

## The Species-group of *Arge captiva* (Insecta, Hymenoptera, Argidae)

Akihiko Shinohara<sup>1</sup>, Hideho Hara<sup>2</sup> and Jung-Wook Kim<sup>3</sup>

<sup>1</sup>Department of Zoology, National Museum of Nature and Science,  
3–23–1 Hyakunin-cho, Shinjuku-ku, Tokyo, 169–0073 Japan  
E-mail: shinohar@kahaku.go.jp

<sup>2</sup>Hokkaido Forestry Research Institute, Koshunai, Bibai-shi,  
Hokkaido, 079–0198 Japan  
E-mail: hara.hideho@pref.hokkaido.lg.jp

<sup>3</sup>Public Health Pest Management, DENR, Raleigh NC, USA  
E-mail: jung.kim@ncdenr.gov

**Abstract** *Arge captiva* (Smith, 1874) and its allied taxa are revised and four species are recognized. All relevant type material was studied, except for that of *Arge praesternalis* Malaise, 1934. *Arge macrops* sp. n. (= *Arge sanguinolenta* auctt., nec Mocsáry, 1909) is described and illustrated from the Primorskij Kraj, Korea and China. The following synonymy is established or confirmed for *Arge captiva*: *Arge captiva* (Smith, 1874) (= *Hylotoma captiva* Smith, 1874 = *Hylotoma flavicollis* Cameron, 1876 [syn. n.] = *Arge sanguinolenta* Mocsáry, 1909 [syn. n.] = *Arge kolthoffi* For-sius, 1927 [syn. n.] = *Arge captiva rufoscutellata* Takeuchi, 1927). *Arge siamana* Togashi, 1988, is removed from synonymy with *A. captiva*. A little known species, *A. praesternalis*, is treated as a valid species.

**Key words:** Argidae, *Arge captiva* group, *Arge macrops*, new species, new synonymy.

The sawfly genus *Arge* (Hymenoptera, Argidae) is represented by more than 300 described species in the world, including about 120 species recorded from eastern Asia (Gussakovskij, 1935; Takeuchi, 1939; Smith, 1989, 1992; Wei *et al.*, 2006). Among the eastern Asian representatives of the genus, there are two groups of species whose adults are black or bluish black with reddish areas on the thorax. The species of the two groups are similar in color pattern but greatly different in structure. One of the groups, herein named the *rejecta* group, includes *A. rejecta* (Kirby, 1882) and its allies. The members of the *rejecta* group are comparatively small species characterized by the medially distinctly carinate supraclypeal area on the head and the pilose outer margins of the wings. The other group, herein named the *captiva* group, is represented by *A. captiva* (Smith, 1874) and its allies, which are comparatively large and robust species distinguished from the members of the *rejecta* group by the roundly swollen supraclypeal area without

a median carina and the nearly glabrous outer margins of the wings. The larvae of *A. rejecta* are known to feed on *Rubus* spp., whereas those of *A. captiva* are associated with *Ulmus* spp. (Okutani, 1967).

A total of nine previously described taxa may belong to the two groups: *A. captiva* (Smith, 1874), *A. flavicollis* (Cameron, 1876), *A. rejecta* (Kirby, 1882), *A. vulnerata* Mocsáry, 1909, *A. sanguinolenta* Mocsáry, 1909, *A. kolthoffi* For-sius, 1927, *A. captiva rufoscutellata* Takeuchi, 1927, *A. praesternalis* Malaise, 1934, and *A. siamana* Togashi, 1988. *Arge captiva* var. *watanabei* Takeuchi, 1932, is regarded as an infrasubspecific unavailable name (Blank *et al.*, 2009) and thus will not be discussed further in the present paper. Taxonomy of these species is in need of revision, because recent works differ in the interpretation of these taxa, particularly as to the placement of *A. flavicollis* and *A. siamana* (Wei and Wen, 2000; Wei and Nie, 2003; Saini *et al.*, 2006). Wei and Wen (2000) synonymized *A. flavicollis* with

*A. captiva*, thus placing the species in the *captiva* group, whereas Saini *et al.* (2006) treated them “as two separate species which are similar in color but differ in morphology”, thus suggesting the placement of *A. flavicollis* in the *rejecta* group. Wei and Wen (2000) also placed *A. siamana* in synonymy with *A. captiva*, but Saini *et al.* (2006) mentioned, “this placement requires closer scrutiny”. It should be noted that these works were not based on the examination of the type material, and this is doubtless the main source of confusion.

We were able to examine the type material of all the taxa stated above, with the exception of *A. praesternalis*. In the following lines, we will revise the taxa belonging to the *captiva* group based on the examination of the type material and a series of specimens from various parts of eastern Asia. Besides *A. rejecta* and *A. vulnerata*, all the taxa cited above belong to the *captiva* group. In conclusion, we have recognized four species in the *captiva* group, namely *A. captiva*, *A. siamana*, *A. praesternalis* and *A. macrops* sp. n. *Arge flavicollis*, *A. sanguinolenta*, *A. kolthoffi* and *A. captiva rufoscutellata* are synonymous with *A. captiva*, which is a widespread species showing large variations in the color pattern of the thorax. The color variations are generally associated with geography but not clear-cut enough to recognize subspecies in our view. Judging from the original description, *A. praesternalis* may also be a synonym of *A. captiva*, but we treat it as a valid species until more information becomes available. *Arge siamana* is very similar to *A. captiva* in external morphology but distinguishable from it in the shape of the ovipositor. A peculiar species characterized by the exceptionally large eyes and ocelli was previously identified with *A. sanguinolenta*, but this is a misidentification and the species will be described under the name of *A. macrops* below.

The material used in this work is kept in the following collections: BMNH—The Natural History Museum, London; CAS—California Academy of Sciences, San Francisco; CSFU—Central South Forestry University, Changsha; HFRI—

Hokkaido Forestry Research Institute, Bibai; HNHMB—Hungarian Museum of Natural History, Budapest; HSC—H. Suda collection, Sakura; HSLC—H.-S. Lee collection, Suwon; HU—Hokkaido University, Sapporo; HYC—H. Yoshida collection, Kobe; KU—Kobe University, Kobe; MCZ—Museum of Comparative Zoology, Cambridge; MNHAH—Museum of Nature and Human Activities, Hyogo, Sanda; NRMS—Swedish Museum of Natural History, Stockholm; NSMT—National Museum of Nature and Science, Tokyo; OMNH—Osaka Museum of Natural History, Osaka; OPU—Osaka Prefecture University, Sakai; SDEI—Senckenberg Deutsches Entomologisches Institut, Müncheberg; SNM—Natural History Museum of Denmark, Copenhagen; SNU—Seoul National University, Suwon (partly on permanent loan from Kangwon National University, Chuncheon, and Gyeongsang National University, Jinju); USNM—National Museum of Natural History, Washington, D.C.; ZSSM—Bavarian State Collection of Zoology, Munich.

For the scientific names of the host plants, we followed Yonekura and Kajita (2009).

### The *Arge captiva* Group

The species of the *captiva* group are characterized as follows: Rather large and robust species (Fig. 1), length 7–12.5 mm in females and 7–11 mm in males. Black, with bluish or purplish reflection; thorax usually with large reddish areas. Interantennal carinae (Fig. 2A, E, J) distinct, nearly straight, subparallel or convergent below between level of dorsal margins of antennal sockets and level of middle inner orbits, and then becoming indistinct and strongly convergent ventrally on supraclypeal area; supraclypeal area roundly swollen, top surface nearly flattened, without median carina, but with very shallow, inconspicuous longitudinal depression or groove along median line enclosed by ventral parts of usually inconspicuous V-shaped interantennal carinae. Right mandible with inner margin distinctly notched. Cell 2Rs in forewing (Fig. 2P–R) very broad (apical length [=crossvein 3r–m

length] about 0.6–0.9 × posterior width), not or weakly widened towards apex, with anterior width about as long as or shorter than posterior width (0.7–1.0 : 1.0); crossvein 2r–m usually bent towards base or sinuate and crossvein 3r–m nearly straight or weakly curved outwards; in both wings, wing margin between veins Rs and Cu nearly glabrous, setae not protruding beyond wing margin (Fig. 2S). Sawsheath rather short, rounded, with median lobe very small and located at base in posterodorsal view (Fig. 2D, H, M), with large swelling at base in lateral view (Fig. 2I). Lance (Fig. 4) with apical crest well developed, roughly serrate and with narrow membranous areas at middle and with groups of rudimentary setae at intervals along ventral margin at middle. Lancet (Figs. 5–7) in lateral view rather thick, with rounded apex and about 22–27 serrulae as recognized by number of marginal sensilla; middle annuli substraight; each serrula rounded or subtriangular in outline; gap between 2nd and 3rd serrulae not much larger than gaps between other serrulae. Male genitalia (Figs. 8–10): Gonostipes in ventral view narrowed apically with apical width about as long as or longer than basal width of harpe and with medial margin posteriorly subtruncate or roundly convex. Harpe gradually narrowed toward apex. Penis valve with valviceps rather simple, narrow subtriangular or oval with elongate apex in outline in lateral view, swollen laterally at middle in dorsal view, and with lateral carina at middle running dorsally from ventral margin in lateral view.

This species-group is possibly a part of the *pectoralis* group defined by Smith (1989), who included *A. captiva* in the *pectoralis* group. The

members of the *captiva* group agree with the diagnosis of the *pectoralis* group, except that the gap between the 2nd and 3rd serrulae of the lancet is not larger than between others.

Extremely dark specimens of *A. captiva*, having no reddish areas on the thorax, look similar to black or bluish black species with the swollen and non-carinate supraclypeal area and the glabrous outer margins of the wings, such as *A. pullata* (Zaddach, 1859) or *A. enodis* (Linnaeus, 1767). These two species will be distinguished from *A. captiva* by the roundly swollen supraclypeal area without very shallow longitudinal groove or depression at middle, the narrow and usually apically widened cell 2Rs in the forewing (ratio of apical length to posterior width is 0.6–0.9 in *A. captiva* group, whereas it is 0.9–1.4 in *A. pullata*, 0.9–1.1 (female) and 0.8–0.9 (male) in *A. enodis*), elongate sawsheath and the very different shape of the penis valve.

The species of the *rejecta* group (*A. rejecta* and *A. vulnerata*) have a very similar color pattern to that of the *captiva* group, but differ in a number of morphological features including the medially sharply carinate supraclypeal area, the densely pilose outer margins of the wings, rather narrow and apically widened cell 2Rs in the forewing, and the slender, apically strongly narrowed lancet. Two western Palearctic species, *A. thoracica* (Spinola, 1808) and *A. pleuritica* (Klug, 1834), also have a similar color pattern. These two species have much in common with the *rejecta* group, sharing the same set of characters given above, though the median carina of the supraclypeal area is rather blunt.

**Key to species** (*A. praesternalis* not included)

1. Eyes and ocelli exceptionally large and malar space very narrow (Fig. 2A–C, N); lancet with longitudinal row of minute setae at base of 1st annulus rudimentary or missing (Fig. 5); male genitalia as in Figs. 8A–C, 9A–I. [Upper head with bluish reflection, purplish only in posterior part; interantennal carinae broadly separated and subparallel; supraclypeal area with side slopes roundly swollen; anterior margin of clypeus broadly, rather shallowly emarginated, lateral lobes subtriangular (Fig. 2B). Lancet with about 25 serrulae as recognized by number of marginal sensilla (Fig. 5); distance between 1st and 15th serrulae about 3.1–3.4 × distance between 15th and terminal serrulae; 2nd annulus sclerotized only ventrally.] . . . . . *A. macrops*, ♀♂

- Eyes, ocelli and malar space normal (Fig. 2E–G, J–L, O); lancet with longitudinal rows of minute setae at base of first annulus present (Figs. 6–7). . . . . 2
2. Upper head with purplish reflection (Fig. 2G); interantennal carinae rather narrowly separated and distinctly convergent below (Fig. 2E); supraclypeal area with side slopes very weakly rounded; anterior margin of clypeus rather narrowly and roundly incised at middle, lateral lobes nearly truncate at apex (Fig. 2F); lancet with about 27 serrulae as recognized by number of marginal sensilla (Fig. 6A); distance between 1st and 15th serrulae about  $2.5\times$  distance between 15th and terminal serrulae. . . . . *A. siamana*, ♀
- Upper head with bluish, not purplish, reflection (Fig. 2L); interantennal carinae broadly separated and subparallel or very slightly convergent below (Fig. 2J); supraclypeal area with side slopes roundly swollen; anterior margin of clypeus broadly, rather shallowly emarginated, lateral lobes subtriangular (Fig. 2K); lancet with about 22 serrulae as recognized by number of marginal sensilla (Figs. 6B–D, 7); distance between 1st and 15th serrulae about  $3.4\text{--}6.1\times$  distance between 15th and terminal serrulae. [Male genitalia as in Figs. 8D–F, 10.] . . . . . *A. captiva*, ♀♂

*Arge macrops* sp. n.

(Figs. 1A–D, 2A–D, N, P, S, 3, 4A–C, 5, 8A–C, 9A–J)

*Arge sanguinolenta*: Kuznetsov-Ugamskij, 1927: 235; Malaise, 1931: 152; Gussakovskij, 1935: 233, 266, 403; Zhelochovtsev and Zinovjev, 1995: 400 (misspelled as *sanguinicolis*); Lelej and Taeger, 2007: 943. Nec Mocsáry, 1909.

*Female* (Fig. 1A–B). Length about 11–12.5 mm. Head, metathorax, legs, and abdomen entirely black with distinct bluish reflection, reflection on posterior upper and lateral parts of head purplish; antenna black, without distinct reflection; mouth parts blackish brown to black; prothorax and mesothorax orange, with most or all cervical sclerite, posterior part of mesepimeron, and often ventral half of mesopleuron bluish black; wings blackish infuscated; veins and stigma blackish.

Surface generally smooth and shining; punctures on anterior part of head fine and distinct, partly irregular but generally separated from each other. Head and thorax covered with rather short hairs, those on upper and lateral parts of head and on ventral part of thorax sparse; hairs generally blackish on dark areas and colorless on pale areas.

Head with exceptionally large eyes and ocelli; in dorsal view (Fig. 2C), posterior part behind eyes very short, scarcely dilated; in lateral view, gena very narrow. Distance between eyes  $1.0\times$

vertical diameter of eye; eye with vertical diameter  $1.5\text{--}1.6\times$  horizontal diameter. Postocellar area scarcely convex, anterior and lateral furrows indistinct (Fig. 2C). Ocellar area concave between ocelli. Frontal area concave in front of anterior ocellus; median fovea in large deep pit; interantennal carinae low and blunt but distinct, subparallel, with very shallow depression with flattened bottom between them; just below level of ventral margin of antennal sockets, carinae becoming indistinct and convergent ventrally to form inconspicuous V-shaped platform, often with indistinct longitudinal depression along midline (Fig. 2A); supraclypeal area with side slopes roundly swollen. Malar space exceptionally short, only  $0.1\times$  width of front ocellus. Clypeus flattened, with anterior margin broadly, rather shallowly emarginated, lateral lobes subtriangular (Fig. 2B). Antennal length  $1.4\text{--}1.7\times$  maximum width of head; flagellum hardly compressed, weakly curved basally and midapically and rather strongly thickened midapically (Fig. 1A–B).

In forewing, cell 2Rs with anterior width  $0.8\text{--}1.0\times$  posterior width, and crossvein 3r-m weakly curved outwards; in both wings, wing margin between veins Rs and Cu nearly glabrous, setae not protruding beyond wing margin (Fig. 2S).

Abdominal terga glabrous, except for distinct pilose lateral parts; seventh and more posterior



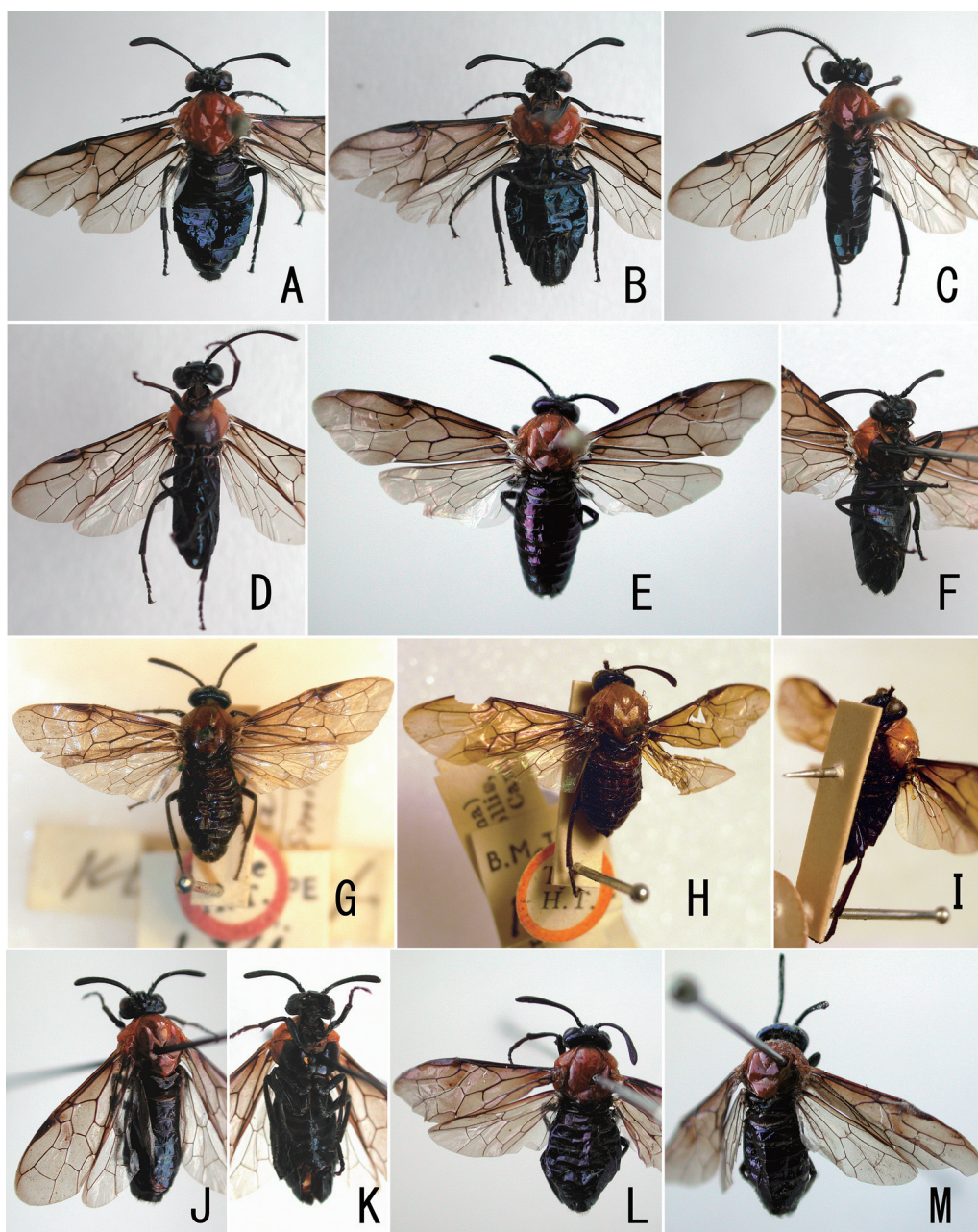


Fig. 1. *Arge macrops* (A–D), *A. siamana* (E–F) and *A. captiva* (G–M), type material. — A, Paratype of *A. macrops* n. sp., female, Mt. Taibaishan, China, dorsal view; B, do., ventral view; C, holotype of *A. macrops* n. sp., male, dorsal view; D, do., ventral view; E, holotype of *A. siamana* Togashi, 1988, female, dorsal view; F, do., ventral view; G, lectotype of *Hylotoma captiva* Smith, 1874, female, dorsal view; H, lectotype of *Hylotoma flavicollis* Cameron, 1876, female, dorsal view; I, do., ventrolateral view; J, syntype of *Arge sanguinolenta* Mocsáry, 1909, female, dorsal view; K, do., ventral view; L, holotype of *Arge kalthoffi* Forsius, 1927, female, dorsal view; M, syntype of *Arge captiva rufoscutellata* Takeuchi, 1927, female, dorsal view.



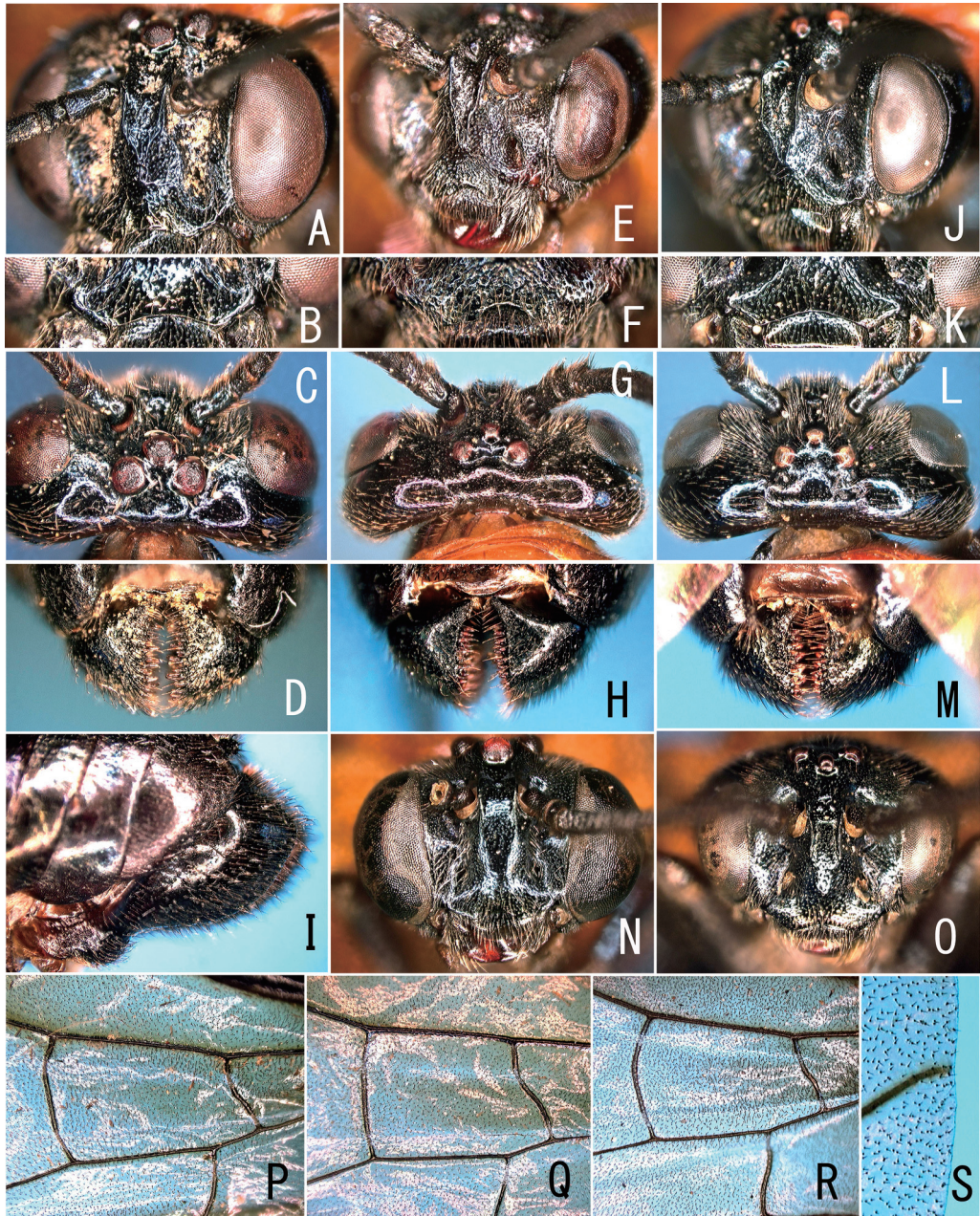


Fig. 2. *Arge macrops*, ♀, paratype, Mt. Taibaishan, China (A–D, P, S), *A. siamana*, ♀, holotype (E–I, Q), *A. captiva*, ♀, Sapporo, Japan (J–L, R), *A. captiva*, ♀, Jirisan, Korea (M), *A. macrops*, ♂, holotype (N), and *A. captiva*, ♂, Kawasaki, Japan (O). — A, E, J, Head laterofrontal view; B, F, K, clypeus, frontal view; C, G, L, head dorsal view; D, H, M, sawsheath, posterodorsal view; I, sawsheath, lateral view; N–O, head, frontal view; P–R, cell 2Rs of left forewing; S, margin of forewing with vein M.

terga with sparse minute setae. Seventh sternum with posterior margin roundly produced at middle. Sawsheath in posterodorsal view (Fig. 2D)

short subtriangular in outline, with lateral margin nearly straight or rounded, apex very narrowly rounded, and medially nearly truncate; dorsome-

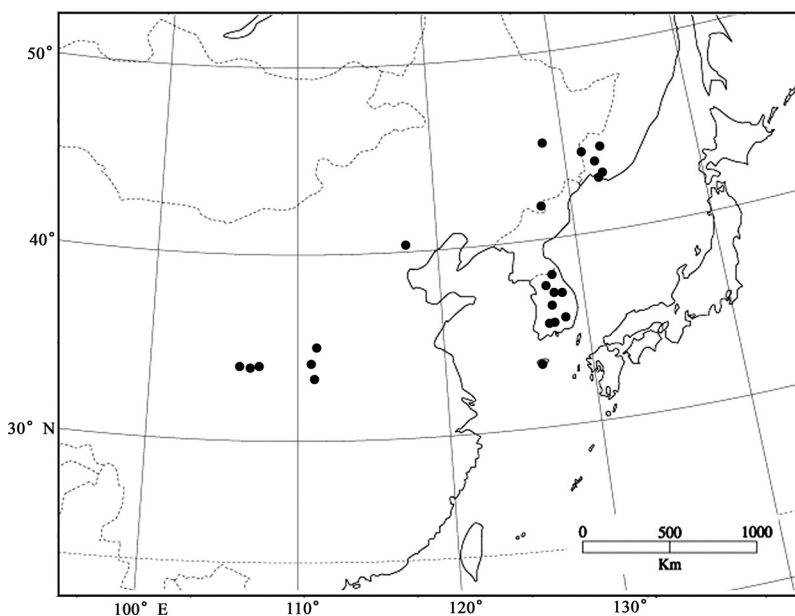


Fig. 3. Distribution of *A. macrops* based on specimens examined.

dial ridge blunt and dorsal surface weakly convex; in lateral view, ventral margin, except for conspicuous basal convexity, roundly convex, dorsal margin nearly straight, and apex rounded; inner surface spinose.

Lance with several narrow membranous areas at middle (Fig. 4A–C). Lancet (Fig. 5) with about 25 serrulae as recognized by number of marginal sensilla; distance between 1st and 15th serrulae about  $3.1\text{--}3.4\times$  distance between 15th and terminal serrulae; dorsal margin glabrous on 1st annulus, with group of sparse setae on each of 2nd to 6th annuli, and continually setose on 7th and more apical annuli; narrow non-annulate area present dorsoapically; transverse rows of minute setae present between annular plates; marginal sensilla long; basal annular plates dorsally rough; 1st annulus with small sclerotized plate ventrally but transverse row of minute setae rudimentary or missing; 2nd annulus sclerotized in ventral half; serrulae roundly and very strongly convex, rather narrow and regular in shape; each serrula in median part of lancet with basal slope slightly shorter than apical slope.

*Male* (Fig. 1C–D). Length 9–11 mm. Head,

metathorax, legs, and abdomen entirely black with distinct bluish reflection, reflection on posterior upper and lateral parts of head often purplish; antenna black, without distinct reflection; mouth parts blackish brown to black; prothorax and mesothorax orange, with most or all cervical sclerite, sunken area of mesoscutal lateral lobe, part of mesoscutellum, posterior part of mesepimeron, and ventral half of mesopleuron bluish black; wings blackish infuscated; veins and stigma blackish.

Structure generally similar to female. Distance between eyes  $0.8\text{--}0.9\times$  vertical diameter of eye; eye with vertical diameter  $1.4\times$  horizontal diameter. Malar space linear,  $0.03\text{--}0.06\times$  width of front ocellus. Antennal length  $2.0\text{--}2.3\times$  maximum width of head; flagellum weakly curved, not compressed (Fig. 1C–D). Cell 2Rs in forewing with anterior width  $0.8\text{--}1.0\times$  posterior width. Subgenital plate (Fig. 9J) with posterior margin very widely rounded in dorsal view and strongly convex ventrally at base in lateral view. Gonostipes in ventral view narrowing apically with apical width longer than basal width of harpe and with medial margin posteriorly trun-



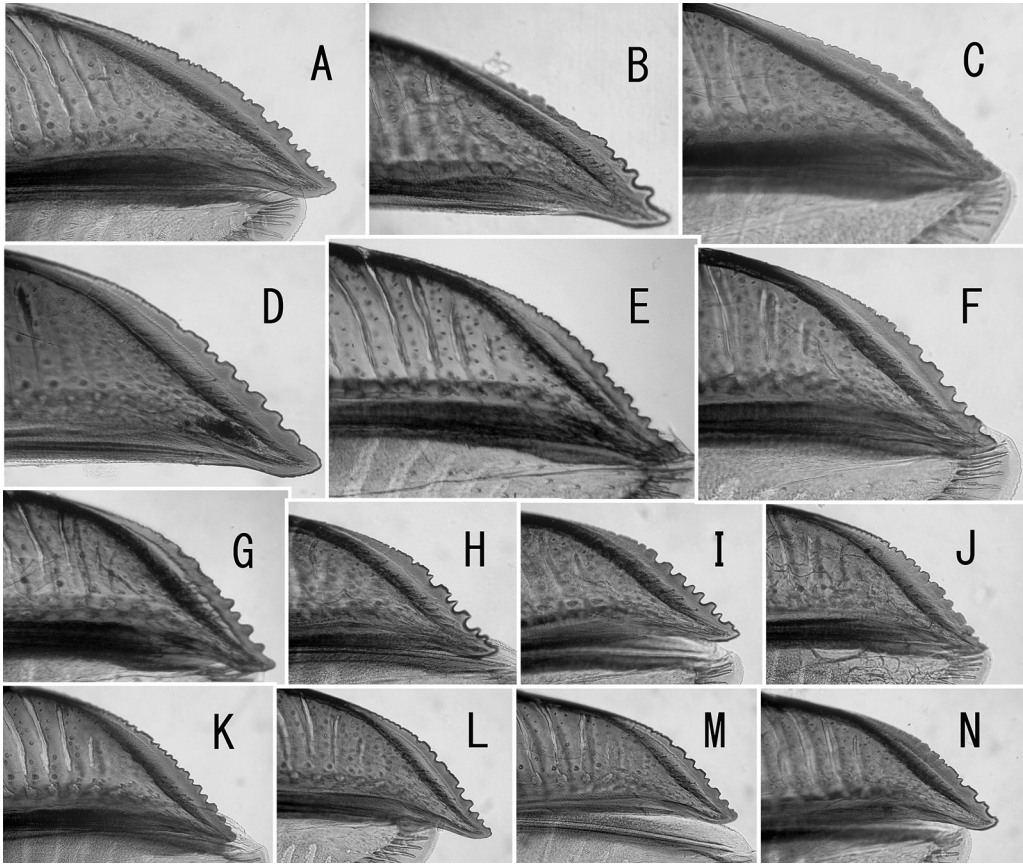


Fig. 4. Apices of lances, lateral view, *A. macrops* (A–C), *A. siamana* (D), and *A. captiva* (E–O). — A, Ussuriysky Zapovednik, Russian Far East; B, Ulju-gun, Korea; C, Mt. Taibaishan, China; D, holotype, Thailand; E, syntype of *A. sanguinolenta*; F, holotype of *A. kolthoffi*; G, Vladivostok, Russian Far East; H, “Kasan”, Korea; I, Daegu, Korea; J, “WenChuanShien”, China; K, Paolai, Taiwan; L, Obihiro, Japan; M, Kurisawa, Japan; N, Kawasaki, Japan.

cate or roundly convex (Figs. 8B, 9B, E, H). Harpe gradually and roundly narrowed toward apex, basally also narrowed. Penis valve with valviceps narrow subtriangular in outline in lateral view, roundly swollen laterally at middle in dorsal view, ventromedially with long oblique and dorsally bent carina in lateral view; apex pointed and bent inward and dorsally (Figs. 8A–C, 9).

*Immature stages and life history.* Unknown.

*Type material examined.* Holotype (NSMT-I-Hym 41670; Fig. 1C–D): ♂, “14 km west of Nakhodka, Primorskij kraj, Russia, 11. VIII. 1992, A. Saito”. Kept in NSMT. Paratypes: RUSSIA, Primorskij kraj: 8♂, “1–24. VIII. 1994,

Vladivostok, Ussuriskij, Pogranitschnyi, Primorskij Kraj, Russia, leg. J. Roloff” (ZSSM); 1♂, “14/7” “Vladivostok, Suchan, Malaise” (NRMS); 1♂, “15/7” “Vladivostok, Suchan, Malaise” (NRMS); 5♂, “18/7” “Vladivostok, Suchan, Malaise” (1♂ labeled “*Arge sanguinolenta* Mocs., Malaise det. 1933”) (NRMS); 1♂, “24/7” “Vladivostok, Suchan, Malaise” (NRMS); 1♂, “Vladivostok, Suchan, Malaise” “*Arge sanguinolenta* Mocs., Malaise det. 1930” (BMNH); 1♂, “8/7” “Vladivostok, Tigrovaja, Malaise” “*Arge sanguinolenta* Mocs., Malaise det. 1931” (NRMS); 1♂, “Jakovlevka, Distr. Spassk, Prov. Ussuri, 17. VII. 1926, Djakonov & Filipjev” “Brit. Mus. 1939-210” “*Arge sanguinolenta*

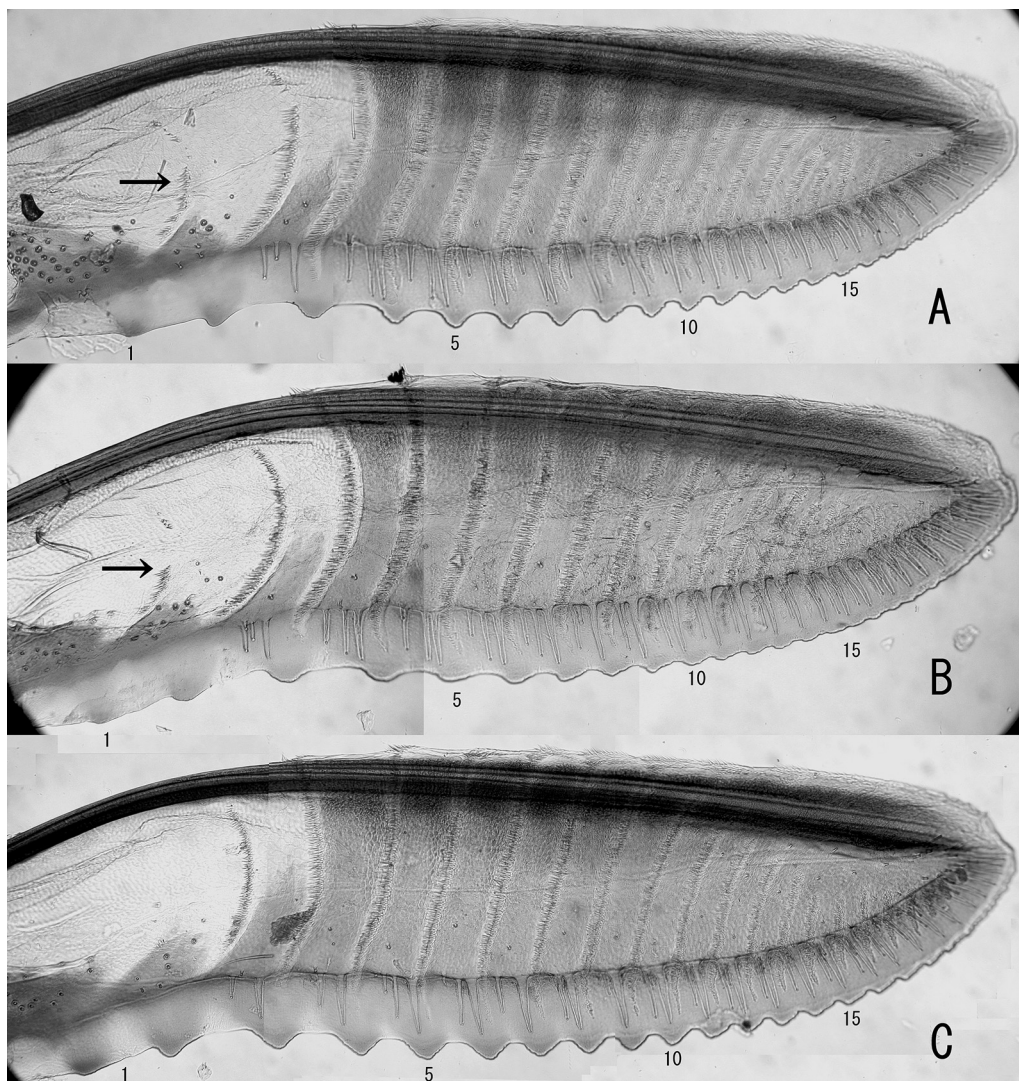


Fig. 5. Lancets, *A. macrops*, paratypes. — A, Ussuriyskiy Zapovednik, Russian Far East; B, Icheon-ri, Gyeongsangnam-do, Korea; C, Mt. Taibaishan, China. Arrows in A-B showing rudimentary longitudinal row of minute setae at base of 1st annulus (row of setae missing in C).

Mocs., Gussakovskij det. 1938” (BMNH); 1 ♀, “Ussuriyskiy Zapovednik, 250 m, 33 km SE Ussuriysk, 43.37 N 132.18 E, 14. VI. 1993, A. Taeger” (SDEI); 1 ♂, “Anisimovka, Sukhodol river, 43.1 N 132.5 E, 6–10. VIII. 1993, E. Groll & C. Kutzscher” (SDEI); 1 ♂, “St. Tigrovaja, [?], 7. VII. 1926, Vasijalev” “Far East, South-Ussuri, Railroad Station, Tigrovaja, 7. VII. 1926” “*Arge sanguinolenta* Mocsáry, ♂, redescribed” (USNM). KOREA: Gangwon-do: 1 ♂, “Mt.

Jeombong-san, GW, 10. VIII. 1992, K. T. Park” (SNU); 4 ♂, “2007. VII. 31, Kangwon-do, Yangyang-gun, So-myon, Hwangi-li, coll. H. S. Lee, N 37.56’ 25.8” E 128.31’ 19.7”, SL256 m” (2 ♂ in HSLC; 2 ♂ in NSMT, NSMT-I-Hym 41671, 41672); 1 ♂, “Mt. Chiak, Korea, 15. Aug. 99, Sang-Wook Park” (HSLC); 1 ♂, “95. VII. 24, Chuncheon, Jiamli, Kyekok, Mun Chang-Seob” (SNU); 1 ♂, Tapdongri, 37.44.36 N 128.35.18 E, 660 m, Jinbu-myeon, Pyeongchang-gun (light



trap), 7. VI. 2009, S.-W. Park (NSMT, NSMT-I-Hym 41673); 3♂, “Mureung Valley, Donghae, 3. VIII. 2009, H.-S. Lee” (2♂ in HSLC; 1♂ in NSMT, NSMT-I-Hym 41674). Chungcheongbuk-do: 1♂, “Chungnam [sic], Yeongdong, Yangsan, Gaseon-li, 21. IV. 2002, Tripotin rec.” (USNM). Chungcheongbuk-do/Gyeongsangbuk-do: 2♂, “20. VIII. 1999, alt. — 600 m, Pilosa, Soebaek-san, Tripotin coll.” (USNM). Gyeongsangbuk-do: 1♂, “6. VIII. 1998, Lampe U. V., alt. — 700 m, Irwol-san, Yong-yang, Tripotin coll.” (USNM). Jeollabuk-do: 1♂, “Manjusanghoe, Dalgungri, Sannae-myeon, Namwon-gun, 25–26. VII. 1990, Ku Deok-Seo” (SNU). Gyeongsangnam-do: 1♂, “Jungsan-ri, Samjang-myeon, Sanchong-gun, 12–13. VII. 1990, Yun, Ju-ik” (SNU); 1♀1♂, Ulju-gun, Sangbuk-myeon, Icheon-ri, 1989. VI. 27 (SNU). Jeju-do: 1♂, “Donneko, Seoguiipo City, Jeju Island, 30. VIII. 2006, Lee, H. S.” (HSLC). CHINA: Heilongjiang Prov.: 2♂, “Pinchiang, Yablonia [=Yabuli], 11–12. VI. 1941, S. Asahina” (NSMT, NSMT-I-Hym 41675, 41676); 2♂, “Laoyeling, Maoershan, Shangzhishi, 19 July 1988, Li” (CSFU). Jilin Prov.: 2♂, “Changbaishan, 2 July 1999, Meicai Wei & Haiyan Nie” (CSFU). Gansu Prov.: 2♂, “Dangchuan, Tianshuishi, 7 August 1993” (CSFU). Shaanxi Prov.: 1♀ (Fig. 1A–B), Kaitianguan, 2000 m, 34°00'N 107°51'E, Mt. Taibaishan, Qinling Mts., 2. VI. 2007, A. Shinohara (NSMT, NSMT-I-Hym 41677); 1♂, “Zhouzhixian, 7 August 1994, Ku Lü/at light” (CSFU). Hebei Prov.: 1♂, “Wulingshan, Xinglongxian, 27 July 1957” (CSFU). Henan Prov.: 2♂, “Baiyunshan, Songxian, 24, 27 July 2003, Yingke He” (CSFU); 1♂, “Longyuwan, Luanchuanxian, 23 July 2002, Jigang Jiang” (CSFU); 1♂, “Baotienman, Neixiangxian, July 1998, Wei Xiao” (CSFU).

*Distribution* (Fig. 3). Russia (Primorskij kraj), Korea, northern and central China.

*Remarks*. This is a very peculiar species, characterized by the extremely large eye and ocelli in both sexes. It has been misidentified with *A. sanguinolenta* Mocsáry, 1909, which was described from “Sibiria or. Raddefka”. Kuznet-

zov-Ugamskij (1927), without studying Mocsáry's type material, identified his specimens from Ussuri region with *A. sanguinolenta* and described the males for the first time. The males, according to Kuznetzov-Ugamskij, are characterized by the head strongly narrowed behind the conspicuously large eyes and by the very long antennae. Malaise (1931) apparently agreed with Kuznetzov-Ugamskij and noted about the unusually developed ocelli of the males associated with the nocturnal activity. Gussakovskij (1935), following these authors, used the large eyes, strongly narrowed posterior part of the head, and the long antennae of the male as the good distinguishing characters for *A. sanguinolenta*. An examination of the type material of *A. sanguinolenta* (Fig. 1J–K, female) has revealed that it has normal-sized eyes and ocelli and is not distinguishable from the type of *A. captiva*.

Malaise (1931) noted that the males of this species were “Nachttiere” and came to light. Many of the male paratypes have lepidopteran scales on their bodies, suggesting that moth collectors caught them in light traps. It is interesting that, of over 50 specimens examined, only three are females. Malaise (1931) examined “2♀♀ und viele ♂♂”, but the females in his collection actually belong to *A. captiva*. The females also have large eyes and ocelli and should possibly be active at night, but probably they are not active fliers as the males or they are not attracted to light for some reason.

*Arge siamana* Togashi, 1988, sp. rev.

(Figs. 1E–F, 2E–I, Q, 4D, 6A)

*Arge siamana* Togashi, 1988: 103; Wei and Wen, 2000: 21 (misspelled as *siamatica*, as syn. of *A. captiva*).

*Female* (Fig. 1E–F). Length about 10 mm. Head, metathorax, legs, and abdomen entirely black with distinct purplish reflection; antenna black, without distinct purplish reflection; mouth parts blackish brown; prothorax and mesothorax orange, most of cervical sclerite, ventral half of mesopleuron, posteromedian corner of mesoscutellum, and narrow posterior margin of

mesepimeron purple black; wings blackish infuscated; veins and stigma blackish.

Surface generally smooth and shining; punctures on anterior part of head fine and distinct, generally separated from each other. Head and thorax covered with rather short hairs, those on upper and outer orbits and on ventral part of thorax rather sparse; hairs generally blackish on dark areas and colorless on pale areas.

Head in dorsal view (Fig. 2G) slightly dilated behind eyes. Distance between eyes  $1.3\times$  vertical diameter of eye; eye with vertical diameter  $1.5\times$  horizontal diameter. Postocellar area weakly convex, anterior furrow distinct but lateral furrows indistinct (Fig. 2G). Ocellar area scarcely concave between ocelli. Frontal area raised with nearly flattened top, anteriorly slightly concave medially; median fovea in large deep pit; interantennal carinae high and sharply defined, rather narrowly separated and distinctly convergent below, with roundly concave depression between them; just below level of ventral margins of antennal sockets, carinae becoming low ventrally and finally fused with each other at ventral end of supraclypeal area (Fig. 2E) enclosing very shallow longitudinal depression or groove along midline; supraclypeal area with side slopes very weakly rounded. Malar space  $1.0\times$  width of front ocellus. Clypeus flattened, with anterior margin rather narrowly and roundly incised at middle, lateral lobes nearly truncate at apex (Fig. 2F). Antennal length  $1.6\times$  maximum width of head; flagellum distinctly compressed, weakly curved basally and midapically and rather strongly thickened midapically (Fig. 1E–F).

In forewing, cell 2Rs with anterior width  $0.8\times$  posterior width, and crossvein 3r-m nearly straight; in both wings, wing margin between veins Rs and Cu with very short setae, generally not protruding beyond wing margin.

Abdominal terga glabrous, except for distinctly pilose lateral parts; seventh and more posterior terga with sparse minute setae. Seventh sternum with posterior margin roundly produced at middle. Sawsheath in posterodorsal view (Fig. 2H) short subtriangular in outline, with lateral margin

rounded, apex very narrowly rounded, and medially nearly truncate; dorsomedial ridge rather sharp and dorsal surface nearly flattened; in lateral view (Fig. 2I), ventral margin, except for conspicuous basal convexity, roundly convex, dorsal margin nearly straight, and apex rounded; inner surface spinose.

Lance with few very narrow membranous areas at middle. Lancet (Fig. 6A) with about 27 serrulae as recognized by number of marginal sensilla; distance between 1st and 15th serrulae about  $2.5\times$  distance between 15th and terminal serrulae; dorsal margin glabrous on 1st annulus, with group of setae on each of 2nd to 6th annuli, and continually setose on 7th and more apical annuli; large non-annulate area present dorsoapically; transverse rows of minute setae present between annular plates; marginal sensilla long; basal annular plates dorsally rough; 1st annulus with transverse row of minute setae and with small sclerotized plate ventrally; 2nd annulus sclerotized in ventral half and on narrow dorsal margin; serrulae roundly and very strongly convex, rather narrow and regular in shape; each serrula in median part of lancet with basal slope slightly shorter than apical slope.

*Male.* Unknown.

*Immature stages and life history.* Unknown.

*Type material examined.* Holotype of *Arge siamana* Togashi, 1988 (Fig. 1E–F): ♀, “Thailand: Chiang Mai Province, Doi Inthanon N. P.: Huai Sai Luang 10–1100 m, 13. X. 1981, Zool. Museum Copenhagen leg.” “*Arge siamana* Togashi, 1983, det. Togashi, 1983”, “Typus” (SNM).

*Distribution.* Thailand.

*Remarks.* This species is known only by the female holotype. Based only on the descriptions, Wei and Wen (2000) synonymized *A. siamana* with *A. captiva*. The characters given in the foregoing key will distinguish these two species. Togashi (1988) compared the holotype of *A. siamana* with the original description of *A. kolthoffi* Forsius, 1927, a junior synonym of *A. captiva*, to which *A. siamana* would run in Gussakovskij's (1935) key. Togashi discussed four characters

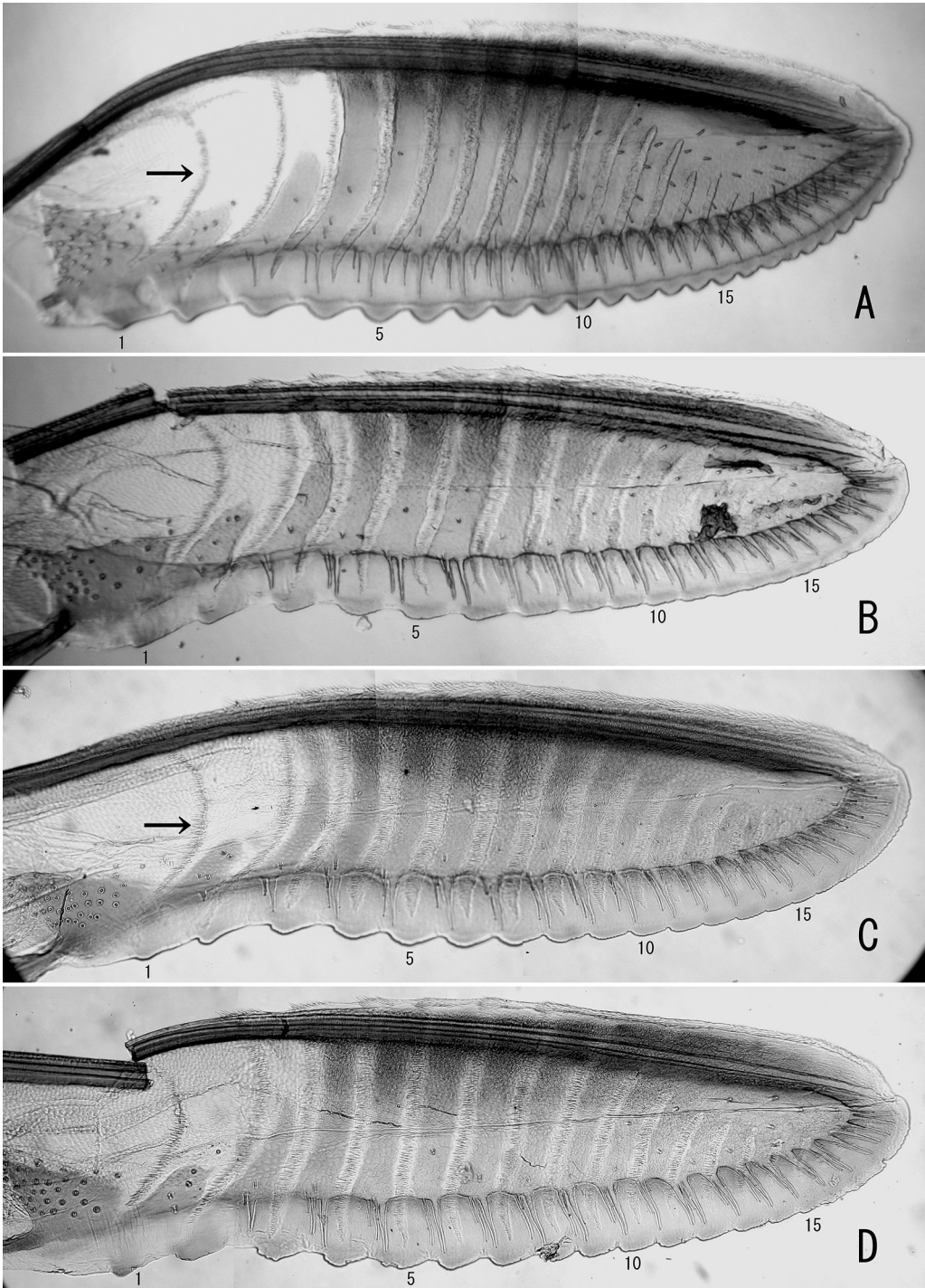


Fig. 6. Lancets, type material. — A, Holotype of *A. siamana*; B, syntype of *A. sanguinolenta*; C, holotype of *A. kolthoffi*; D, syntype of *A. captiva rufoscutellata*. Arrows in A and C showing longitudinal row of minute setae at base of 1st annulus.



(shape of the 2nd and 3rd cubital crossveins in the forewing and the distinctness of the lateral and postocellar furrows on the head), but his interpretation of Forsius (1927) and Gussakovskij (1935) was erroneous concerning the features of the 2nd cubital crossvein and the postocellar furrow. Togashi (1988, p. 104) mentioned, "the 2nd cubital crossvein in the forewing is nearly straight" and "the postocellar furrow is rather ill-defined" in *A. kolthoffi*. However, Forsius (1927) and Gussakovskij (1935) never referred to the "2nd cubital crossvein" of *A. kolthoffi* and, regarding the postocellar furrow, Forsius (1927, p. 4) noted "bei *A. kolthoffi* ist der Scheitel vorn durch eine deutliche Furche begrenzt" and Gussakovskij (1935, p. 403) noted "Scheitelplatte [of *A. kolthoffi*] vorne von den Ozellen durch eine deutliche Furche geschieden". The alluded differences in these two characters therefore have no grounds. A direct comparison of the holotypes of *A. siamana* and *A. kolthoffi* (Fig. 1E–F, L) has revealed no significant differences in the four characters mentioned by Togashi (1988).

### *Arge captiva* (Smith, 1874)

(Figs. 1G–M, 2J–L, M, O, R, 4E–O, 6B–D, 7, 8D–F, 9K–M, 10–13)

*Hylotoma captiva* Smith, 1874: 376; Kirby, 1882: 62; Dalla Torre, 1894: 328; Marlatt, 1898: 504; Nakagawa, 1899: 202; Nakagawa, 1902: 89; Matsumura, 1931: 85 ("captivum"); Matsumura, 1932: 30, 42 ("captivum"); Shinohara and Hara, 2007: 131.

*Hylotoma flavicollis* Cameron, 1876: 460; Kirby, 1882: 63. Syn. n.

*Arge captiva*: Konow, 1905: 18; Konow, 1908: 55; Rohwer, 1910: 118; Takeuchi, 1919: 188; Takeuchi, 1932: 35; Tosawa, 1932: 84; Gussakovskij, 1935: 233, 264, 403; Watanabe, 1937: 5; Takeuchi, 1938: 83; Takeuchi, 1939: 405; Saito, 1941: 130; Takeuchi, 1949: 50; Takeuchi, 1955: 128; Okutani, 1959: 582; Kim, 1963: 279 (misspelled as *captina*); Sato, 1965: 224; Okutani, 1967: 46; Sato and Tosawa, 1967: 178; Kim, 1970: 143, 717 (misspelled as *captina*); Zombori, 1974: 454; Kondo and Miyake, 1976: 7; Okuno *et al.*, 1977: 125; Dai, 1979: 217; Okutani, 1982: 413; Yang and Bianweihui, 1983: 879; Miyoshi, 1988: 189; Abe and Togashi, 1989: 543; Smith, 1989: 125; Yuan and Ding, 1993: 640; Xiao *et al.*, 1992: 70; Kim *et al.*, 1994: 218; Lee and Chung, 1997: 114; Nakamura and Enoki,

1997: 560; Nambu, 1998: 17; Togashi, 1998a: 253; Togashi, 1998b: 33; Wei and Wen, 2000: 21; Kubo, 2000: 288; Yoshida, 2002: 62; Nakamura, 2003: 253; Katayama, 2004: 48; Nagase, 2004: 1244; Naito *et al.*, 2004: 10; Hara and Shinohara, 2005: 276; Wei *et al.*, 2006: 513; Saini *et al.*, 2006: 597; Yoshida, 2006: 24; Shinohara and Hara, 2007: 131.

*Arge flavicollis*: Konow, 1905: 19; Konow, 1908: 54; Gussakovskij, 1935: 233, 265, 403, 420; Ermolenko, 1976: 261; Okutani, 1977: 294; Chou and Naito, 1991: 86; Saini and Thind, 1995: 107; Zhelochovtsev and Zinovjev, 1995: 400; Wei and Wen, 2000: 21 (as syn. of *A. captiva*); Saini *et al.*, 2006: 597 (as sp. rev.); Lelej and Taeger, 2007: 943.

*Arge sanguinolenta* Mocsáry, 1909: 4. Syn. n.

*Hylotoma* ("Arge" [sic]) *captiva*: Matsumura, 1912: 35; Matsumura, 1930: 70 ("Arge").

*Arge kolthoffi* Forsius, 1927: 3; Gussakovskij, 1935: 233, 403. Syn. n.

*Arge captiva rufoscutellata* Takeuchi, 1927: 381; Takeuchi, 1932: 35; Doi, 1938: 29; Takeuchi, 1939: 405 (as syn. of *A. captiva*).

[*Arge captiva* var. *watanabei* Takeuchi, 1932: 35, infra-specific; Takeuchi, 1939: 405; Abe and Togashi, 1989: 543; Wei *et al.*, 2006: 513; Saini *et al.*, 2006: 597.]

*Arge captiva captiva*: Wei and Nie, 2003: 174.

*Arge captiva flavicollis*: Wei and Nie, 2003: 175.

*Female* (Fig. 1G–M). Length about 7–12 mm. Head, cervical sclerite, ventral half of mesopleuron, posterior margin of mesepimeron, metathorax, legs, and abdomen black with dull bluish reflection; antenna black, without distinct bluish reflection; mouth parts blackish brown; pronotum, mesonotum, and dorsal parts of mesopleuron entirely or partly orange, or entirely black with dull bluish reflection; wings blackish infuscated; veins and stigma blackish.

Surface generally smooth and shining; punctures on anterior part of head fine and distinct, partly confluent with each other. Head and thorax covered with rather short hairs, those on upper and outer orbits and on ventral part of thorax rather sparse; hairs generally blackish on dark areas and colorless on pale areas.

Head in dorsal view (Fig. 2L) distinctly dilated behind eyes. Distance between eyes 1.2–1.4× vertical diameter of eye; eye with vertical diameter 1.5–1.7× horizontal diameter. Postocellar area weakly convex, anterior and lateral furrows

usually indistinct (Fig. 2L). Ocellar area scarcely concave between ocelli. Frontal area raised and medially shallowly concave in front of median ocellus; median fovea in large deep pit; interantennal carinae low but sharply defined, subparallel or very slightly convergent below, rather broadly separated, with nearly flattened or widely rounded bottom between them; just below level of ventral margins of antennal sockets, carinae becoming inconspicuous and strongly convergent ventrally and fused with each other at ventral end of supraclypeal area, often V-shaped (Fig. 2J), enclosing shallow, often inconspicuous longitudinal depression along midline; supraclypeal area with side slopes roundly swollen. Malar space  $0.6\text{--}1.0\times$  width of front ocellus. Clypeus flattened, with anterior margin broadly, rather shallowly emarginated, lateral lobes subtriangular (Fig. 2K). Antennal length  $1.3\text{--}1.6\times$  maximum width of head; flagellum hardly compressed, weakly curved basally and midapically and thickened midapically (Fig. 1G–H, J–M).

In forewing, cell 2Rs with anterior width  $0.7\text{--}1.0\times$  posterior width, and crossvein 3r–m weakly curved outwards; in both wings, wing margin between veins Rs and Cu with very short setae, generally not protruding beyond wing margin.

Abdominal terga glabrous, except for distinctly pilose lateral parts; sixth and more posterior terga with sparse minute setae also dorsally. Seventh sternum with posterior margin roundly or subtriangularly produced at middle. Sawsheath in posterodorsal view (Fig. 2M) short subtriangular in outline, with lateral margin rounded, apex very narrowly rounded, and medially nearly truncate; dorsomedial ridge blunt and dorsal surface nearly flattened; in lateral view, ventral margin, except for conspicuous basal convexity, roundly convex, dorsal margin nearly straight, and apex rounded; inner surface spinose.

Lance with several narrow membranous areas at middle (Fig. 4E–N). Lancet (Figs. 6B–D, 7) with about 22 serrulae as recognized by number of marginal sensilla; distance between 1st and 15th serrulae about  $3.4\text{--}6.1\times$  distance between

15th and terminal serrulae; dorsal margin glabrous on 1st annulus, with group of setae on each of 2nd to 6th annuli, and continually setose on 7th and more apical annuli; narrow non-annulate area present dorsoapically; transverse rows of minute setae present between annular plates; marginal sensilla long; basal annular plates dorsally rough; 1st annulus with transverse row of minute setae and with small sclerotized plate ventrally; 2nd annulus fully sclerotized (e.g. Fig. 7A) or weakly sclerotized dorsally (e.g. Fig. 7B); serrulae roundly and strongly convex in basal half and weakly convex in apical half; each serrula with basal slope much shorter than apical slope.

*Male.* Length 7–9 mm. Black with dull bluish reflection; antenna black, without distinct bluish reflection; mouth parts blackish brown; pronotum, cervical sclerite, mesonotum, and dorsal parts of mesopleuron often entirely or partly orange; wings blackish infuscated; veins and stigma blackish.

Structure generally similar to female. Distance between eyes  $1.2\text{--}1.3\times$  vertical diameter of eye; eye with vertical diameter  $1.4\text{--}1.6\times$  horizontal diameter. Malar space  $0.4\text{--}0.8\times$  width of front ocellus. Antennal length  $1.7\text{--}2.2\times$  maximum width of head; flagellum nearly straight, not compressed. Cell 2Rs in forewing with anterior width  $0.6\text{--}0.9\times$  posterior width. Subgenital plate with posterior margin very widely rounded or sometimes truncate in dorsal view and convex ventrally at base in lateral view (Fig. 9K–M). Gonostipes in ventral view narrowed apically with apical width about as long as basal width of harpe and with medial margin posteriorly subtruncate (Figs. 8E, 10B, D, F). Harpe gradually narrowed toward apex. Penis valve with valviceps narrow oval with elongate apex, with round dorsal incision at middle in lateral view, swollen laterally with angular top in dorsal view, and ventromedially with short lateral carina (Figs. 8D–F, 10).

*Larva* (Figs. 11–12). Late instar (Fig. 12) about 23 mm long, creamy white, with head, thoracic legs and spots on body black as in Figs. 11–



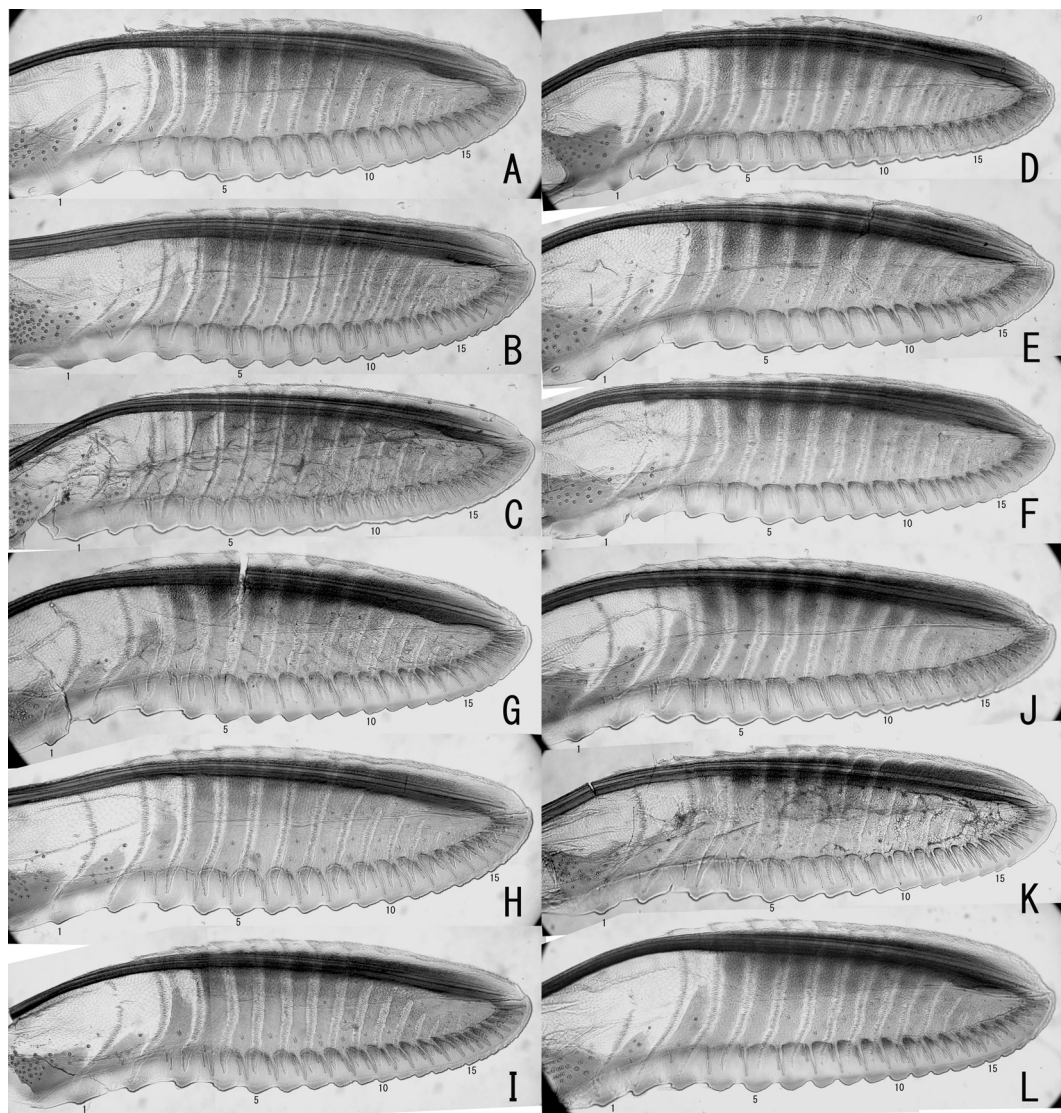


Fig. 7. Lancets, *A. captiva*. — A, Vladivostok, Russian Far East; B, Dalian, Liaoning, China; C, “WenChuan-Shien”, Sichuan, China; D, Chuul, Korea; E, Kasan, Korea; F, Daegu, Korea; G, Sapporo, Hokkaido, Japan (“holotype” of *A. captiva* var. *watanabei* Takeuchi); H, Kurisawa, Hokkaido, Japan, reared from larva on *Ulmus laciniata*; I, Obihiro, Hokkaido, Japan, reared from larva on *Ulmus davidiana* var. *japonica*; J, Kawasaki, Honshu, Japan; K, “Takasago” (=Taiwan); L, Paolai, Taiwan.

12; thorax and apical abdominal segments often slightly tinted with pale orange. Antenna conical, rather elongate (Fig. 12B); clypeus and labrum each with two pairs of setae; mandible with two setae on outer surface; maxillary palp four-segmented; palpifer with two setae; labial palp three-segmented. First to ninth abdominal seg-

ments each three-annulated; black dorsal spots on trunk more or less tuberculate; tubercles except for small ones each with one large seta; lateral lobes with some large setae; setae on trunk missing in final instar, except for those on legs, ventral tubercles and anal segment; prolegs on second to sixth and tenth abdominal segments;

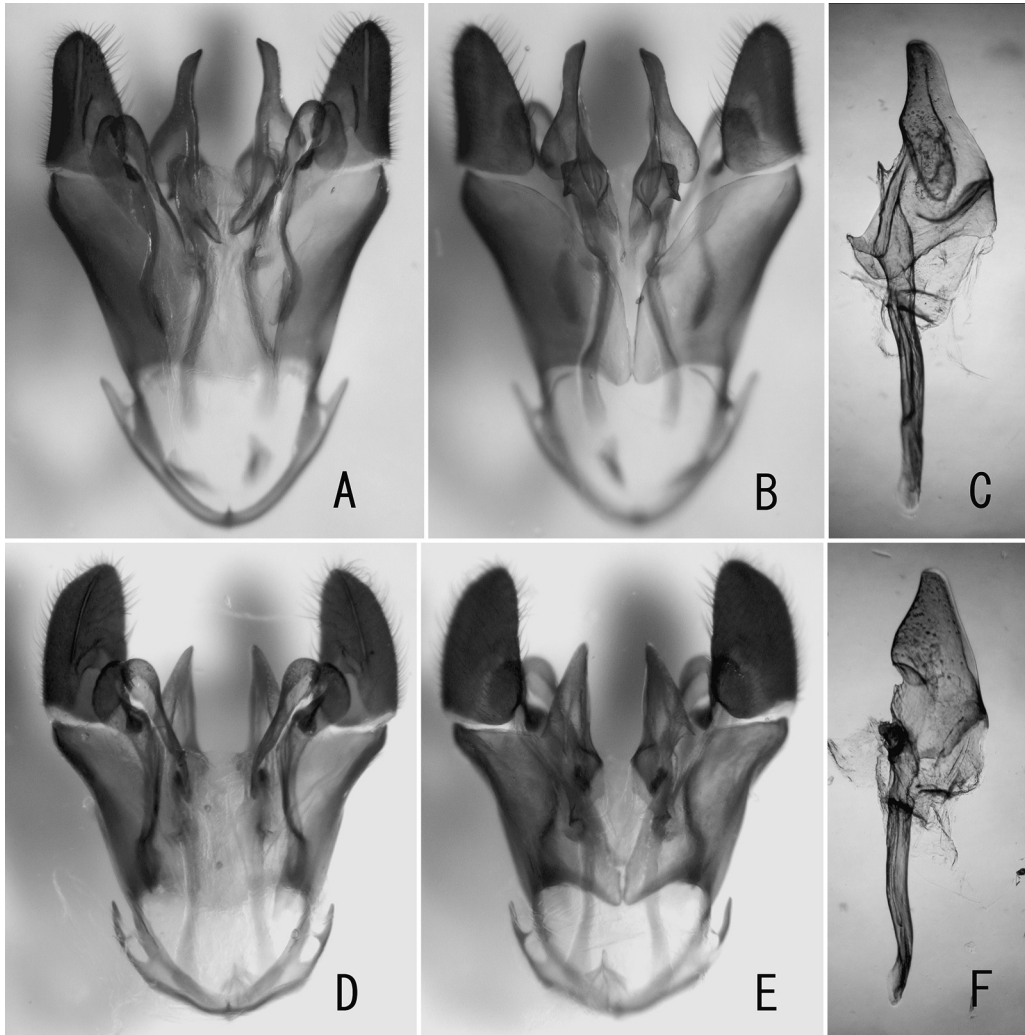


Fig. 8. Male genitalia, *A. macrops*, holotype (A–C) and *A. captiva*, Kawasaki-shi, Japan (D–F). — A, D, Dorsal view; B, E, ventral view; C, F, penis valve, lateral view (left dorsal).

tenth tergum in dorsal view broadly rounded apically.

*Cocoon.* Length 10.5–14 mm in female, 9–10 mm in male. Pale brown. Elongate oval, double walled; outer wall netted and inner wall parchment like.

*Type material examined.* Lectotype of *Hylotoma captiva* Smith, 1874 (Fig. 1G): ♀, “Type H. T.” “B.M.TYPE, HYM. 1.71” “*Hylotoma captiva*, Type Smith” “Hiogo/T 4/6” “Kb.1: 4/14” (BMNH). Lectotype of *Hylotoma flavicollis* Cameron, 1876 (Fig. 1H–I): ♀, “Type H. T.”

“B.M.TYPE, HYM. 1.69” “*Arge (Hylotoma) flavicollis*, Cam.” “61, 49” “Type” (BMNH). Syntype of *Arge sanguinolenta* Mocsáry, 1909: 1 ♀ (Fig. 1J–K), labeled “Siberia or. Raddefka” “Typus, *Arge sanguinolenta* Mocs., 1909” (HNHMB). Holotype of *Arge kolthoffi* Forsius, 1927 (Fig. 1L): ♀, “Provins Kiangsu” “China, Kolthoff” “Juni” “Type” “*Arge kolthoffi* n. sp., ♀, Type, R. Forsius det.” (NRMS). Syntypes of *Arge captiva rufoscutellata* Takeuchi, 1927: 1 ♀ (Fig. 1M), labeled “17. VI. 1926, Shinshu [=Jinju, Gyeongsangnam-do, Korea], Hasegawa” “Lecto-



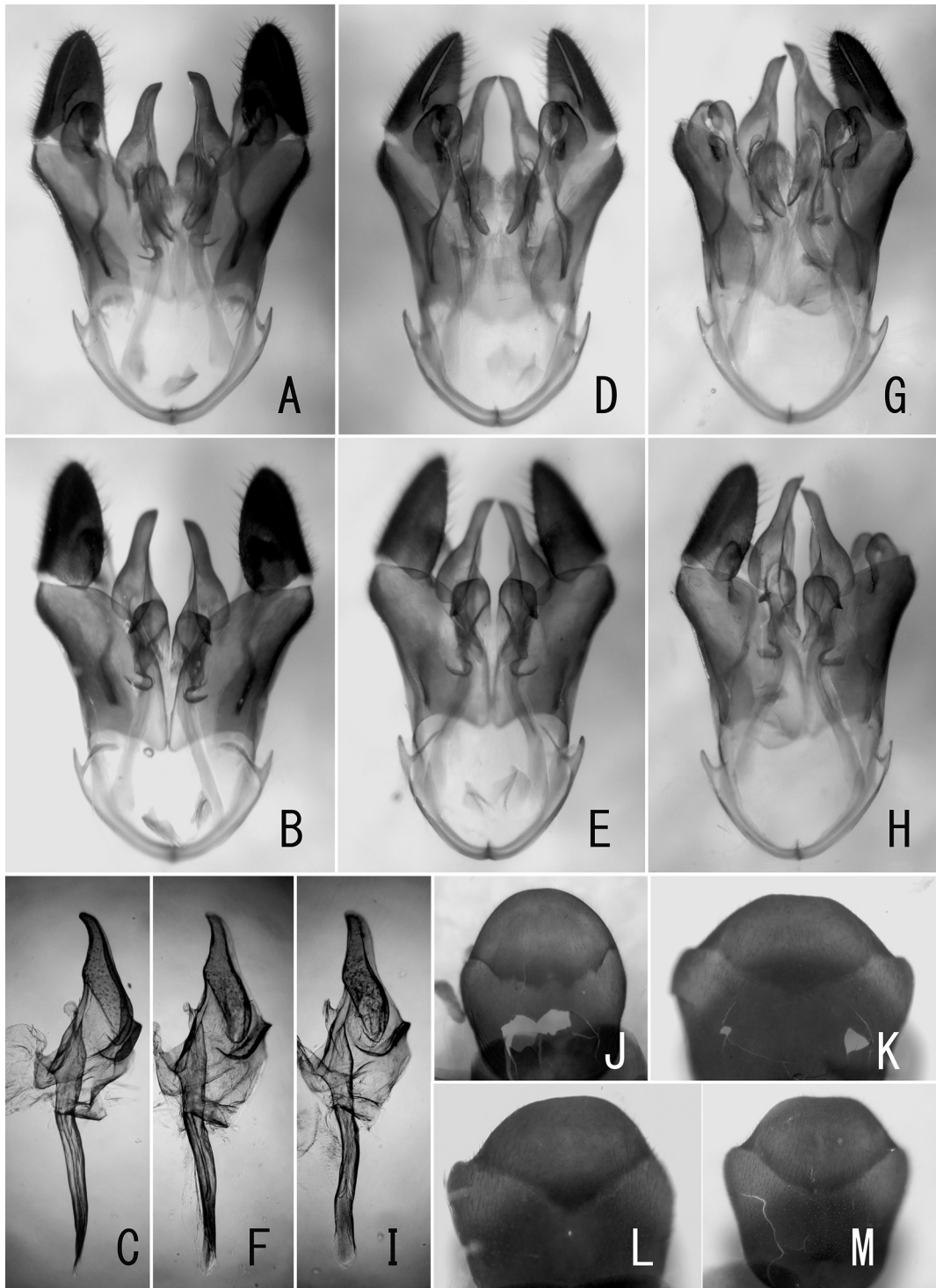


Fig. 9. Male genitalia, dorsal view (A, D, G), ventral view (B, E, H), penis valves, lateral view (left dorsal) (C, F, I), subgenital plates (J–M), *A. macrops* (A–J) and *A. captiva* (K–M). — A–C, Vladivostok, Russia; D–F, Chuncheon, Korea; G–J, “Yablonia”, China; K, “Taikyu”, Korea; L, “Dairen”, China; M, “Takasago”, Taiwan.

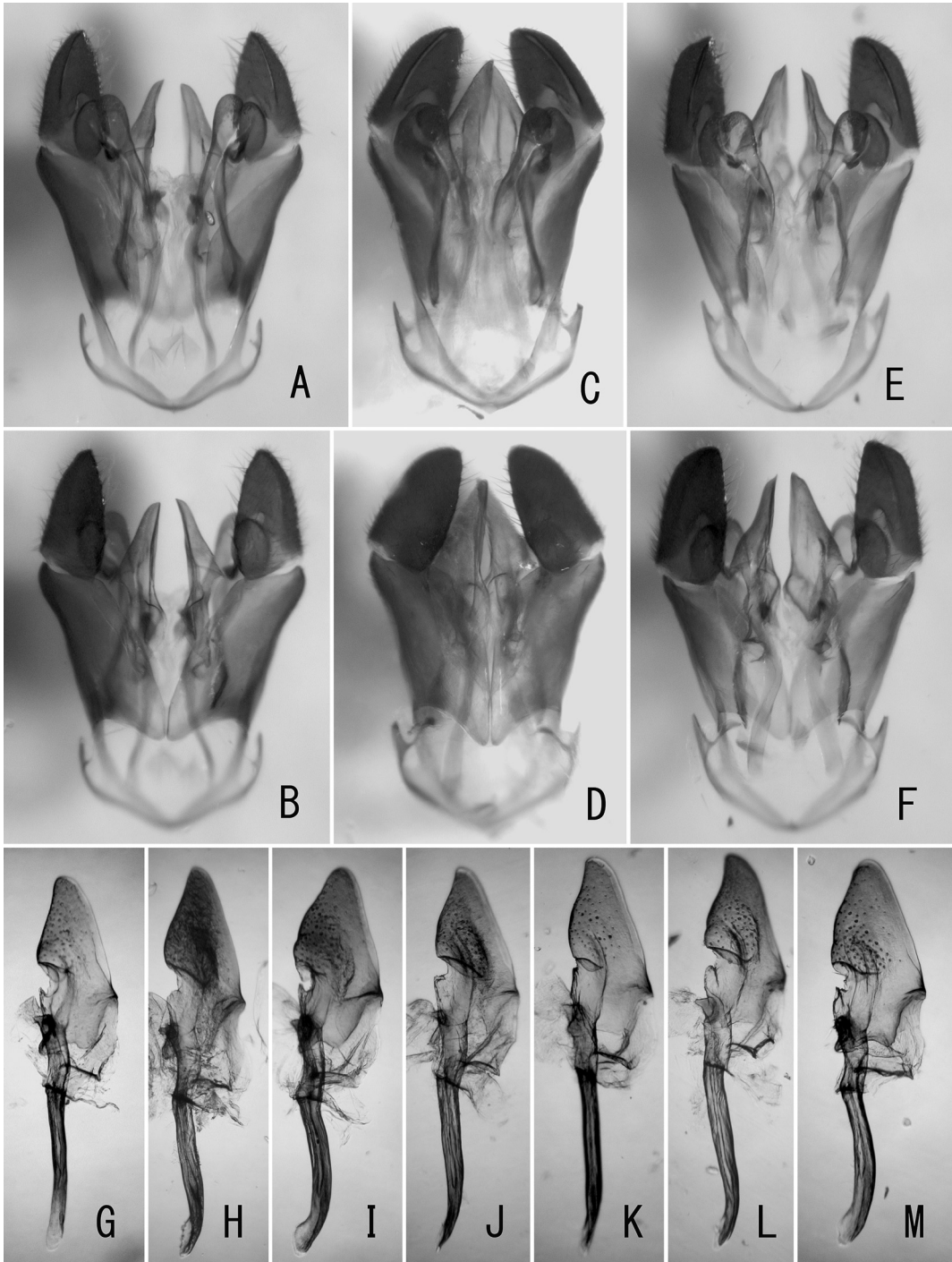


Fig. 10. Male genitalia, *A. captiva*, dorsal view (A, C, E), ventral view (B, D, F), and penis valves, lateral view (left dorsal) (G–M). — A, B, G, Gribnoye, Russia; C, D, J, Jinju, Korea; E, F, M, Mt. Lashan, Taiwan; H, Dalian, China; I, Daegu, Korea; K, Nishiobihiro, Japan; L, “Takasago”, Taiwan.



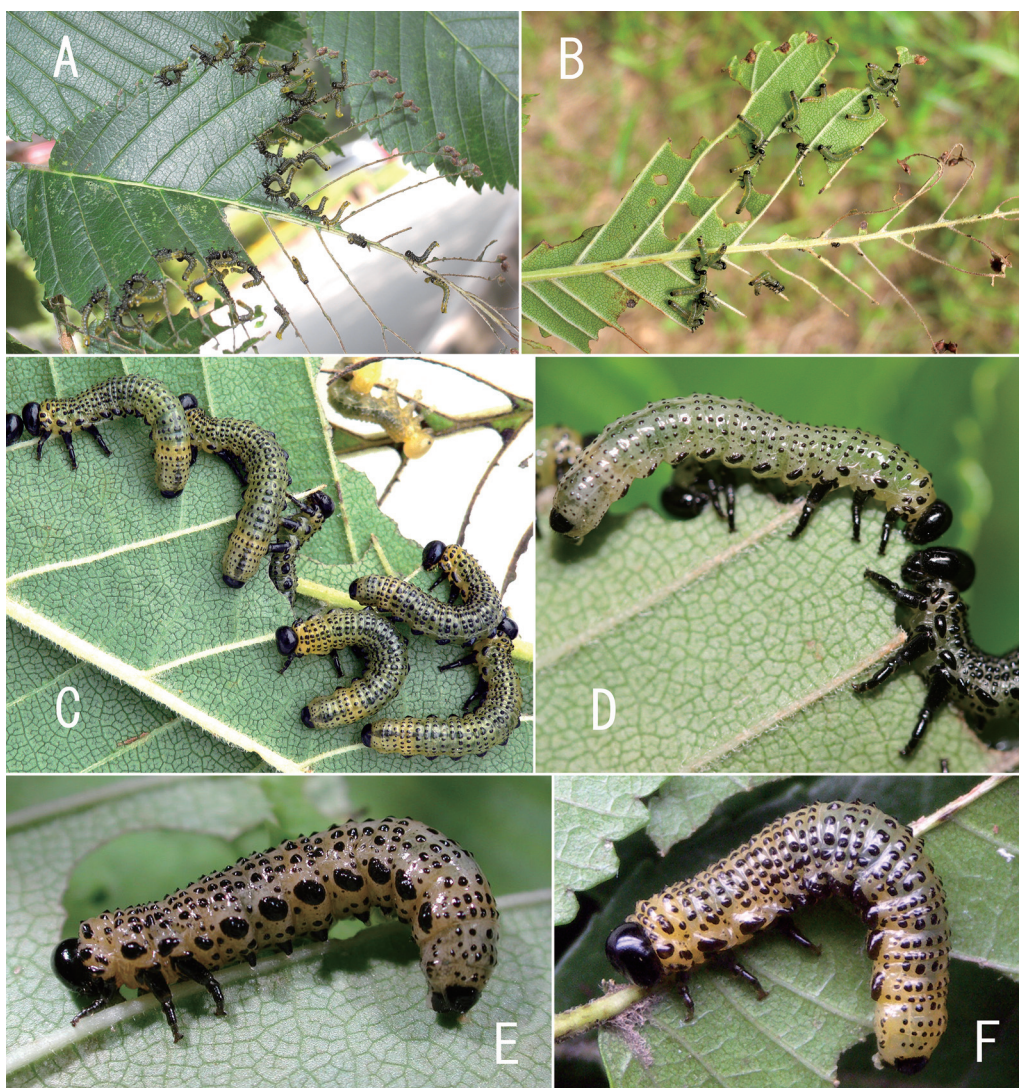


Fig. 11. Larvae, *A. captiva*. — A, Early instar (rearing record H, AS080804) on *Ulmus davidiana* var. *japonica*, near Shirakaba-ko Lake, Nagano Prefecture, Honshu, August 4, 2008; B, early instar (rearing record E, AS090702) on *Ulmus davidiana* var. *japonica*, Nopporo Forest Park, Ebetsu, Hokkaido, July 2, 2009; C, middle instar (rearing record F, HH080717H) on *Ulmus davidiana* var. *japonica*, Kikyo, Hakodate, Hokkaido, August 2, 2008; D, middle instar, same as B, July 5, 2009; E, late instar (rearing record B, HH040810A) on *Ulmus laciniata*, in Manji, Kurisawa, Hokkaido, August 11, 2004; F, late instar (rearing record G, AS061008A) on *Ulmus parvifolia*, in Kamigo-cho, Yokohama-shi, Kanagawa Prefecture, Honshu, October 17, 2006. Digital images taken by Shinohara (A, B, D, F) and Hara (C, E) on the given date.

type [unpublished], *Arge captiva* var. *rufoscutellata* Takeuchi, D. R. Smith" (OPU); 1 ♂, labeled "17. VI. 1926, Shinshu, Hasegawa" (OPU).

*Other material examined.* RUSSIA: Primorskij kraj: 1 ♀, "3/7" "Vladivostok, Tigrovaja, Malaise" (NSMT); 1 ♀, "26/7" "Vladivostok,

Sedanka, Malaise" (NRMS); 1 ♀, "Vinogradovka, Ussur. kr., 30. V. 929, Kirichenko" (NRMS); 1 ♀, "Frolovka, Suchan, Ussur. kr., 11.VII.926, Mordvilko" (NRMS); 1 ♂, "Gribnoye, 10km E of Chernigovka, Prim. kray, 23–24. V. 1995, A. Lelej" (NSMT). KOREA: Hamgyeongnam-do:



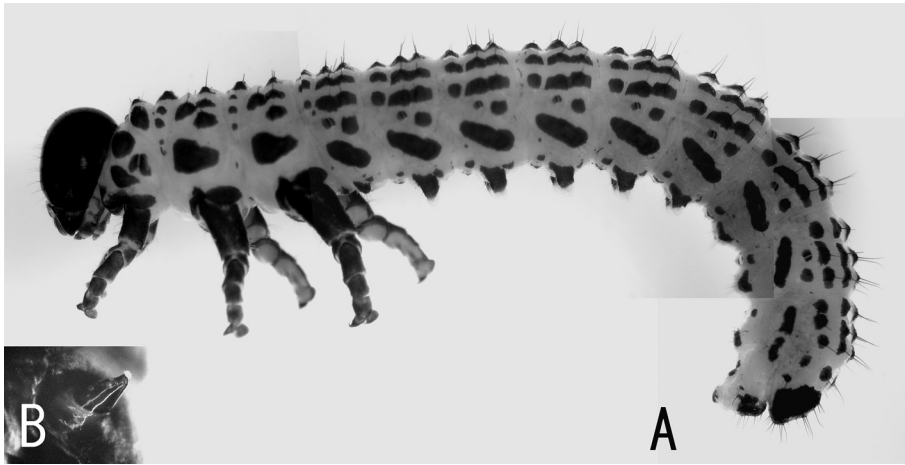


Fig. 12. Late instar larva, *A. captiva* (rearing record H, AS080804, fixed August 12, 2008). — A, Lateral view; B, antenna, lateral view.

2 ♀ 1 ♂, “end VII, 1933, Hokusei [=Pukchong], K. Saito” “collected in Hokusei and reared in Suigen [=Suwon], em. end of July, 1933, host: *Ulmus*” (OPU). Hamgyeongbuk-do: 1 ♀, “Shuotsu [=Chuul], 16. VII. 1931, K. Sato” (NSMT). 1 ♀, “Shuotsu, 17. VII., Y. Yano (Cor. Chi. Exp. 1937)” (OMNH). Gyeonggi-do: 1 ♀, “Koryo [=Kwangneung], 1. VI. 1924, Y. Hasegawa” (NSMT); 1 ♀ 1 ♂, Suigen [=Suwon], 5. VII. 1922, K. Sato (NSMT); 2 ♀ 1 ♂, Suigen, 10. VII. 1922, K. Sato (NSMT); 1 ♂, Suigen, 25. V. 1924, K. Sato (NSMT); 1 ♂, Suigen, 5. VI. 1924, K. Sato (NSMT); 1 ♂, Suigen, 5. VII. 1925, K. Sato (NSMT); 3 ♂, Suigen, 8. VII. 1925, K. Sato (NSMT); 1 ♀, Suigen, 29. V. 1929, S. Fujii (NSMT); 1 ♀ 2 ♂, Suigen, VII. 1925, K. Sato (NSMT); 1 ♀, Suigen, 4. VII. 1925, K. Sato (NSMT); 1 ♀, “Suwon, 6. VI. 1990, D. H. Kang” (SNU); 2 ♀, “5. VI. 1936, Kasan [? nr. Suwon], Takeuchi” (OPU); 1 ♀, “Nongdae [=College of Agriculture, Seoul National Univ., Suwon], 11. IX. 95, Kim Jung-Wook” (SNU); 1 ♀, same data except “12. IX. 95” (SNU); 1 ♀, “Bukhansan, Uiryon, V. 30. 1995, Han Kyeong-Deok” (SNU); 1 ♀, “Anyang, 31. V. 91, K.S.I.” (SNU); 1 ♀, “Anyang Sumokwon, V. 12. 95, Kim Jung-Wook, on *Hydrangea arborescens*” (SNU); 1 ♀, “Deungducheon, Soyosan, 1985. IX. 1, Park Jeom-Hui”

(SNU). Gangwon-do: 1 ♀, “Pyongchang, GW, 31. VII. 1991, K. T. Park” (SNU); 1 ♀, “Kangwon, Hongcheon, Kachilbong, 1995.06.09, Lee Jeong-Hun” (SNU); 1 ♀, same data except “Baek Jeong-Hui” (SNU); 1 ♀, “Cahngchon [sic], GW, 11. VI. 1994, Y. I. Kim & J. H. Lee” (SNU); 1 ♀, “2007. VII. 31, Kangneung-si, Yeongok-myeon, Samsan-ri (Guhwolsaap), coll. H. S. Lee, N 37.51'31" E 128.43'04", alt. 186 m” (HSLC); 1 ♀, “Chuncheon, Nam-myeon, Magag-li, Mal. trap in larch planted forest with dense shrub layer, 24. V.–12. VI. 2004, Tripotin Coll.” (USNM); 1 ♀, same locality “along Hongcheon river, alt. 70 m, N 37.43.786 / E 127.34.589, 11. VII.–7. VIII. 2004, Tripotin rec.” (USNM); 1 ♀, “Inje-gun, Nam-myeon, Gamdun-li, 250 m, N. 37.58.40 / E 128.07.54 on Sumac/Ampelopsis/yellow Umbelifera flowers, 5–6. VIII [sic]. 2005, Tripotin rec.” (USNM); 1 ♀, “Odaesan nr. Dongdaesa, 4 Mal. tr. in old Korean Fir Forest, 2. vi.–2. viii, 2006, N. 37.44.31 / E 128.35.71, 800 m, Tripotin rec.” (USNM); 1 ♀, Pugdaesa, ca. 1300 m, Mt. Odaesan, 27. V. 2008, A. Shinohara (NSMT); 2 ♀, “Gapyeong-gun, Seo-myeon, Magok-li, 37.42.97 N 128.35.45 E, 5 Mal. tr. in forest area, 24. VIII–31. IX. 2006, Tripotin rec.” (USNM). Chungcheongnam-do: 1 ♀, “Chungnam, Daejeon-si, Wadong, Mal. tr., al. forest on wild Rosa

- patch, 36 24.02 N/127 25.98 E, 17. IX.–6. X. 2006, Tripotin rec.” (USNM). Chungcheongbuk-do: 1 ♂, “Seishu [=Chongju], J. Yoshioka” (NSMT); 1 ♀, “Chungbuk, Muju Valley (resort), 2–3. VIII. 2003, C. Yong rec./leg.” (USNM); 1 ♀, “Chungnam [sic], Yeongdong-gun, Sangchonmyon, Mulhan valley, Gojadong, 4. VIII–24. IX. 2002, P. Tripotin Coll.” (USNM). Gyeongsangbuk-do: 5 ♀, Andong, 3–6. VI. 1970, H. Yamada, K. Tobi & S. Ohkusa (KU); 8 ♀10 ♂, Taikyu [=Daegu], 5. V. 1931, H. Sugiura (NSMT); 3 ♀ 2 ♂, Taikyu, 5. V. 1931, K. Sato (NSMT); 1 ♀2 ♂, “29. V. 1936, Kinsen [?=Kimchon], Takeuchi” (OPU); 1 ♀, “Bukkokuji [=Bulguksa], 7. V. 1931, H. Sugiura” (NSMT). Jeollabuk-do: 1 ♀, “Jirisan, Hamyang-gun, Songjeon-li, Munsu-sa, alt. – 400 m, Mal. trap, in forested area in shade, N 35 24.739/E 127 43.818, 6–27. VI. 2004, Tripotin Coll.” (USNM); 1 ♀, same data except “ex 2 Mal. traps in forested area, 27. VI.–27. VII. 2004” (USNM); 1 ♀, same data except “16. VIII.–5. IX. 2004” (USNM); 2 ♀, same data except “5. V.–4. VI. 2005” (USNM); 1 ♀, same data except “9. VII.–17. VIII. 2005” (USNM); 1 ♀, “Jirisan, Hamyang-gun, Macheon-myon, Songjeon-li, alt. – 700 m, Mal. trap, on sm. stream, N 35 20.930/E 127 38.503, 27. VI.–27. VII. 2004, Tripotin rec.” (USNM); 1 ♂, same data except “27. VII.–16. VIII. 2004” (USNM); 1 ♀, same data except “6. VI. 2004” (USNM); 1 ♀, “Jirisan, Hamyang-gun, Macheon-myon, Songjeon-li, alt. – 700 m, 35 20.55 N/127 38.21 E, 27. VII. 2004, Tripotin rec.” (USNM). Gyeongsangnam-do: 2 ♀, “Masan, 1994.VIII.10, Lee Hak-Yeong” (SNU); 1 ♀, “K. N., Sancheong-gun, Jungsan-ri, Sunduryu, 1981.VI. 3, Choe Nak-sik” (SNU); 1 ♀, “7. VI. 97, Pijindo, nr. Kojedo, Tripotin Coll.” (USNM). Jeollanam-do: 1 ♀, “Korea, I. A. S., Suncheon, VI. 29. 1994, E. Y. Her” (SNU). JAPAN: Hokkaido: 1 ♀, Nayoro, Odori-minami, 26. VI. 2009, H. Hara (NSMT); 1 ♀, Sounkyo, 5. VIII. 1931, Kobayashi (OPU); 1 ♀, Tenninkyō, 28. VII. 1962, K. Tsuji (KU); 4 ♀, “Abashiri, 4. VIII. 1930, S. Fujii” “*Arge captiva* var. *watanabei* Takeuchi, det. K. Sato, ‘57” (NSMT); 1 ♀, Ashoro, Tokachi, 15. VII. 1964, A. Nagatomi (KU); 1 ♀, Obihiro, 18. VII. 2007, H. Hara (NSMT); 1 ♀ (HH040823A), Obihiro, 23. VIII. 2004, deposited 14 eggs on *Ulmus davidiana* var. *japonica* on 23–25. VIII. in cage, H. Hara (NSMT); 3 ♀ (progeny of HH040823A), Obihiro, eggs deposited on 23–25. VIII. 2004, cocoon 21–23. IX., em. 13–15. X. 2004, host: *Ulmus davidiana* var. *japonica*, H. Hara (NSMT); 1 ♂, Nishiobihiro, 20. VI. 2004, A. Shinohara (NSMT); 1 ♀, Memuro, Tokachi, 16. VII. 1976, M. Suwa (HU); 1 ♀ (HH040810A), Manji, Kurisawa, 5 gregarious larvae on *Ulmus laciniata*, 10. VIII. 2004, cocoon 12–13. VIII., em 31. VIII. 2004, H. Hara (NSMT); 1 ♀, Bibai, Sorachi, 10. VI. 1996, H. Hara (NSMT); 1 ♀, Ichinosawa, Iwamizawa, 30. V. 2007, on *Ulmus davidiana* var. *japonica*, H. Hara (NSMT); 1 ♂, Nakagoya, Tobetsu, 14. VI. 1998, H. Hara (NSMT); 1 ♂, “Sapporo, Matsumura, Maruyama, 26. VI. 1913” (HU); 1 ♀, “Sapporo, Dr. Matsumura” (HU); 1 ♀, “Maruyama, K. Igarashi, 3. VI. 1928” (HU); 1 ♀, “Sapporo, Y. Ota, 9. VI. 1930” (HU); 1 ♂, Kotoni, 1. VII. 1932, H. Sugiura (NSMT); 15 ♀13 ♂ [including “type series” of *A. captiva* var. *watanabei* Takeuchi, 1932], Sapporo, 2. VII. 1932, C. Watanabe (HU, OPU); 1 ♂, Hokkaido, Uchida, Kotei [=school campus], 5. VII. 1932” (HU); 1 ♀, “Sapporo, 25. VI. 1939, H. Aoki” (OMNH); 1 ♂, Hyakumatsuzawa, Sapporo, 20. VIII. 2001, T. Yoshida (HU); 1 ♀, Hokkaido Univ., Sapporo, 15. IX. 2003, H. Hara (NSMT); 1 ♀, Hokkaido Univ., Sapporo, 26. VIII. 2004, H. Hara (NSMT); 1 ♀ (HH040826A), Hokkaido Univ., Sapporo, 26. VIII. 2004, deposited 10 eggs on leaf margin of *Ulmus pumila* on 26–27. VIII. in cage, H. Hara (NSMT); 1 ♀, Hokkaido Univ., Sapporo, larva coll. 12. IX. 2006, em. 25. IV. 2007, host: *Ulmus pumila*, H. Hara (NSMT); 23 ♀, Hokkaido Univ. Campus, Sapporo, 43-04-33N 141-20-31E, 28. VI. 2007, A. Shinohara (NSMT); 24 ♀52 ♂, Hokkaido Univ., Sapporo, 7. VII. 2007, on *Ulmus pumila*, H. Hara (NSMT, HFRI); 1 ♀, Botanical Garden, Hokkaido University, Sapporo 43-03-51N 141-20-34E, 28. VI. 2007, A. Shinohara (NSMT); 5 ♀, Hokkaido Government Office, Sapporo, 43-03-47N 141-20-

- 56E, 28. VI. 2007, A. Shinohara (NSMT); 1 ♀, Shikotsu, 24. VI. 1989, R. Inomata (MNHAH); 3 ♀ 1 ♂ (HH080717H), Hakodate, Kikyo, eggs coll. 17. VII. 2008, hatched 24. VII., cocoon 8-11. VIII., em. 31. VIII.–10. IX. 2008, host: *Ulmus davidiana* var. *japonica*, H. Hara (NSMT). Honshu: Tochigi Pref.: 2 ♀, Chuzenji, Nikko, 4. VI. 1977, A. Shinohara (NSMT); 6 ♂ (AS080925B), Nikko, 590 m alt., 36-45-8N 139-36-25E, larvae coll. 25. IX. 2008, matured 1–5. X, em. 18–25. X. 2008, host: *Ulmus davidiana* var. *japonica*, A. & N. Shinohara (NSMT). Gunma Pref.: 1 ♂, Nishikurozawa, 800 m, 36-49-55N 138-57-29E, nr. Mt. Tanigawadake, Doai, 26. VIII. 2007, A. & N. Shinohara (NSMT). Chiba Pref.: 1 ♀ 2 ♂, Sawada, Ichikawa City, 21. VIII. 2003, H. Suda (HSC); 1 ♀, Moto — Kamimoto, Shisui, Inba, 8. V. 1975, H. Suda (HSC); 1 ♀, Enokido, Yachimata City, 29. VII. 1995, H. Suda (HSC). Tokyo Met.: 4 ♀ 3 ♂, Meguro, 25. V. 1934, K. Sato (NSMT); 1 ♀, Koremasa, Fuchu, 22. VII. 1989, A. Shinohara (NSMT); 1 ♀, Shinmachi, Oume, 18. V. 1990, H. Takahashi (NSMT); 1 ♀, “7–18. 1930, *Ulmus americana*, Komaba” (OPU); 1 ♀, “Komaba, Tokyo, Hirayama” (OPU). Kanagawa Pref.: 2 ♂ 13 ♀ (AS061008A), Kamigo-cho, Yokohama-shi, 80 m alt., 35-20-30N 139-35-02E, larvae coll. 8. X. 2006, matured 20. X.–1. XI., em. 18–29. XI. 2006, host: *Ulmus parvifolia*, A. & N. Shinohara (NSMT); 15 late instar larvae, same data, except fixed 25. X. 2006 (NSMT); 30 ♀ 61 ♂, Kosugimachi, Kawasaki-shi, 27. IV. 1989, H. Ono (NSMT); 9 ♀ 1 ♂, Ebina, 20. VIII. 1957, fed on *Ulmus* sp., Izumi (NSMT). Nagano Pref.: 1 ♀, Shimashima-dani, 29. VII. 1989, H. Takahashi (NSMT); 25 late instar larvae (AS080804), Shirakaba-ko, 1420 m alt., 36-6-22N 138-14-31E, 4. VIII. 2008, fixed 12. VIII, host: *Ulmus davidiana* var. *japonica*, A. & N. Shinohara (NSMT). Kyoto Pref.: 1 ♀ 7 ♂, Kyoto, 15. V. 1927, K. Takeuchi (OPU, OMNH); 1 ♀, Kyoto, 27. V. 1931, K. Takeuchi (OPU); 1 ♀, Kyoto, 21. V. 1953, K. Takeuchi (OPU); 1 ♀, Kose, 26. VII. 1929, K. Takeuchi (OPU); 1 ♂, Kyoto, 20. VII. 1924, K. Takeuchi (OPU); 1 ♀, “Kyoto, von Herr Oe” (OMNH); 1 ♀, “Kyoto, Daimonjiyama, ‘39. 9. 3, T. Kimura” (KU). Nara Pref.: 1 ♂, Saki-cho, 100 m, Nara-shi, 19. V. 2002, H. Yoshida (HYC). Osaka Pref.: 1 ♀, Yoshikawa-mura, 11. V. 1941, J. Yoshioka (NSMT); 1 ♂, Minoo, 11. VI. 1936, K. Shibuya (OPU); 1 ♀ 1 ♂, “Minomo [=Minoo], N. Tosawa” (OMNH); 1 ♀, “Minou [=Minoo], 21. VI. 1926, N. Tosawa” (OMNH); 1 ♀, Osaka, 24. V. 1916, K. Takeuchi (OPU); 2 ♂, Osaka, 27. V. 1915, K. Takeuchi (OPU); 1 ♀, “Juso, 28. IV. 1916, N. Tosawa” (OMNH); 1 ♀, Utsubo-koen, Nishi-ku, Osaka, 26. VI. 1991, S. Okuno (OMNH); 4 ♂, Utsubo-koen, Nishi-ku, Osaka, 16. VIII. 1992, S. Okuno & K. Katsura (OMNH); 1 ♂, Chishima-koen, Taisho-ku, Osaka, 30. VI. 1986, A. Ichikawa (OMNH); 1 ♀, Chishima-koen, Taisho-ku, Osaka, 21. VI. 1994, A. Ichikawa (OMNH); 1 ♂, Ohama-koen, Ohamakita-machi, Sakai-shi, 12. V. 1981, K. Harusawa (OMNH); 1 ♂, Ishibashi, 18. V. 1952, M. Koizumi (OMNH). Hyogo Pref.: 1 ♀, “Hisayaki-mura, Sayo-gun, Japan” “*Arge captiva* Sm., det. Malaise, 1933” (NRMS); 1 ♀, “Takarazuka, N. Tosawa” (OMNH); 1 ♀, “Takarazuka, 25. V. 1948, N. Tosawa” (OMNH); 1 ♀, Nishiwaki, Yokacho 45, 27. V. 1958, R. Inomata (MNHAH, B1-298054); 1 ♀, Aina, Yamada, Kita-ku, Kobe-shi, 17. V. 1997, H. Yoshida (cited by Naito *et al.*, 2004, HYC); 1 ♀, “760718, Kasui, coll. N. H.” (KU). Tottori Pref.: 1 ♀, Daisen, 15. VII. 1920, K. Takeuchi (OPU). Shikoku: Kochi Pref.: 3 ♀, Shioyazaki, 28. VII. 1982, A. Ishida (OMNH); 3 ♀ (AS071103A), Godai-san, Kochi-shi, ca. 100 m alt., 33-32-57N 133-34-50E, larvae coll. 3. XI. 2007, matured 4–5. XI., em. 23–25. IV. 2008, host: *Ulmus parvifolia*, A. Shinohara (NSMT); 1 ♀, same data except em. 21. V. 2008 (NSMT); 1 late instar larva, same data, except fixed 4. XI. (NSMT). Kyushu: Nagasaki Pref.: 1 ♀, Tsushima, Izuhara — Ariake-yama, 9. VI. 1941, T. Shirozu (OPU); 1 ♀, Tsushima, Mitsushima, Ofunakoshi, 2. VI. 2002, E. & R. Matsumoto (OMNH). CHINA: 1 ♂, “Walker Coll., China 92–196” “8335” “British Museum” “*Arge flavicollis* Cam., Malaise det., 1933” (NRMS). Heilongjiang Prov.: 1 ♀, “Harbin, Manchiukuo, Aug.

6. 1937, T. Touchiyama" (OPU); 1 ♀, "Harbin, Manchukuo, M. Weymar." "June 10, 1936" "Carn. Mus. Acc. 11136" "*Arge captiva* Smith" (USNM); 1 ♀, "Manchuria, Ertsentientze, 62 km E of Harbin on Chinese Eastern Railway, 15-VI-41, V. N. Alin coll." (CAS). Jilin Prov.: 1 ♀, "Erdao, Changbaishan, 30 June 1999, Meicai Wei & Haiyan Nie" (CSFU). Liaoning Prov.: 1 ♀, "On: Nire [= *Ulmus*], Date: 1935.6.23, Place: Yugakuzyo [= Xiongyuecheng], Name Seki [= Qi]" (OPU); 1 ♀, "Yugakuzyo, S. Kariya, 1936.6.10" (OPU); 12 ♀ 1 ♂, "Yugakujo, 17. VI. 1917" (KU); 2 ♀ 1 ♂, "Dairen [= Dalian], Nanmanshu, 2. VIII. 1933, Col. K. Nomura" (OPU); 1 ♀, "Mukden [= Shenyang], von E. Suenson, 2. V. 1922" (OMNH); 1 ♀, "Shenyang, 10 June 1999, Yuzhan Sun" (CSFU); 1 ♂, "Shenyang, 10 June 2003, Maoling Sheng" (CSFU); 1 ♀, "Shenyang, 26 June 2003, Maoling Sheng" (CSFU); 1 ♀ 2 ♂, "Shenyang, 25 July 2003, Maoling Sheng" (CSFU); 1 ♂, "Shenyang, 25 July 2003, Suping Sun" (CSFU); 2 ♀, "Shenyang, 30 July 2003, Maoling Sheng & Suping Sun" (CSFU). Neimenggu Auton. Reg.: 1 ♀, "Yimenzhunqi, 24 June 1972" (CSFU). Ningxia Hui Auton. Reg.: 1 ♀ 1 ♂, "Shapotou, Zhongwei, April 1985, Guodong Rea" (CSFU). Gansu Prov.: 2 ♀ 1 ♂, "Yuquanguan, Tianshuishi, 24 April 2001, Xingyu Wu" (CSFU); 1 ♂, "Huaqiqinjiagou, Tianshuishi, 23 May 2006, Heng Xin" (CSFU); 1 ♀, "Xiaolongshan, Tianshuishi, 7 July 2007, Yihai Zhong" (CSFU). Shaanxi Prov.: 1 ♂, "Zhongnanshan, Xi'an, 27 May 2006, Xun Zhu" (CSFU). Shanxi Prov.: 1 ♂, "Shanxi Prov., 27 July" (CSFU). Hebei Prov.: 1 ♀, "Wulingshan, Xinglongxian, August 1974" (CSFU); 1 ♀ 3 ♂, "Yunyougu, Wulingshan, 15 June 2007, Zezhan Li" (CSFU). Beijing Munic.: 1 ♀ 1 ♂, "Xishan, 20 June 1957, Songhe Ying & Shaohua Li" (CSFU); 1 ♂, "Peiping, 1417" (USNM); 6 ♀ 1 ♂, "Peiping, Hopei, VII-VIII, 1932, G. Liu" (MCZ). Tianjin Munic.: 1 ♀, "Tientsin [= Tianjin], June 1902, F. M. Thomson, 1904-229" (NRMS); 2 ♀ 1 ♂, "Tientsin, 15. 6. 06, F. M. Thomson, 1907-200" "*Arge (Hylotoma) flavicollis* Cam." (1 ♀ in NRMS labeled "compared with

type and found identical, Malaise, 1933") (NRMS, NSMT); 1 ♀, "Tientsin" "Collection Tischbein, Konow determin. 1906" "*Arge flavicollis* Cam. ♀, Fr. W. Konow determin. 1907" (NRMS). Sichuan Prov.: 1 ♀, "WenChuanShien, 30 mi NNW Kuanshien [= Guanxian], VII-22. 1933" "Szechwan [= Sichuan], DCGraham, 4600 ft." (USNM). Hubei Prov.: 1 ♂, "Shizhishan, Wuhan-shi, July 1995, Yanggan Zhu" (CSFU). Henan Prov.: 1 ♀, "Anyang, 3 July 1957, Xiaoquan Li" (CSFU); 1 ♂, same data except "6 October 1957" (CSFU); 1 ♂, same data except "22 October 1957" (CSFU); 1 ♀, "Langyuwan, Luanchuanxian, 21 July 2004, Meicai Wei" (CSFU). Shandong Prov.: 1 ♀, "China, Tsingtao [= Qingdao], VI-10-1926, RHLLeFevre" (USNM); 1 ♀, "Tsinan [= Jinan], Shantung [= Shandong], VI-10-1926, RHLLeFevre" (USNM); 1 ♀, same locality, "A. P. Jacot, Jun. 8, 1922" (USNM). Jiangsu Prov.: 1 ♀, "Nanking [= Nanjing], China, V. 5. 23" "Presented by ECVanDyke, Collector" "*captiva*, D. R. Smith" (USNM); 1 ♀, "Nanking, VI. 20. 1923" (USNM); 1 ♀, Nanking, Aug. 14, 1919, H. E. Loomis (USNM); 1 ♀ 1 ♂, "Nantung [= Nantong], China, V-9-23" "Presented by ECVanDyke, Collector" (♀ with "*Arge flavicollis* (Cameron) ♀, det. H. N. Greenbaum") (CAS); 1 ♀, "Penniu, China, IX. 22, 1925, Coll. C. Y. Wong" (USNM); 1 ♀ 1 ♂, "Nanking, IV. 20, 23" "Presented by ECVanDyke, Collector" (CAS); 1 ♂, "Nanking, V. 1. 23" "Presented by ECVanDyke, Collector" (CAS). Shanghai Munic.: 1 ♀, "Zô-sè [= She Shan]" "Chine, Prov. Kiangsu, Shanghai, Musee Heude" "26.6.30, O. Piel coll." (cited by Takeuchi, 1938; OPU). Guizhou Prov.: 1 ♀, "Fuguoshi, Fanjingshan, 28 July 2001, Mingli Chen & Ningting Huang" (CSFU). Hunan Prov.: 1 ♀, "Laopenggou, Mufushen, Yueyangshi, 28 May 2007, Shuaigo Nie" (CSFU); 1 ♀, "Jiuweishan, Yongzhoushi, 23 April 2007, Meicai Wei" (CSFU). Zhejiang Prov.: 1 ♀, "Hangchow [= Hangzhou], China, V-10, 1925, Coll. T. P. Chao" (USNM); 1 ♀, "Hangchow, IV-5-1926, T. P. Chao" (USNM); 1 ♀, "Xitianmushan, Linanshi, 2 June 1990, Junhua He" (CSFU). Guangdong Prov.: 2 ♀ 1 ♂, "Chebaling, Shixingxian, Shaotian-



shi, 13 April 2007, Meicai Wei & Yihai Zhong” (CSFU). Fujian Prov.: 1 ♀, “Jiangningxian” (CSFU); 1 ♀, “Foochow [=Fuzhou], C. R. Kellogg Coll.” (CAS). TAIWAN: 1 ♂, Mt. Lala-shan, Taoyuan Hsien, 3.VI.1986, C. C. Lo (NSMT); 1 ♀, “Paolai, Taoyuan, Kaohsiung, 3. V. 1996, H. Takizawa” (HU); 4 ♀10 ♂, “Takasago [=Taiwan], Go-gatsu [=May]” “hachi [=8, probably refers to fig. 8 in plate XLIV in Matsumura, 1912]” “Muneaka-ruri-habachi [Japanese name for *A. captiva* used by Matsumura]” (HU).

*Distribution* (Fig. 13). Russia (Primorskij kraj), Korea, China, Taiwan, Japan. Mongolia (Ermolenko, 1976), northern India (Saini and Thind, 1995).

*Host plants*. *Ulmus davidiana* Planch. var. *japonica* (Rehder) Nakai, *Ulmus laciniata* (Trautv.) Mayr, *Ulmus parvifolia* Jacq., *Ulmus pumila* L. in Japan. One female examined is labeled “7–18. 1930, *Ulmus americana*, Komaba”, suggesting that this specimen was reared from the larva feeding on a cultivated *Ulmus americana* L. *Ulmus pumila* (“*Ulmus mandshurica*”) in Korea (Saito, 1941) and elm (“yu”) in China (Dai, 1979). Watanabe’s (1937) record of alder as a host plant of this species is most probably erro-

neous. Yoshida and Miyashita’s (1993) record of *Zelkova* needs confirmation.

*Notes on rearing*. The following records on rearings were made by H. Hara in Bibai, Hokkaido (A–D, F) and by A. Shinohara in Tokyo, Honshu (E, G–J).

A, HH040823A. A female collected at Obihiro, Tokachi, on August 23, 2004, deposited 14 eggs on *Ulmus davidiana* var. *japonica* on August 23–25 in the laboratory. The larvae made cocoons on September 21–23, and three females emerged on October 13–15 of the same year. Others died.

B, HH040810A (Fig. 11E). Five gregarious larvae, each about 20 mm long, were found on *Ulmus laciniata* in Manji, Kurisawa, on August 10, 2004. They spun cocoons on August 12–13 and one female emerged on August 31, 2004. Others died.

C, HH060820H. A group of 33 larvae were found on *Ulmus laciniata* on Mt. Sankakuyama, Kurisawa, on August 20, 2006. They matured and made cocoons on August 22–24. No adults emerged.

D, HH060912. A group of larvae were collected from the leaves of *Ulmus pumila* in the cam-

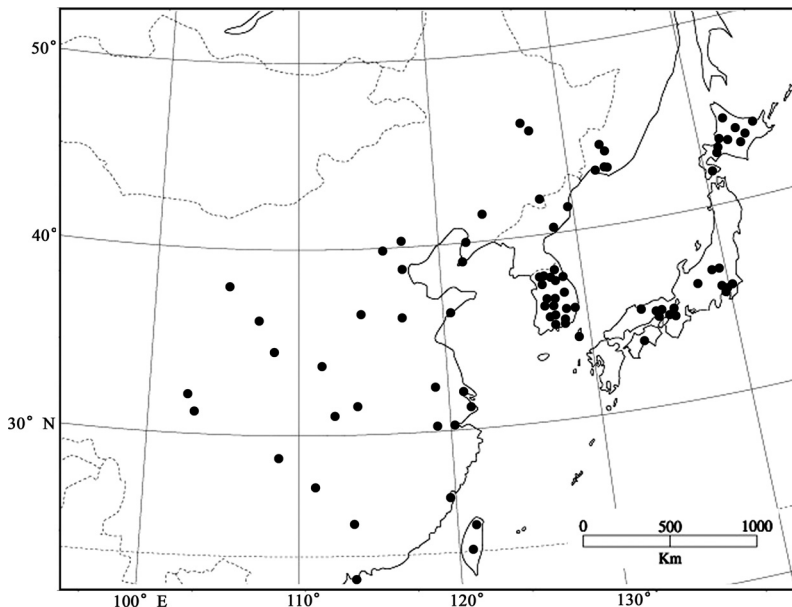


Fig. 13. Distribution of *A. captiva* based on specimens examined.



pus of Hokkaido University, Sapporo, on September 12, 2006. One female emerged on April 25, 2007.

E, AS090702 (Fig. 11B, D). A group of 19 young larvae were found on *Ulmus davidiana* var. *japonica* in Nopporo Forest Park, 50 m alt., Ebetsu, Hokkaido, on July 2, 2009. They all died within a week.

F, HH080717H (Fig. 11C). Several eggs were collected on *Ulmus davidiana* var. *japonica* in Kikyo, Hakodate, on July 17, 2008. They hatched on July 24 and the larvae made cocoons on August 8–11. One male and three females emerged on August 31–September 10 of the same year.

G, AS061008A (Fig. 11F). A group of 71 young and middle-sized larvae were found feeding on *Ulmus parvifolia* in Kamigo-cho, Yokohama-shi, Kanagawa Prefecture, Honshu, on October 8, 2006. They were apparently a mixture of different instars derived from a few clutches. A total of 28 larvae reached maturity, 20 larvae were fixed in ethanol, and all others died. The 28 larvae spun cocoons on October 15 to November 5. Two males and 13 females emerged on November 14–29. The remaining 13 larvae died in the cocoons.

H, AS080804 (Fig. 11A). A group of about 30 young larvae were found feeding on *Ulmus davidiana* var. *japonica* near the coast of Shirakaba-ko Lake, 1420 m alt., Nagano Prefecture, Honshu, on August 4, 2008. Mainly because the short of fresh leaves, some larvae died and the remaining 25 larvae were fixed in ethanol on August 12.

I, AS080925B. A group of about 20 larvae were collected from the leaves of *Ulmus davidiana* var. *japonica* in Nikko, 590 m alt., Tochigi Prefecture, Honshu, on September 25, 2008. They reached maturity on October 1–5 and six males emerged on October 18–25 of the same year. Others did not survive.

J, AS071103A. Four almost mature larvae feeding on *Ulmus parvifolia* were found in Godai-san, Kochi-shi, Kochi Prefecture, Shikoku, on November 3, 2007. They were found on nearby leaves but not forming a group. They

matured on November 4–5 and three females emerged on April 23–25 and one female on May 21, 2008.

*Life history.* The general life cycle of this species is as follows. The female deposits eggs along the margin of the leaf in a row. The hatched larvae cling to the margin of the leaf and feed on it in a group (Fig. 11A–B). When the larvae become large, the group may become very loose. The mature larva goes down to the ground and spins a cocoon, in which it pupates often after a diapause of various lengths. After a short period of pupa, the adult emerges.

Takeuchi (1932) first noted simply that the larvae of *A. captiva* fed on *Ulmus* sp. The life history of this species was briefly described by Okutani (1959), Okuno *et al.* (1977) and Hara and Shinohara (2005) in Japan, by Saito (1941) and Lee and Chung (1997) in Korea, and by Dai (1979), Yang and Bianweihui (1983), and Xiao *et al.* (1992) in China. There are two generations a year in Japan (Okuno *et al.*, 1977), Korea (Saito, 1941), and in China (Dai, 1979; Yang and Bianweihui, 1983), though Okutani (1959) noted “two or three generations a year” for Japanese populations.

Our rearing records as well as the adult collection records may suggest a complex and variable life history of the species, not as simple and regular as the one described by previous authors. The rearing data obtained, though rather poor, may show that one life cycle of this species lasts about 50–60 days without prolonged diapause (see rearing cases A, B, F and G above). All the larvae, except for part of those found in late autumn (rearing case J), became adults in the laboratory within the same year. In northern areas, this species probably has two generations a year, whereas there are potentially three or four generations a year in southern and warmer areas in its distributional range. The adult emergence of this species may show a polymodal pattern (Knerer, 1993) (see rearing case J above), which is rather common in *Arge* species (e.g., Shinohara and Hara, 2009).

The adult collection records (see specimens

examined) may indicate that the spring emergence of the adults (e.g., in early June to early July in Sapporo, Hokkaido, Japan, in late April to late May in lowlands of central Honshu, Japan, in late May to early June in lowlands of Gyeonggi-do, Korea) is largest in scale but the emergence period is long and may not be unimodal. In Sapporo, Hokkaido, the larvae in various stages and adults were found together in late June to early July. These larvae were the offspring of the adults that had occurred a few weeks before (early June). The adults found in late June to early July probably belonged to the same generation as the adults that oviposited in early June, the individuals that emerged from the hibernated larvae. In summer through autumn, the occurrence of the adults and larvae in the field is rather irregular, and it is difficult to determine to which generation the individual adults or larvae actually belong. As a result of polymodal adult emergence, the adults found in early summer may be the offspring of the spring adult (first generation of the year) or possibly a late occurrence of the hibernated individual (last generation of the previous year). In warmer areas, the adults and larvae found in autumn may be the individuals of the third or even fourth generations probably mixed with late-occurring individuals of earlier generations. The actual dynamics of populations and details of the life history of *A. captiva* are still little known.

*Remarks.* The characters given in the foregoing key will distinguish the adults of *A. captiva* from those of the other two species of the *captiva* group. The larvae are gregarious leaf-feeders on elm and *A. captiva* is the only known species of the genus associated with elm in eastern Asia. The larvae of *A. macrops* and *A. siamana* are unknown. In general appearance, the larvae of *A. captiva* resemble those of *A. pullata*, which are gregarious leaf-feeders on birch. Besides the definite differences in host plants, the late instar larvae of *A. captiva* differ from those of *A. pullata* in the non-metallic black areas (with slight bluish metallic luster in *A. pullata*), the presence of black spot on the subanal lobe (black spot absent

on the subanal lobe in *A. pullata*), and the presence of prolegs on the second to sixth and tenth abdominal segments (on second to eighth and tenth abdominal segments in *A. pullata*).

*Arge captiva* is a widespread species showing large variations in the color of thorax. The continental specimens, including the type material of *Hylotoma flavicollis* Cameron, 1876, from Hong Kong (Fig. 1H–I), *A. sanguinolenta* Mocsáry, 1909, from the Russian Far East (Fig. 1J–K), *A. kolthoffi* Forsius, 1927, from Jiangsu, China (Fig. 1L) and *A. captiva rufoscutellata* Takeuchi, 1927, from Korea (Fig. 1M), are paler in color pattern; the females usually have the pronotum, mesonotum, and dorsal part of mesopleuron entirely reddish. The Japanese females, including the type specimen of *Hylotoma captiva* Smith, 1874 (Fig. 1G), are more variable, having various amount of reddish areas on the thorax, but even in the palest specimens the posterior part of the mesoscutellum is marked with black. The Japanese specimens often have no reddish areas on the thorax, while such entirely dark females are rare on the continent. After examining a long series of specimens from various localities (see material examined), we have concluded that these taxa are all conspecific and are difficult to distinguish even at the subspecies level.

The systematic position of *A. flavicollis* was particularly in confusion. This taxon was first described under the name of *Hylotoma flavicollis* by Cameron (1876) on the basis of the female from Hong Kong. The description was very short, only five lines long. Kirby (1882) re-described it, again in a few lines, based on one female (“Type of species”) and noted “closely allied to *H. captiva*”. Konow (1908) gave a more detailed description of the female apparently based on his new material from “Tientsin”. Forsius (1927) followed Konow’s interpretation of the species. Gussakovskij (1935) described both the male and female and recorded the species from North China, Ussuri, Khabarovsk and Transbaikalia. Takeuchi (1939) recorded *A. flavicollis* from Taiwan and synonymized *A. vulnerata* Mocsáry, 1909, with it. More recently, Saini

and Thind (1995) redescribed *A. flavicollis* using the Indian and Chinese material. Based on Saini and Thind's redescription, Wei and Wen (2000) synonymized *A. flavicollis* with *A. captiva* (Smith, 1874), whereas Wei and Nie (2003) treated them as separate subspecies of *A. captiva* and Saini *et al.* (2006) again treated them as separate species. All these works, except for the original description by Cameron (1876) and the redescription by Kirby (1882), were not based on the examination of the type material.

The main source of confusion may probably date back to the misinterpretation of *A. flavicollis* by Takeuchi (1939) who grouped it with *A. rejecta*, a species having a sharp median carina in the supraclypeal area, in his key. He also synonymized *A. vulnerata* Mocsáry, 1909, a very close relative of *A. rejecta*, with *A. flavicollis*. Our examination of the type material has revealed that *A. flavicollis* is a junior synonym of *A. captiva*, whose supraclypeal area has no sharp median carina.

Cameron (1876) did not designate a holotype of *Hylotoma flavicollis* and did not mention the number of specimens he had before him. Kirby (1882) listed only one specimen of this species as the "Type of species". We consider this to be the lectotype designation.

We have also examined the type material of *A. sanguinolenta* Mocsáry, 1909, *A. kalthoffi* Forsius, 1927, and *A. captiva rufoscutellata* Takeuchi, 1927, and found that they all show no significant differences from the lectotype of *A. captiva*. As discussed by Blank *et al.* (2009), *A. captiva* var. *watanabei* Takeuchi, 1932, is an infrasubspecific unavailable name. The "types" (holotype, allotopotype and four paratopotypes) are very dark specimens of *A. captiva* collected with the other "normal" specimens in the same place on the same day.

#### *Arge praesternalis* Malaise, 1934

*Arge praesternalis* Malaise, 1934: 474; Saini and Thind, 1995: 106; Saini *et al.*, 2006: 598.

*Material examined.* INDIA: 1 ♂, "India, U.

P., Bartot, 900 m, 13–6–83, M. Saini" "*Arge praesternalis* Mal., det. Saini" (USNM); 1 ♂, "India: Himachal Pradesh: Kasol 1600 m, June 30, 1984, M. Saini" "*Arge praesternalis*, H. P., Kasol–1600 m, 30. 6. 1984" (USNM).

*Distribution.* Northern India.

*Remarks.* We were not able to study the holotype of *A. praesternalis* Malaise, 1934, described from Assam, India. Also without seeing Malaise's holotype, Saini and Thind (1995) treated *A. praesternalis* and *A. flavicollis* as two distinct species. The three characters used to separate the species are the malar space length/median ocellus diameter ratio, the 1st/2–4th metatarsomere lengths ratio, and the shape of the mesoscutellum. In our view, the differences in these characters are not stable enough to distinguish species. We have examined two northern Indian male specimens identified with *A. praesternalis* by Saini (see above) and found no significant differences from the specimens of *A. captiva* in extragenital characters. Unfortunately the two Indian specimens have no genitalia. According to Saini and Thind's (1995) illustrations (figs. 52, 66), the lancet and the penis valve of their "*A. praesternalis*" show some differences from those of *A. captiva*. We tentatively treat *A. praesternalis* as a valid species, though, judging from the original description, this taxon may possibly be a synonym of *A. captiva*. We need more material from India and particularly a study of Malaise's holotype to clarify the true identity of this taxon.

#### Acknowledgments

We wish to thank G. Broad and C. Taylor (BMNH), Y. Hashimoto (MNHAH), T. Hirowatari (OPU), H.-S. Lee (Suwon), S.-H. Lee (SNU), R. Matsumoto (OMNH), T. Naito and K. Maeto (KU), M. Ohara (HU), P. Perkins (MCZ), W. Pulawski (CAS), S. Schmidt (ZSSM), D. R. Smith (USNM), H. Suda (Sakura), A. Taeger and S. Blank (SDEI), H. Takahashi (Hachioji), H. Vårdal and G. Lindberg (NRMS), L. Vilhelmsen (SNM), M.-C. Wei (CSFU), H. Yoshida (Kobe) and L. Zombori (HNHMB) for making the mate-



rial available for the present study. We also thank B.-K. Byun (Pocheon), S.-W. Park (Suwon), N. Shinohara (Tokyo) and X.-H. Wang (CSFU) for their help in various ways. This study is partly supported by the Grant-in-aid for Scientific Research No. 20580165 from the Japan Society for the Promotion of Science.

## References

- Abe, M. and I. Togashi, 1989. Symphyta. In: Hirashima, Y. (ed. supervisor), *A Check List of Japanese Insects*, pp. 541–560. Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka. (In Japanese.)
- Blank, S. M., A. Taeger, A. D. Liston, D. R. Smith, A. P. Rasnitsyn, A. Shinohara, M. Heidema and M. Vitasaari, 2009. Studies towards a World Catalog of Symphyta (Insecta: Hymenoptera). *Zootaxa, Auckland*, (2254): 1–96.
- Cameron, P., 1876. Descriptions of new genera and species of Tenthredinidae and Siricidae, chiefly from the East Indies, in the collection of the British Museum. *Transactions of the Entomological Society of London, London*, **1876**: 459–471.
- Chou, L.-Y. and T. Naito, 1991. Name lists of insects in Taiwan—Hymenoptera: Symphyta. *Chinese Journal of Entomology, Taipei*, **11**: 85–95. (In Chinese and English.)
- Dai, Q., 1979. [Primary observations on the Elm-red-thorax-sawfly.] *Kunchong Zhishi, Beijing*, **16**: 217–218. (In Chinese.)
- Dalla Torre, C. G., 1894. Tenthredinidae incl. Uroceridae (Phyllophaga & Xylophaga). *Catalogus Hymenopterorum hucusque descriptorum systematicus et synonymicus, vol. 1*. 459 pp. Sumptibus Guilelmi Engelmann, Lipsiae.
- Doi, H., 1938. Tenthredinidae from Korea. *Journal of Chosen Natural History Society, Keijo*, (24): 29–35. (In Japanese.)
- Ermolenko, V. M., 1976. On the fauna of sawflies (Hymenoptera, Symphyta) of Mongolia, I. Pamphiliidae, Cimbicidae, Argidae. *Insects of Mongolia, Leningrad*, (4): 259–267.
- Forsius, R., 1927. Tenthredinoiden aus China eingesammelt von Herrn Dir. Kj. Kolthoff 1921. *Arkiv för Zoologi, Stockholm*, **19 A** (10): 1–12.
- Gussakovskij, V. V., 1935. Chalastogastra (pt. 1). *Faune de l'URSS* (n. s. 1), Insectes Hyménoptères, II (1). XVIII+453 pp. Édition de l'Académie des Sciences de l'URSS, Moscou, Leningrad. (In Russian with German summary.)
- Hara, H. and A. Shinohara, 2005. Argidae. In: *Insect Larvae of Japan*, pp. 276–277. Gakken, Tokyo. (In Japanese.)
- Katayama, E., 2004. [Hymenoptera of Otawara City VI. Additional records of the Symphyta.] *Insekuto, Utsunomiya*, **55**: 47–56. (In Japanese.)
- Kim, C. W., 1963. Hymenoptera of Korea. *Humanities and Sciences (Natural Science), Korea University, Seoul*, **6**: 243–374. (In Korean.)
- Kim, C. W., 1970. *Illustrated Encyclopedia of Fauna and Flora of Korea*, **11(3)**. 891 pp. Samwha-Chulpansa, Seoul. (In Korean.)
- Kim, C. W., J. W. Lee, J. S. Park, B. J. Kim and J. C. Park, 1994. Hymenoptera. In: Entomological Society of Korea and Korean Society of Applied Entomology, *Check List of Insects from Korea*, pp. 216–269. Konkuk University Press, Seoul.
- Kirby, W., 1882. *List of Hymenoptera with Descriptions and Figures of the Typical Specimens in the British Museum, 1*. 450 pp., 15 pls. Taylor & Francis, London.
- Knerer, G., 1993. Life history diversity in sawflies. In: Wagner, M. and K. F. Raffa (eds.), *Sawfly Life History Adaptations to Woody Plants*, pp. 33–59. Academic Press, San Diego.
- Kondo, T. and M. Miyake, 1976. [Symphyta of Okayama Prefecture 2.] *Suzumushi, Kurashiki*, (113): 1–13. (In Japanese.)
- Konow, F. W., 1905. Hymenoptera, Fam. Tenthredinidae. In: Wytzman, P. (ed.), *Genera Insectorum*, (29). 176 pp., 3 pls. Bruxelles.
- Konow, F. W., 1908. Systematische Zusammenstellung der bisher bekannt gewordenen Chalastogastra. *Zeitschrift für Systematische Hymenopterologie und Dipterologie, Teschenedorf bei Stargard i. Mecklenburg*, **8**: 49–64, 113–128, 177–192.
- Kubo, K., 2000. 5-15 Hymenoptera Hachi-moku. In: Enkaisen-iki-shizen-chosa-kai, [Insects of Enkaisen area.], *Kanagawa Chuho, Odawara*, (130): 287–345. (In Japanese.)
- Kuznetsov-Ugamskij, N. N., 1927. Beiträge zur Blattwespenfauna des Süd-Ussuri-Gebietes. *Zoologischer Anzeiger, Leipzig*, **71**: 224–238.
- Lee, B.-Y. and Y.-J. Chung, 1997. *Insect Pests of Trees and Shrubs in Korea*. 10+459 pp. Seong An Dang Publishing Co., Seoul. (In Korean.)
- Lelej, A. S. and A. Taeger, 2007. 4. Sem. Argidae—Argidy. In: Lelej, A. S. (ed.), *Key to the Insects of Russian Far East, Vol. 4, Neuropteroidea, Mecoptera, Hymenoptera, Pt. 5*, pp. 943–944. Dalnauka, Vladivostok. (In Russian.)
- Malaise, R., 1934. On some sawflies (Hymenoptera: Tenthredinidae) from the Indian Museum, Calcutta. *Records of the Indian Museum, Calcutta*, **36**: 453–474.
- Malaise, R., 1931. Blattwespen aus Wladiwostok und an-

- deren Teilen Ostasiens. *Entomologisk Tidskrift, Stockholm*, **51**: 97–159.
- Marlatt, M. S., 1898. Japanese Hymenoptera of the family Tenthredinidae. *Proceeding of the United States National Museum, Washington, D. C.*, **21**: 493–506.
- Matsumura, S., 1912. *Thousand Insects of Japan. Supplement IV*. 247 pp., 55 pls. Keiseisha, Tokyo. (In Japanese and English.)
- Matsumura, S., 1930. *The Illustrated Thousand Insects of Japan, II (Hymenoptera)*. 198+89 pp., 18 pls. Tokoshoin, Tokyo. (In Japanese and English.)
- Matsumura, S., 1931. *6000 Illustrated Insects of Japan-Empire*. 10 pls., 1497+189 pp. Tokoshoin, Tokyo. (In Japanese.)
- Matsumura, S., 1932. *Illustrated Common Insects of Japan, Vol. IV. Hymenoptera, Diptera, Rhynchota*. 23 pls., 99+145+9 pp. Shunyodo, Tokyo. (In Japanese and English.)
- Miyoshi, K., 1988. Hymenoptera. In: Yamaguchi Museum (ed.), *Insects of Yamaguchi Prefecture*, pp. 46, 187–197. Yamaguchi Museum, Yamaguchi.
- Nagase, H., 2004. Hymenoptera (excl. Formicidae). In: *Insect Fauna of Kanagawa*, pp. 1241–1326. Kanagawa Konchu Danwakai, Odawara. (In Japanese.)
- Naito, T., H. Yoshida, H. Nakamine, T. Morita, T. Ikeda, H. Suzuki and A. Nakanishi, 2004. Species diversity of sawflies in Hyogo Prefecture, central Japan. *Museum of Nature and Human Activities, Hyogo, Monograph of Natural History and Environmental Science*, (1): [1–2], [pl. 1–10], 1–85. (In Japanese.)
- Nakagawa, H., 1899. Kichi honpou-san nokobachi mokuroku [Catalogue of known sawflies of Japan]. *Zoological Magazine, Tokyo*, **11**: 200–208.
- Nakagawa, H., 1902. Honpou-san habachi-ka dai-1-shu [The Japanese sawflies, first volume.] *Noji Shikenjo Tokubetsu Hokoku*, (17): 1, 1-10, 1-113, 1-3, 1-21, 1 folded table, 1 folded pl.
- Nakamura, K., 2003. [Hymenoptera (excl. Formicidae).] In: Tochigi-ken Shizen-kankyo Chosa Kenkyu-Kai Konchu Bukai (ed.), [*Insects of Tochigi I, Basic Survey of Natural Environment in Tochigi Prefecture*], pp. 249–336. Tochigi-ken, Rimmu-bu, Utsunomiya. (In Japanese.)
- Nakamura, S. and J. Enoki, 1997. Hymenoptera. In: Hiba Kagaku Kyoiku Shinko-kai (ed.), *Insects of Hiroshima Prefecture*, pp. 559–633. Hiroshima-ken Konchu-shi Kanko-kai, Shobara (In Japanese.)
- Nambu, T., 1998. [Hymenoptera of Saitama Prefecture.] In: *Saitama-ken Konchu-shi*, 3, pp. 9–92. Saitama Konchu Danwa-kai, Omiya. (In Japanese.)
- Okuno, T., Y. Tanaka and Y. Kimura, 1977. *Diseases and Pests of Cultivated Trees and Shrubs in Color*. 8+365 pp., 64 color pls. Hoikusha, Osaka. (In Japanese.)
- Okutani, T., 1959. [Symphyta.] In: Esaki, T., T. Ishii, A. Kawada, T. Shiraki and H. Yuasa (eds.), *Illustrated Insect Larvae of Japan*, pp. 548–582. Hokuryukan, Tokyo. (In Japanese.)
- Okutani, T., 1967. Food plants of Japanese Symphyta (I). *Japanese Journal of Applied Entomology and Zoology, Tokyo*, **11**: 43–49. (In Japanese.)
- Okutani, T., 1977. Argidae. In: Ito, S., T. Okutani and I. Hiura (eds.), *Colored Illustrations of the Insects of Japan, Vol. II*, pp. 294–295, pl. 56, figs. 1008–1014. Hoikusha, Osaka. (In Japanese.)
- Okutani, T., 1982. [Woodwasps and sawflies.] In: Gifu-ken Kankyo-bu Kankyohozen-ka (ed.), [*Insects of Gifu Prefecture*], pp. 409–413. Gifu-ken Kankyo-bu, Gifu. (In Japanese.)
- Rohwer, S. A., 1910. Japanese sawflies in the collection of the United States National Museum. *Proceeding of the United States National Museum, Washington, D.C.*, **39**: 99–120.
- Saini, M. S., S. M. Blank and D. R. Smith, 2006. Checklist of sawflies (Hymenoptera: Symphyta) of India. In: Blank, S. M., S. Schmidt and A. Taeger (eds.), *Recent Sawfly Research: Synthesis and Prospects*, pp. 575–612. Goecke & Evers, Keltern.
- Saini, M. S. and A. S. Thind, 1995. Revision of the genus *Arge* Schrank from India (Hymenoptera, Symphyta: Argidae). *Deutsche Entomologische Zeitschrift, N. F., Berlin*, **42**: 71–111.
- Saito, K., 1941. Ein dendro-entomologischer Beitrag. *Bulletin of the Agricultural and Forestry College, Suigen*, (6): 1–235. (In Japanese.)
- Sato, O., 1965. VII Hymenoptera. In: Kinki Seibutsu Kenkyu-kai, [*Faunal Investigation on Mt. Minoo-san*], pp. 217–254. Osaka-fu Norin-bu, Osaka. (In Japanese.)
- Sato, O. and N. Tosawa, 1967. VII Hymenoptera. In: Kinki Seibutsu Kenkyu-kai, [*Faunal Investigation on Mt. Minoo-san (Rev. Ed.)*], pp. 177–206. Osaka-fu Norin-bu, Osaka. (In Japanese.)
- Shinohara, A. and H. Hara, 2007. Type material of Japanese sawflies of the genus *Arge* (Insecta, Hymenoptera, Argidae) described by Snellen van Vollenhoven (1860), Smith (1874) and Kirby (1882). *Bulletin of the National Museum and Nature and Science, Tokyo*, Ser. A, **33**: 127–132.
- Shinohara, A. and H. Hara, 2009. *Arge indicura* n. sp. feeding on *Potentilla* and *Sanguisorba* from Japan (Insecta, Hymenoptera, Argidae). *Bulletin of the National Museum of Nature and Science, Tokyo*, Ser. A, **35**: 55–71.
- Smith, D. R., 1989. The sawfly genus *Arge* (Hymenoptera: Argidae) in the *Western Hemisphere*. *Transactions of the American Entomological Society, Philadelphia*, **115**: 83–205.
- Smith, D. R., 1992. A synopsis of the sawflies (Hymenoptera: Symphyta) of America south of the United

- States: Argidae. *Memoirs of the American Entomological Society, Philadelphia*, **39**: 1–201.
- Smith, F., 1874. Descriptions of new species of Tenthredinidae, Ichneumonidae, Chrysididae, Formicidae, &c. of Japan. *Transactions of the Entomological Society of London, London*, **1874**: 373–409.
- Takeuchi, K., 1919. [A list of the known sawflies from Japan.] *Insect World, Gifu*, **23**: 182–188. (In Japanese.)
- Takeuchi, K., 1927. Some Chalastogastra from Corea. *Transactions of the Natural History Society of Formosa, Taihoku*, **17**: 378–387.
- Takeuchi, K., 1932. A revision of the Japanese Argidae. *Transactions of the Kansai Entomological Society, Osaka*, **3**: 27–42.
- Takeuchi, K., 1938. Chinese sawflies and woodwasps in the collection of the Musée Heude in Shanghai (I). *Notes d'Entomologie Chinoise, Changhai*, **5**: 59–85.
- Takeuchi, K., 1939. A systematic study on the suborder Symphyta (Hymenoptera) of the Japanese Empire (II). *Tenthredo, Kyoto*, **2**: 393–439.
- Takeuchi, K., 1949. A list of the food-plants of Japanese sawflies. *Transactions of the Kansai Entomological Society, Osaka*, **14**: 47–50.
- Takeuchi, K., 1955. *Coloured Illustrations of the Insects of Japan*, 2. 190 pp, 68 pls. Hoikusha, Osaka. (In Japanese.)
- Togashi, I., 1988. Symphyta of Thailand (Insecta, Hymenoptera). *Steenstrupia, Kobenhavn*, **14**: 101–119.
- Togashi, I., 1998a. Hymenoptera. In: Ishikawa Mushi-no-kai and Hyakumangoku Chodan-kai (eds.), [*Insects of Ishikawa Prefecture*], pp. 252–304. Ishikawa-ken Kankyo Anzen-bu, Kanazawa.
- Togashi, I., 1998b. Sawflies (Hymenoptera: Symphyta) collected by Mr. T. Mikage in Fukushima Prefecture, Honshu, Japan. *Bulletin of the Biogeographical Society of Japan, Tokyo*, **53**: 33–37.
- Tosawa, N., 1932. List of insects of Minomo Park, Osaka, Japan. In: *Shiseki Meisho Tennenkinenbutsu Chosa Hokoku, Dai 2 Shu, Meisho Minoo-san*, ["List of insects" with separate pagination], pp. 1–114, pls. 1–7. Osaka-fu, Osaka. (In Japanese.)
- Watanabe, F., 1937. Tenthredinidae. In: Watanabe, F. (ed.), [*Catalogue of Pests of Trees in Japan*], pp. 5–8. Maruzen, Tokyo. (In Japanese.)
- Wei, M. and J. Wen, 2000. Notes on Argidae (Hymenoptera: Argidae) of China. *Journal of Central South Forestry University, Zhuzhou*, **20**: 19–21.
- Wei, M. and H. Nie, 2003. Argidae. Hymenoptera. In: Huang, B. (ed.), *Fauna of Insects in Fujian Province of China, Vol. 7*, pp. 165–183. Fujian Press of Science and Technology, Fuzhou. (In Chinese.)
- Wei, M., H. Nie and A. Taeger, 2006. Sawflies (Hymenoptera: Symphyta) of China — Checklist and review of research. In: Blank, S. M., S. Schmidt and A. Taeger (eds.), *Recent Sawfly Research: Synthesis and Prospects*, pp. 505–574. Goecke & Evers, Keltern.
- Xiao, G., X. Huang, S. Zhou, J. Wu and P. Zhang, 1992. *Economic Sawfly Fauna of China (Hymenoptera, Symphyta)*. 226 pp. Tianze Eldonejo, Beijing. (In Chinese.)
- Yang, Y. and Bianweihui [=Bianjiwei yuanhui=Editorial Committee], 1983. Yuyefeng *Arge captiva* Smith. In: [Chinese Academy of Forestry] (ed.), [*Chinese Forest Insects*], pp. 879–881. China Forestry Press, Beijing. (In Chinese.)
- Yonekura, K. and T. Kajita, 2009. BG Plants Wamei-Gakumei Index (YList). [http://bean.bio.chiba-u.jp/bgplants/ylist\\_main.html](http://bean.bio.chiba-u.jp/bgplants/ylist_main.html) (Last access on August 21, 2009; in Japanese.)
- Yoshida, H., 2002. [Hymenoptera of Aina, Kita-ku, Kobe-shi, (1) Sawflies.] *Kiberihamushi, Himeji*, **30**: 62–65. (In Japanese.)
- Yoshida, H., 2006. Symphyta (Hymenoptera) of Osaka Prefecture, Japan. West Japan Hymenopterists' Club, Kakogawa. (4 pp.), 24 pls., 127 pp. (In Japanese.)
- Yoshida, N. and S. Miyashita, 1993. [Information on the damages of forest by disease, insects and animals.] *Forest Pests*, **42**: 201–203. (In Japanese.)
- Yuan, D. and Y. Ding, 1993. Hymenoptera: Cimbicidae, Argidae and Tenthredinidae. In: Huang, F. (ed.), *Insects of Wuling Mountains Area, Southwestern China*, pp. 640–642. Science Press, Beijing. (In Chinese with English summary.)
- Zhelochovtsev, A. N. and A. G. Zinovjev, 1995. A list of the sawflies and horntails (Hymenoptera, Symphyta) of the fauna of Russia and adjacent territories. I. *Entomologicheskoe Obozrenie, St. Peterburg*, **74**: 395–415. (In Russian.)
- Zombori, L., 1974. Sawflies from Korea (Hymenoptera: Symphyta). *Acta Zoologica Academiae Scientiarum Hungaricae, Budapest*, **20**: 453–461.