. *Arge meliosmae* is the first sawfly species to be recorded as feeding on Sabiaceae in the Old World and the second known species of Argidae attached to *Meliosma*. This is the first record of *Meliosma* as a host plant for *Arge* species.

Life history

The observations summarized above show that *A. meliosmae* probably has two generations a year in Nakagawa, Tochigi Prefecture. The larvae were found in the field in mid-August and from the end of September to mid-October in Nakagawa (125–140 m) and in mid-October in Shiso (ca. 500 m), Hyogo Prefecture. We have only two adults collected in the field, a female collected in Onikobe Spa (ca. 300 m?) in Miyagi Prefecture and a male collected in Fujiyoshida (750–1000 m?), Yamanashi Prefecture, both in late August. According to our rearing results, the egg stage lasts 20–22 days, the larval stage 19–24 days, and the cocoon period 16–27 days without entering prolonged diapause. In Nakagawa, adults should appear in mid-July and the end of August to early September, though no adults have been collected there. The occurrence of another generation in spring (emergence of adults in May) is quite possible, but no evidence for this is available. In May 2010 and thereafter, Ibuki tried to find adults and larvae on some *Meliosma* trees where the larvae actually occurred in the autumn of 2009, but he found nothing until August 11 when he discovered a group of middle instar larvae (see *Rearing records* above).

This species is quite peculiar in *Arge* by having a very long egg period and probably fewer larval instars, though the information about these characters is available only for several congeners mainly from Japan. Table 4 shows the lengths of the egg and larval stages and number of larval instars in ten species of *Arge*. The larval stage of *A. meliosmae* is generally longer than that of *A. en-*

odis (Linnaeus, 1767), *A. indicura* Shinohara and Hara, 2009, *A. nigronodosa* (Motschulsky, 1860), *A. nipponensis* Rohwer, 1910, *A. pagana* (Panzer, 1797), *A. suspicax* Konow, 1908, and *A. suzukii* (Matsumura, 1912), but may be similar to or shorter than those of *A. pullata* (Zaddach, 1859) and *A. similis* (Snellen van Vollenhoven, 1860). However, the egg period of *A. meliosmae* is about twice as long as those of the six species for which data are available. Known larvae of *Arge* species usually have five instars in males and six instars in females, though this is often subject to variation (Ii, 1934; Tokunaga and Tsujita, 1951; Petre *et al*., 2007; Shinohara and Hara, 2009). In this study, 48 larvae reared from 91 eggs laid by three females of *A. meliosmae* matured and cocooned all in the fourth instar (Tables 2, 3). The 48 larvae may be all males, though 25 of these may include females because they are offsprings of a female that copulated (E3, Tables 2, 3).

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