

The Sawfly Genus *Spinarge* (Hymenoptera, Argidae)

Hideho Hara¹ and Akihiko Shinohara²

¹ Hokkaido Forestry Research Institute, Koshunai, Bibai-shi,
Hokkaido, 079–0198 Japan
e-mail: hara.hideho@pref.hokkaido.lg.jp

² Department of Zoology, National Science Museum,
3–23–1 Hyakunin-cho, Shinjuku-ku, Tokyo, 169–0073 Japan
e-mail: shinohar@kahaku.go.jp

Abstract The genus *Spinarge*, previously represented by three Chinese species, is redefined to include 11 Palearctic species, and is transferred from the Athermantini to the Argini of the Arginae. This genus is characterized by the fifth abdominal tergum with a dark median line (=inconspicuous median groove) in the female and a long median process in the male. A key to the world species and descriptions or redescrptions of the following nine species are given: *S. affinis* sp. nov. from Japan, *S. chrysoptera* (Gussakovskij, 1935), comb. nov. from China, *S. fulvicornis* (Mocsáry, 1909), comb. nov. from Japan, Korea and China, *S. flavicostalis* sp. nov. from Japan, *S. metallica* (Klug, 1834), comb. nov. from Europe to Kamchatka, Primorskij kraj, Sakhalin and Korea, *S. nigricornis* sp. nov. from Japan, *S. prunivora* sp. nov. from Japan and Korea, *S. pumila* sp. nov. from Japan, and *S. sichuanensis* Wei, 1998, from China. Larvae are gregarious leaf feeders on broad-leaved trees such as *Betula*, *Prunus* and *Sorbus*.

Key words: Hymenoptera, Argidae, *Spinarge*, new species.

Spinarge Wei, 1998, is a small genus of the sawfly family Argidae (Hymenoptera), so far represented by three Chinese species, *S. sichuanensis* Wei, 1998, *S. liui* Wei, 1998 and *S. hyalina* Wei & Nie, 1998. Wei (1997, 1998) characterized this genus principally by having the male fifth abdominal tergum with a long median process and the combination of the middle tibia with a preapical spur and the hind tibia without a preapical spur, and placed this genus in his “Athermantinae” (=the Athermantini of the Arginae of Benson, 1963). The Athermantini are separated from the Argini only by the middle and hind tibiae without a preapical spur (the Argini have these tibiae with a preapical spur) (Benson, 1938, 1963). In the condition of the preapical spurs, therefore, *Spinarge* agrees neither with the Athermantini nor with the Argini.

We noticed that the males of several species of “*Arge*” with a preapical spur both on the middle and hind tibiae, as the Argini, have a long conspicuous median process on the fifth abdominal

tergum. The process is a very peculiar and unquestionably an apomorphic character state that indicates the close relationships of these species and the three known species of *Spinarge*. In this paper, we redefine *Spinarge* to include all these species, place the genus in the Argini, and describe or redescrcribe nine species of the genus.

All the material used in this paper is kept in the National Science Museum, Tokyo, unless otherwise indicated. Abbreviations for depositories are as follows: EU–Ehime University, Matsuyama; HNHMB–Hungarian Natural History Museum, Budapest; HNC–H. Nagase collection, Kamakura; HSC–H. Suda collection, Sakura; HU–Hokkaido University, Sapporo; IZB–Institute of Zoology, Beijing; KNC–K. Nakamura collection, Utsunomiya; KU–Kobe University, Kobe; MNHAH–Museum of Nature and Human Activities, Hyogo, Sanda; MYC–M. Yamada collection, Hirosaki; OMNH–Osaka Museum of Natural History, Osaka; OPU–Osaka Prefecture University, Sakai; RMNHL–Nationaal Natu-

urhistorisch Museum, Leiden; TMC—T. Murakami collection, Nikko; TSC—T. Saito collection, Yaita; ZSSM—Zoologische Staatssammlung, München.

***Spinarge* Wei, 1998**

Spinarge Wei, 1997: 297. [Nomen nudum.]

Spinarge Wei & Nie, 1998 (August): 347, 380. [Nomen nudum.]

Spinarge Wei, 1998 (September): 219.

Type species. Spinarge sichuanensis Wei, 1998, original designation.

Diagnosis. Length 7.2–11.9 mm in female, 7.2–9.5 mm in male. Black (Figs. 1–2). Head width 0.7–0.9× thorax width, 1.3–1.4× head height. Occipital carina indistinct. Frons to supra-clypeal area medially protruding. Inner margins of eyes barely or slightly concave dorsally, slightly converging below (Figs. 3–4). Interantennal area laterally carinate, with width 0.2–0.3× distance between eyes. Clypeus with very weak dull dorsal ridges extending from ventral end of median supra-clypeal ridge toward lateral extremities of clypeus; ventral margin medially concave roundly, laterally convex roundly. Postclypeal suture absent. Flagellum (Figs. 5–6) with sharp ventral longitudinal carina almost throughout and not or weakly compressed in both sexes, ventrally with long bristles generally arranged in short transverse rows in male. Mandibles (Fig. 4C) without inner teeth. In maxillary palpus, sixth (apical) segment slightly longer than fifth segment and 1.3–2.3× apical height of fore tibia, fourth segment slightly wider than fifth segment. Pronotum laterally with furrow. Fore and middle tibiae not compressed; hind tibia slightly compressed; middle tibia with preapical spur; hind tibia with or without preapical spur; tibial spurs simple, tapering apically; tarsal claws simple; hind first tarsomere 0.9–1.1× following three tarsomeres combined in length. Forewing (Figs. 1–2) with apical section of vein Sc complete, vein R+M punctiform or shorter than apical section of vein Sc, crossveins 2r–m and 3r–m complete, cell R closed, cell 1A closed and cell Rs

with posterior length (distance between posterior ends of veins Rs and 2r–m) 0.8–1.8× posterior length of cell 1Rs₂; hindwing with cell R closed and cell A closed; apical margins of wings between apices of veins Rs and Cu narrowly glabrous, with setae generally about as long as or slightly longer than width of vein M (Fig. 7A). Fifth abdominal tergum with inconspicuous median groove (linear apodeme or thickening appearing as dark line inside), its apex usually slightly convex or produced on posterior margin of tergum in female (Fig. 7B–C), with long median process in male (Fig. 7D–J). Fourth tergum usually with dark median line (linear apodeme or thickening appearing as dark line inside) (Fig. 7B–C). Female seventh sternum (Fig. 7K) posteromedially slightly depressed and glabrous. Saw-sheath (Fig. 8) robust, with dorsal side sunk basally; inner side spinose. Lancet (Figs. 9–10) not spinose, without dorsally projecting hairs, without large gap between second and third serulae. Gonostipes with apical width about as long as basal width of harpe (Fig. 14); valviceps with small lateral lobe posteriorly (Fig. 14B, E, G, K) or without it (Fig. 14I), in lateral view anteriorly with large ventral lobe (Fig. 15).

Surface generally smooth and shining, with punctures very fine and sparse; frons to clypeus and their adjacent areas relatively distinctly punctured (Figs. 3–4); surfaces of dorsal side of antenna, tibiae and tarsi not or slightly granulate; dorsal parts of second to fifth abdominal terga mostly glabrous; dorsal sides of sixth and more posterior abdominal terga setose in female (Fig. 7C), medially glabrous in male (Fig. 7D–J).

Immature stages (based on *S. fulvicornis*, *S. prunivora* and *S. flavicostalis*). Larva: Antenna conical, 1-segmented; each thoracic leg with tarsal claw and enlarged apical pad (empodium); first to ninth abdominal segments each three-annulate; second to sixth and tenth abdominal segments with pair of prolegs.

Cocoon: Oval, double walled; outer wall netted; inner wall parchment-like. Made in soil or leaf litter in cage.

Gender. Although Wei & Nie (1998) treated

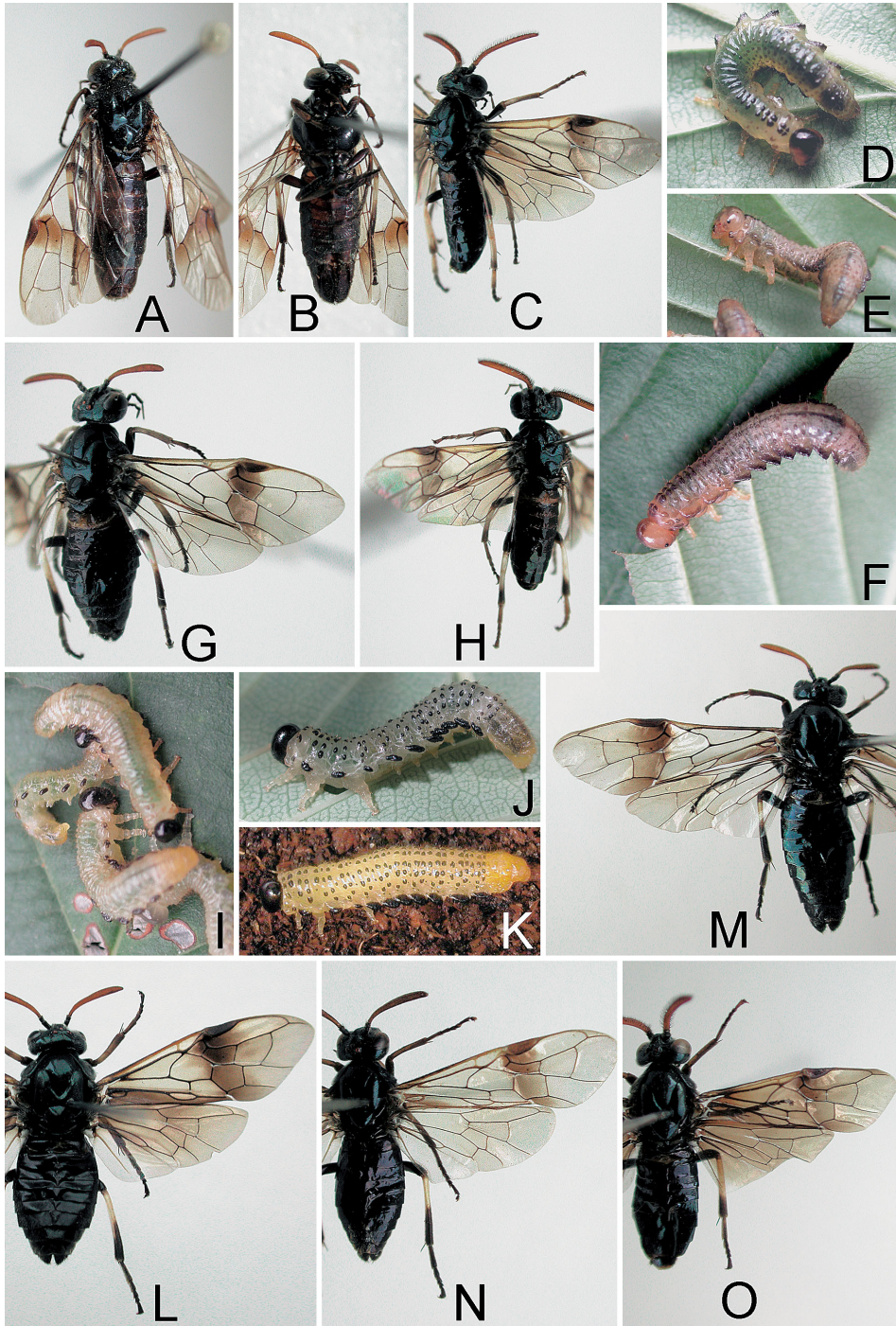


Fig. 1. *Spinarge* spp. — A–B, *S. fulvicornis* (Mocsáry), ♀, holotype; C, do., ♂ (No. HH040711D), Hokkaido; D, do., middle instar larva (No. HH040711D); E–F, do., final instar larvae (No. HH040711D); G, *S. prunivora* sp. nov., ♀, holotype; H, do., ♂, paratype (No. HH040731A), Hokkaido; I, do., middle instar larvae (No. HH040731A); J, do., final instar larva (No. HH040731A); K, do., mature larva, Aoki-ko, Honshu; L, *S. prunivora* sp. nov., ♀, paratype, Ichinomiya, Honshu; M, *S. affinis* sp. nov., ♀, holotype; N, *S. pumila* sp. nov., ♀, holotype; O, *S.* sp. (*fulvicornis* group), ♂, Yokohama, Honshu.

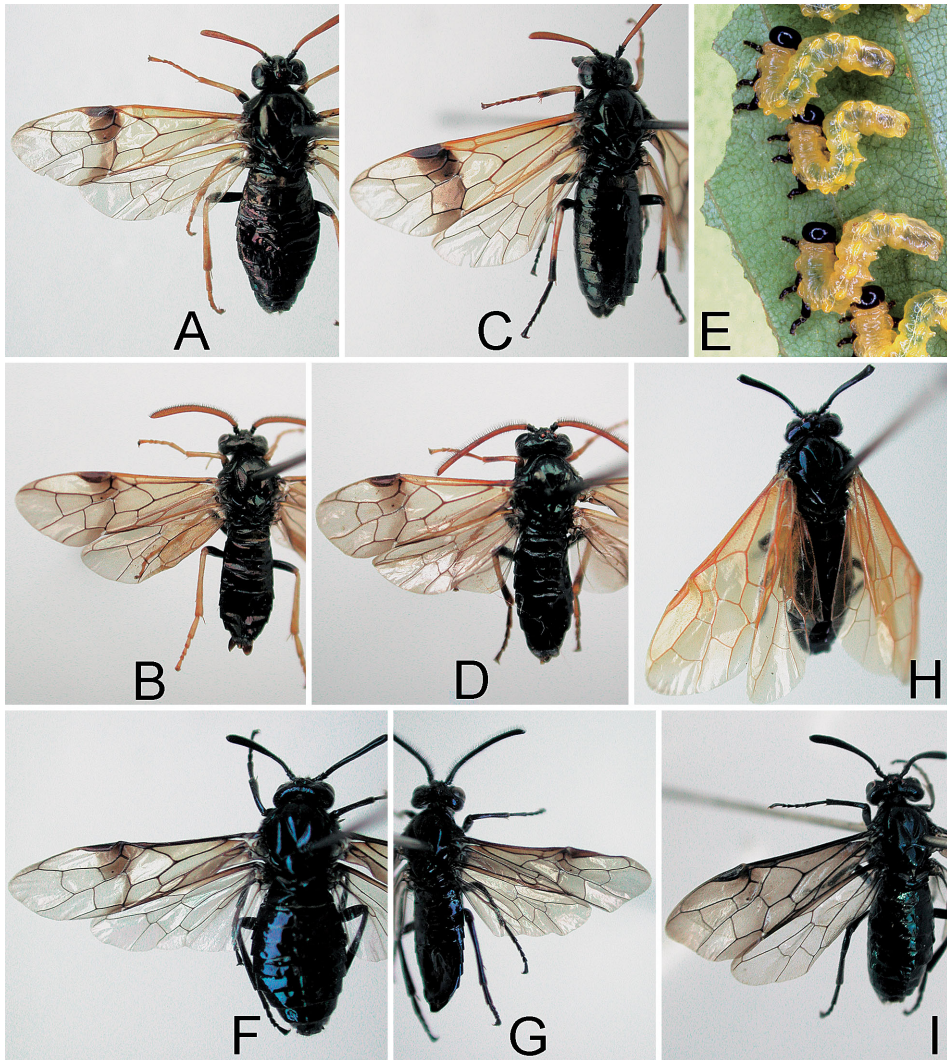


Fig. 2. *Spinarge* spp. — A, *S. metallica* (Klug), ♀, Sosninskij River, Russia; B, do., ♂, Sosninskij River, Russia; C, *S. flavicostalis* sp. nov., ♀, holotype; D, do., ♂, paratype, Asahidake-onsen, Hokkaido; E, middle instar larvae (No. HR920713E), Hokkaido; F, *S. nigricornis* sp. nov., ♀, holotype; G, do., ♂, paratype, Mt. Sankakuyama, Hokkaido; H, *S. chrysoptera* (Gussakovskij), ♀, Mt. Zheduoshan, China; I, *S. sichuanensis* Wei, ♀, Mt. Taibaishan, China.

this genus as masculine, we regard it as feminine, because *Spinarge* is undoubtedly a compound word, *spina* (a thorn)+*Arge*, and *Arge* has been always treated as feminine.

Remarks. The name *Spinarge* first appeared in the key to the Palaearctic and Oriental genera of the Argidae by Wei (1997) and then Wei & Nie (1998) described a new species, “*Spinarge hyalinus*”. However, *Spinarge* in these papers is

an unavailable genus name, because it does not fulfill the requirements of the ICZN (1999).

Spinarge is distinguished from the other argid genera in having the fifth abdominal tergum with a dark median line and usually slight posteromedial convexity in the female (Fig. 7B–C) and with a long median process in the male (Fig. 7D–J). These character states are quite unique to this genus in the Argidae and probably in all

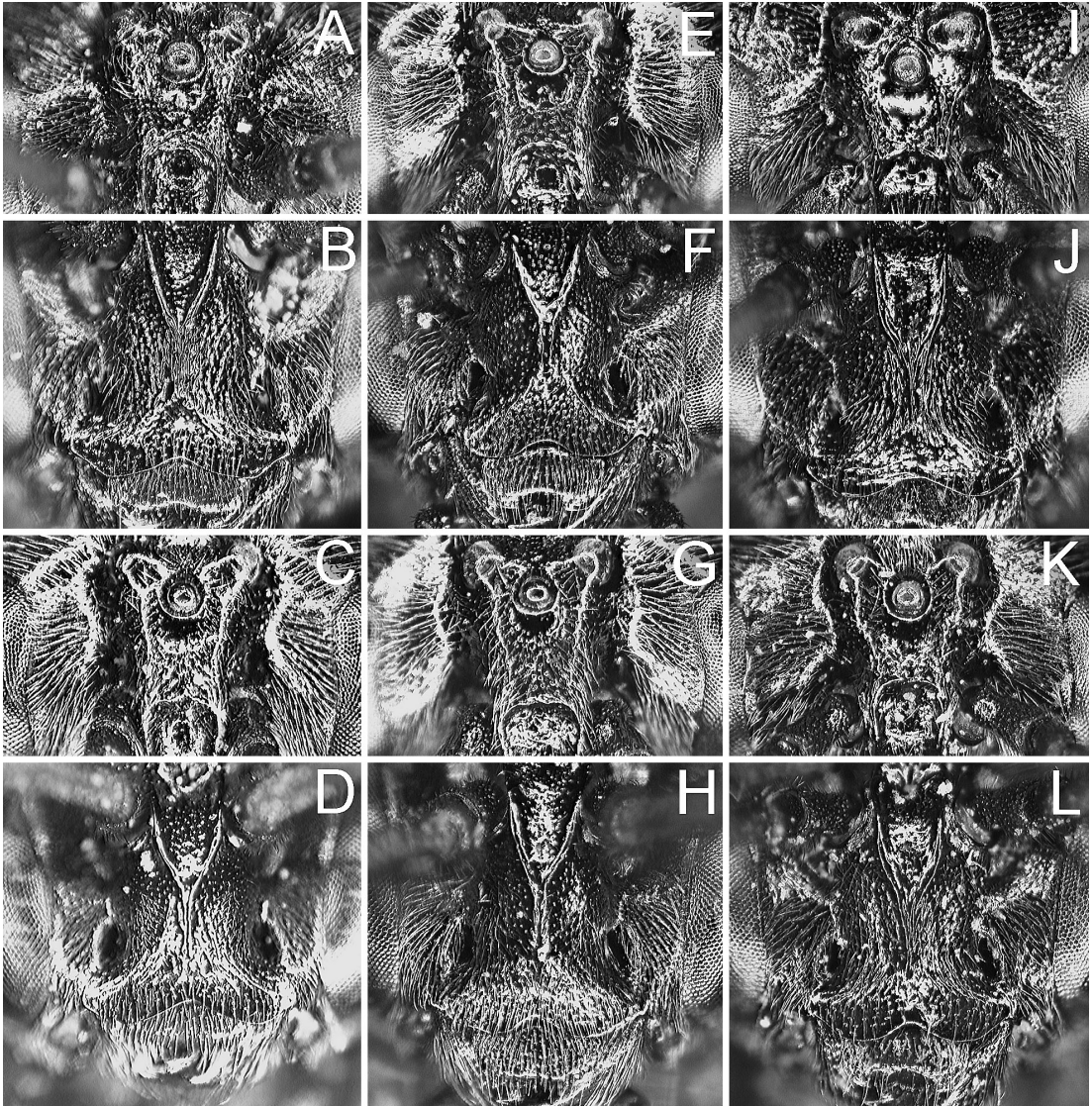


Fig. 3. Heads of *Spinarge* spp. — A–B, *S. fulvicornis* (Mocsáry), ♀, holotype; C–D, do., ♂ (No. HH040711D), Hokkaido; E–F, *S. prunivora* sp. nov., ♀, holotype; G–H, do., ♂, paratype (No. HH040731A), Hokkaido; I–J, *S. affinis* sp. nov., ♀, holotype; K–L, *S. pumila* sp. nov., ♀, holotype.

sawfly families, and strongly support the monophyly of the genus.

In the female with a deformed abdomen, one may fail to detect the dark median line or the posteromedial convexity on the fifth abdominal tergum. Even in such cases, the females of some species such as *S. sichuanensis* are easily recognized as belonging to *Spinarge* because of the lack of a preapical spur on the hind tibia. The fe-

males of the species with a preapical spur on the hind tibia would run to *Arge* in the keys to the argid genera given by Gussakovskij (1935), Malaise (1941), Wei (1997), and so on.

Apart from the differences mentioned above, *Spinarge* is not distinguishable from *Arge*. We, therefore, transfer *Spinarge* into the Argini. Smith (1989) divided Nearctic *Arge* into four species-groups. *Spinarge* is similar to the *A. clavi-*

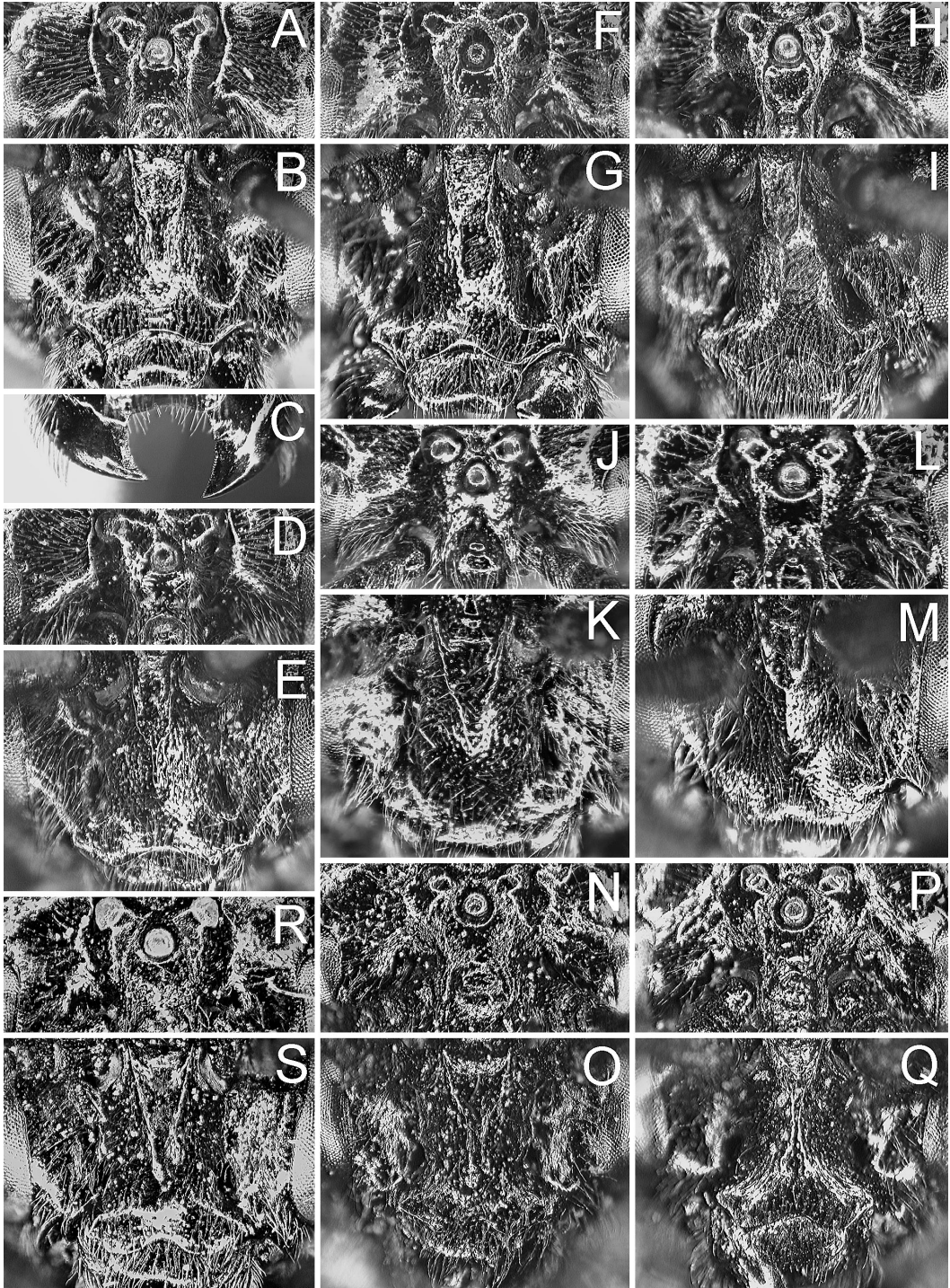


Fig. 4. Heads of *Spinarge* spp. — A–C, *S. metallica* (Klug), ♀, Sosninskij River, Russia; D–E, do., ♂, Sosninskij River, Russia; F–G, *S. flavicostalis* sp. nov., ♀, holotype; H–I, do., ♂, paratype, Asahidake-onsen, Hokkaido; J–K, *S. nigricornis* sp. nov., ♀, holotype; L–M, do., ♂, paratype, Mt. Sankakuyama, Hokkaido; N–O, *S. chrysoptera* (Gussakovskij), ♀, Mt. Zheduoshan, China; P–Q, do., ♂, Mt. Zheduoshan, China; R–S, *S. sichuanensis* Wei, ♀, Mt. Taibaishan, China.

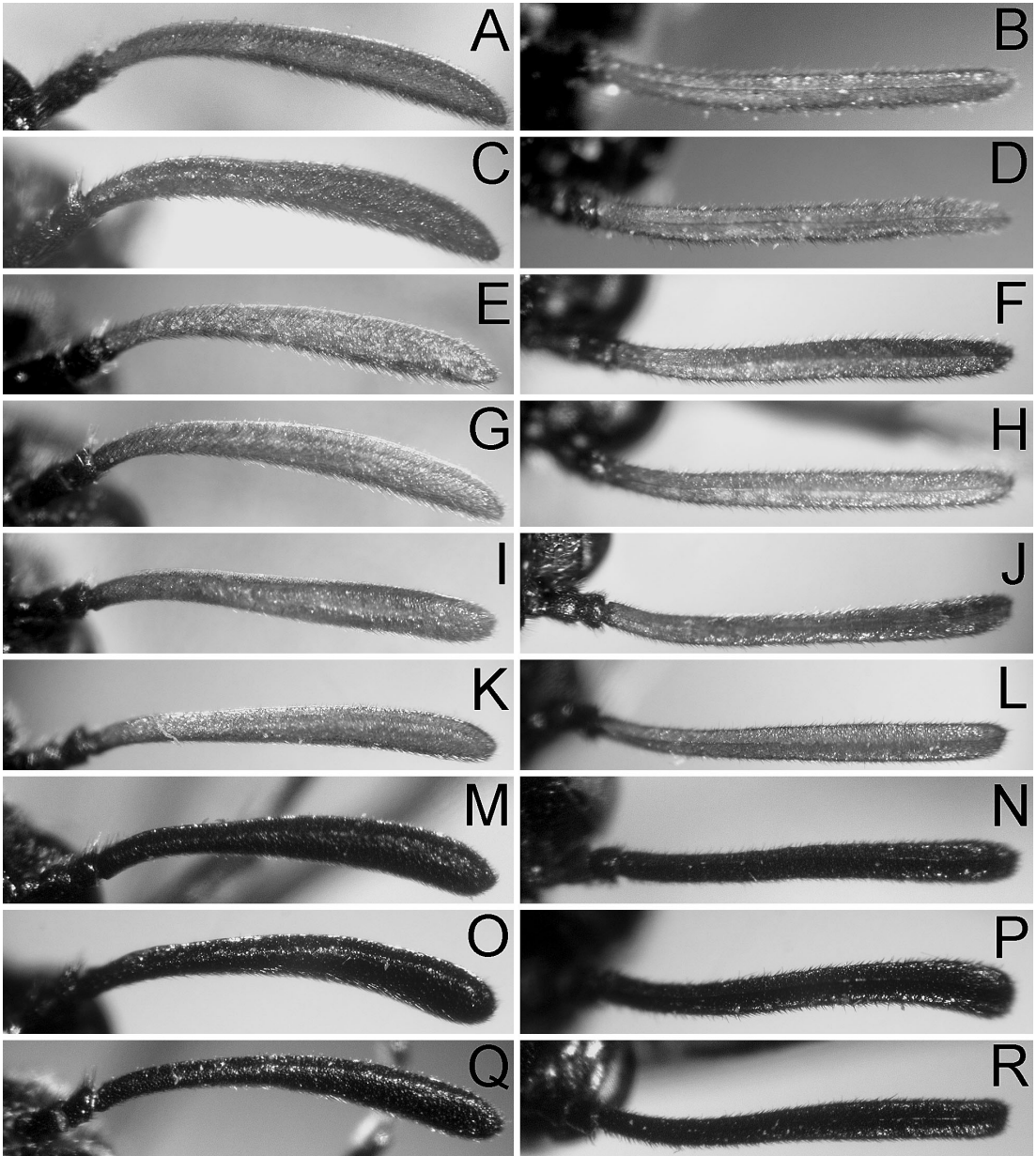


Fig. 5. Female antennae of *Spinarge* spp. (lateral and ventral views) — A–B, *S. fulvicornis* (Mocsáry), holotype; C–D, *S. prunivora* sp. nov., holotype; E–F, *S. affinis* sp. nov., holotype; G–H, *S. pumila* sp. nov., holotype; I–J, *S. metallica* (Klug), Sosninskij River, Russia; K–L, *S. flavicostalis* sp. nov., holotype; M–N, *S. nigricornis* sp. nov., holotype; O–P, *S. chrysoptera* (Gussakovskij), Mt. Zheduoshan, China; Q–R, *S. sichuanensis* Wei, ♀, Mt. Taibaishan, China.

cornis group in having the non-spinose lancet without dorsally projecting hairs and a large gap between the second and third serrulae, and with the valviceps strongly protruding anteroventrally,

but *Spinarge* is separated from the *A. clavicornis* group by the narrow gonostipes (broad in the *A. clavicornis* group) and the valviceps apically with a very small lateral lobe, if any (apically

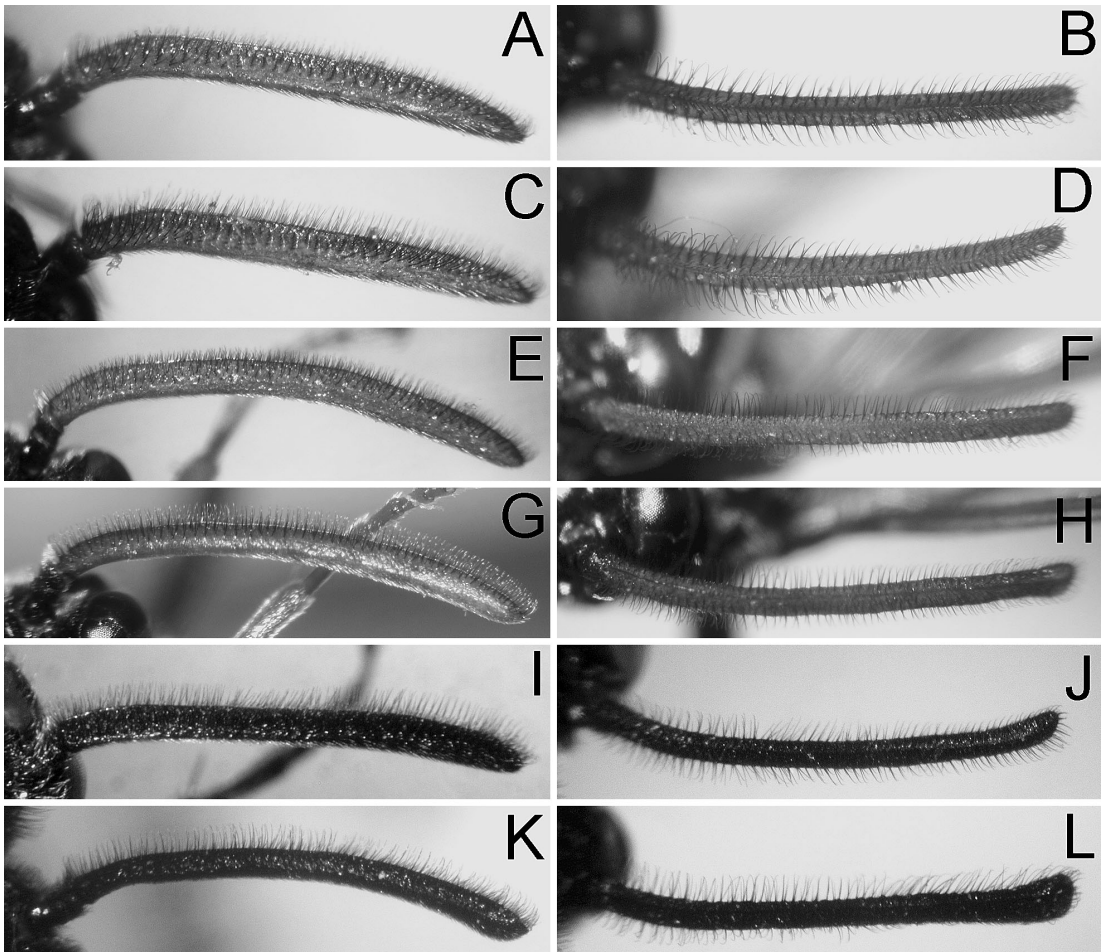


Fig. 6. Male antennae of *Spinarge* spp. (lateral and ventral views) — A–B, *S. fulvicornis* (Mocsáry), No. HH040711D, Hokkaido; C–D, *S. prunivora* sp. nov., paratype (No. HH040731A), Hokkaido; E–F, *S. metallica* (Klug), Sosninskij River, Russia; G–H, *S. flavicostalis* sp. nov., paratype, Asahidake-onsen, Hokkaido; I–J, *S. nigricornis* sp. nov., paratype, Mt. Sankakuyama, Hokkaido; K–L, *S. chrysoptera* (Gussakovskij), Mt. Zheduoshan, China.

with a large lateral lobe in the *A. clavicornis* group). Smith (1989) placed “*Arge metallica*” (= *S. metallica*) in the *A. clavicornis* group.

Wei (1998) characterized *Spinarge* by the presence of the process on the fifth abdominal tergum in the male and the combination of the presence of a preapical spur on the middle tibia and the absence of a preapical spur on the hind tibia. However, the preapical spur on the hind tibia may be present or absent within *Spinarge*; it is absent in *S. sichuanensis* and *S. liui*, but is present in the other species. The presence or absence of preapi-

cal spurs on the middle and hind tibiae was employed for the subdivision or generic classifications of the Argidae by many authors (Gussakovskij, 1935; Benson, 1938, 1963; Malaise, 1941; Smith, 1992; Wei, 1997). According to Benson (1963), the Argini have a preapical spur on the middle and hind tibiae (state A) and the Athermantini have no preapical spurs on these tibiae (state B). Benson (1938) regarded the retention of the preapical spur as primitive. Wei (1998) wrote that *Spinarge* “may be more primitive than other genera of Athermantinae

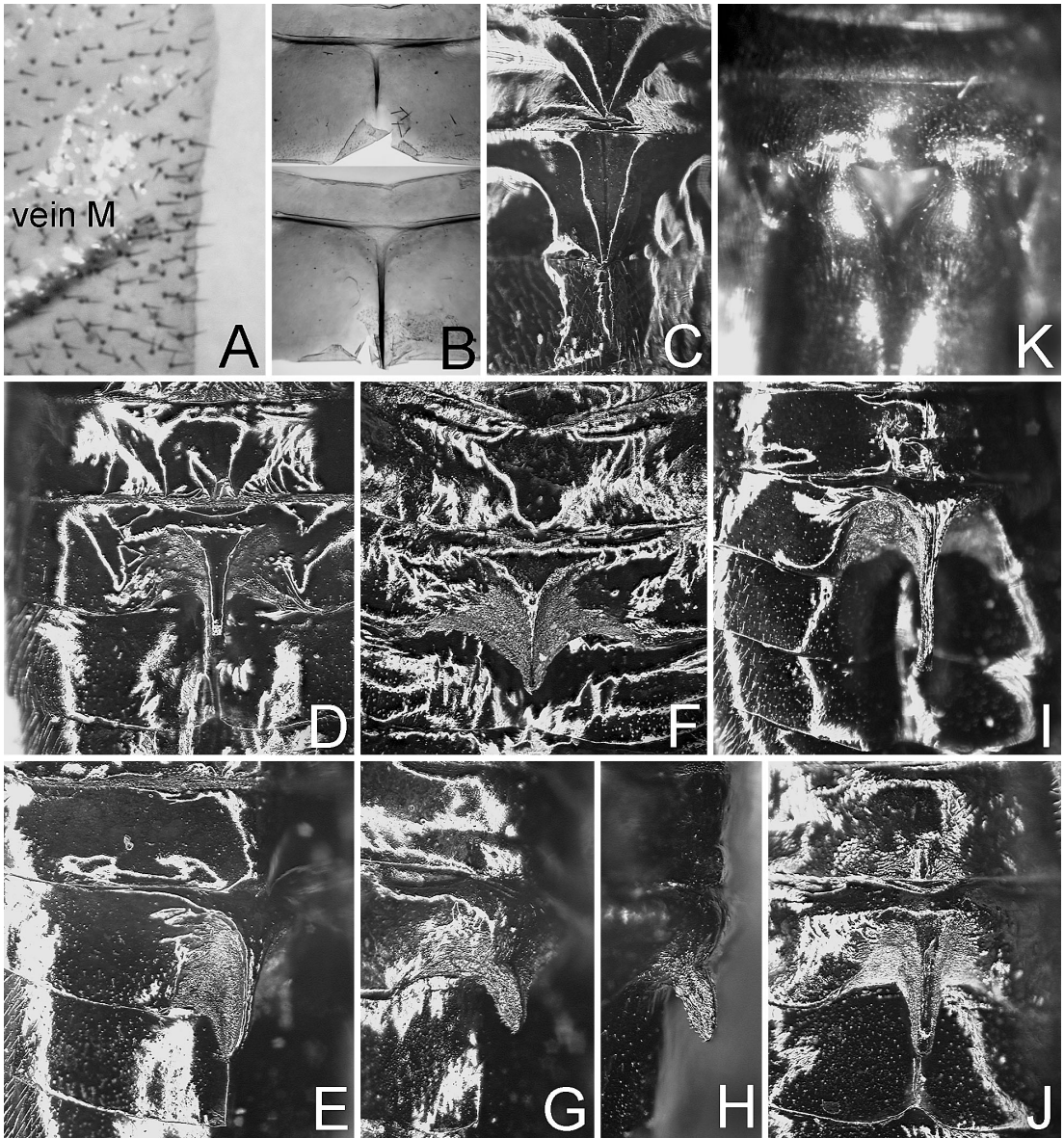


Fig. 7. Wing and abdomens of *Spinarge* spp. — A, Apical margin of forewing, *S. prunivora* sp. nov., ♀, paratype (No. HH040731A), Hokkaido; B, median parts of fourth and fifth abdominal terga, *S. prunivora* sp. nov., ♀, paratype, Aoki-ko, Honshu, mounted on slide; C, median parts of fourth to sixth abdominal terga, *S. prunivora* sp. nov., ♀, holotype; D, fourth to sixth abdominal terga, *S. fulvicornis* (Mocsáry), ♂, No. HH040711D, Hokkaido; E, do., *S. prunivora* sp. nov., ♂, paratype (No. HH040731A); F, do., *S. metallica* (Klug), ♂, Sosninskij River, Russia; G–H, do., *S. flavicostalis* sp. nov., ♂, paratype, Asahidake-onsen, Hokkaido; I, fourth to seventh abdominal terga, *S. nigricornis* sp. nov., ♂, paratype, Mt. Sankakuyama, Hokkaido; J, fourth to sixth abdominal terga, *S. chrysoptera* (Gussakovskij), ♂, Mt. Zheduoshan, China; K, sixth and seventh abdominal sterna and sawsheath, *S. prunivora* sp. nov., ♀, holotype, ventral view.

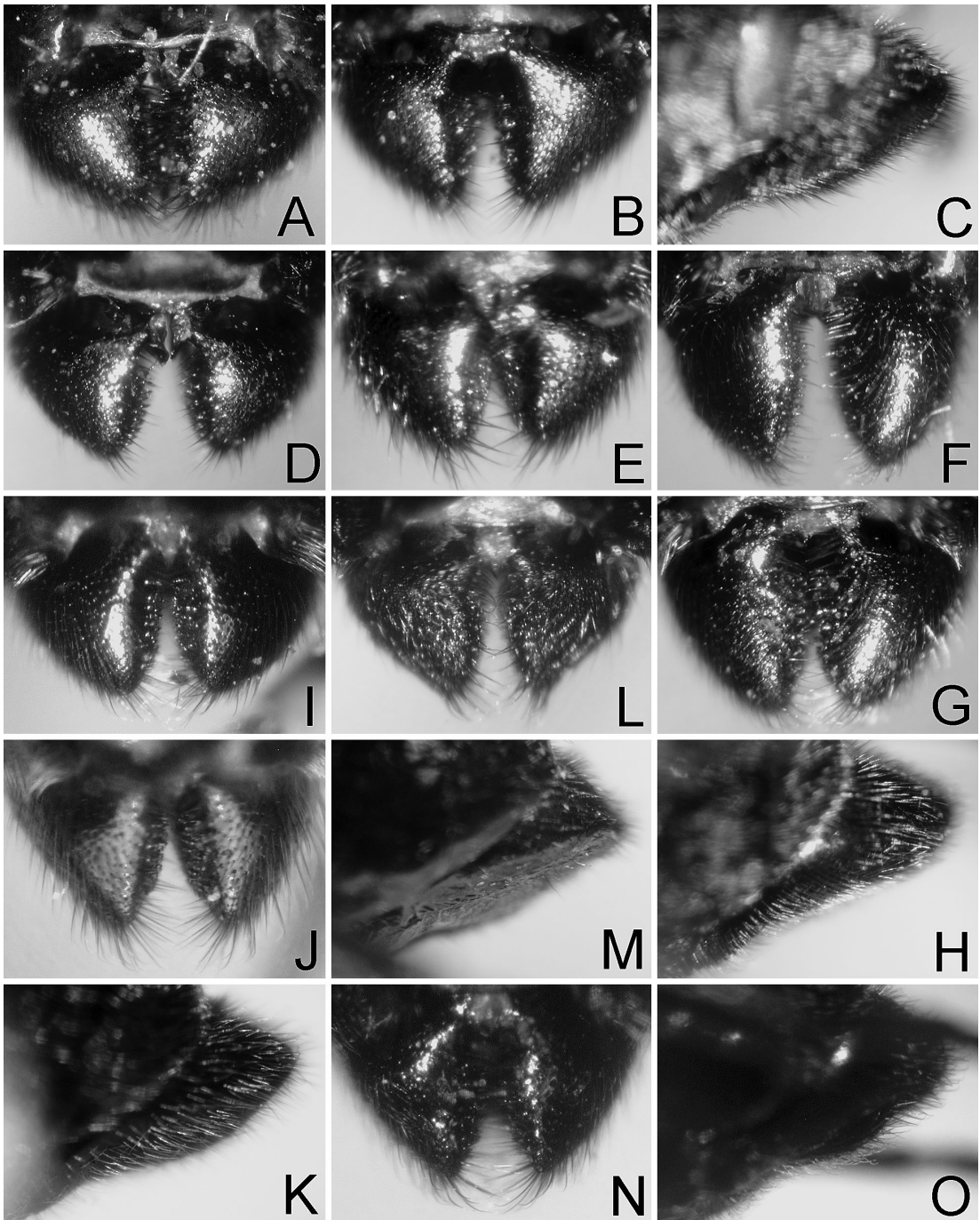


Fig. 8. Sawsheaths of *Spinarge* spp. — A, *S. fulvicornis* (Mocsáry), holotype, posterodorsal view; B, *S. prunivora* sp. nov., holotype, posterodorsal view; C, do., paratype (No. HH040731A), Hokkaido, lateral view; D, *S. affinis* sp. nov., holotype, posterodorsal view; E, *S. pumila* sp. nov., holotype, posterodorsal view; F, *S. metallica* (Klug), Sosninskij River, Russia, posterodorsal view; G–H, *S. flavicostalis* sp. nov., holotype, posterodorsal and lateral views; I, *S. nigricornis* sp. nov., holotype, posterodorsal view; J–K, do., paratype, Shikotsuko, Hokkaido, posterodorsal and lateral views; L–M, *S. chrysoptera* (Gussakovskij), Mt. Zheduoshan, China, posterodorsal and lateral views; N–O, *S. sichuanensis* Wei, ♀, Mt. Taibaishan, China, posterodorsal and lateral views.

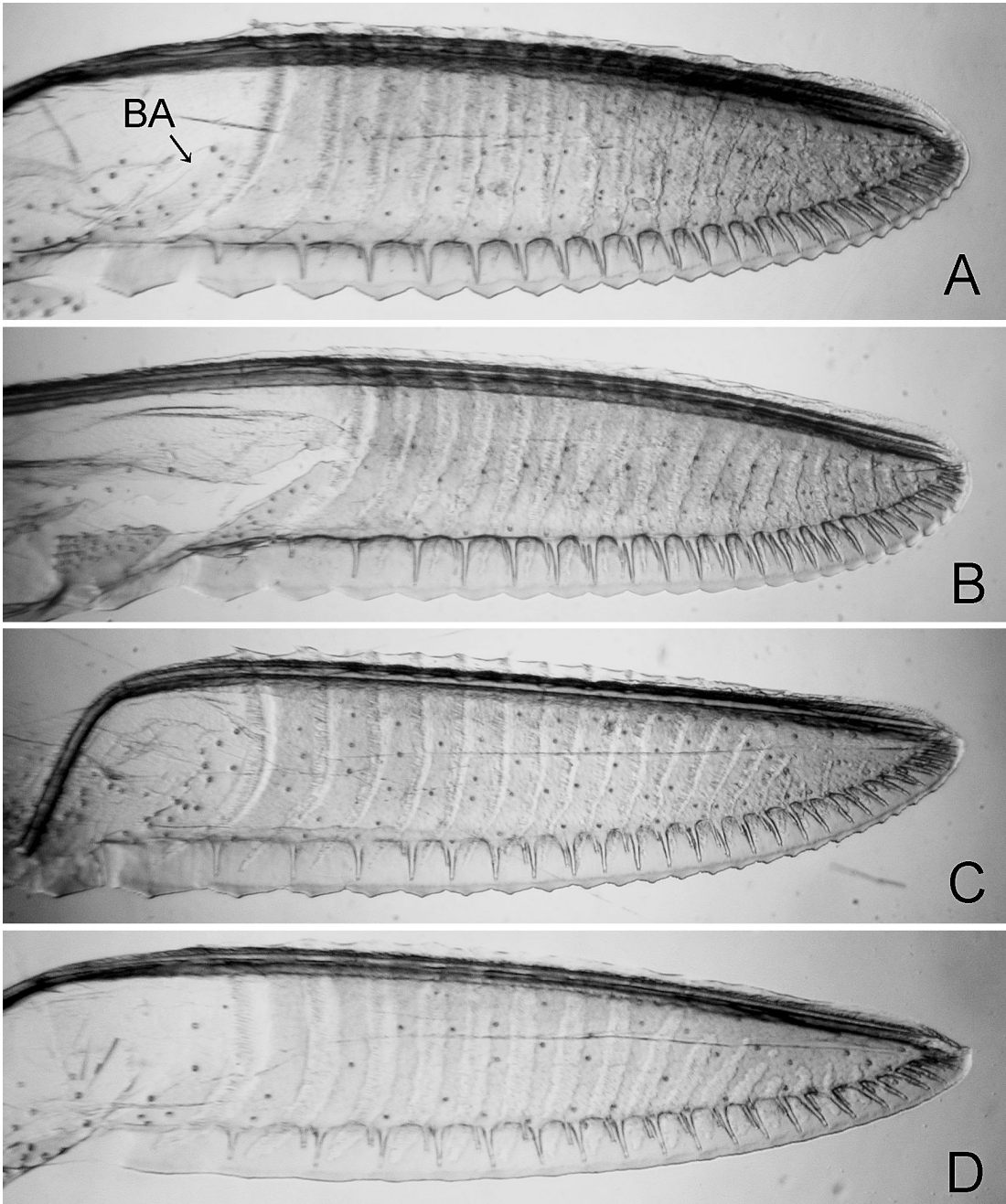


Fig. 9. Lancets of *Spinarge* spp. — A, *S. fulvicornis* (Mocsáry), No. HH040711D, Hokkaido; B, *S. prunivora* sp. nov., paratype (No. HH040731A), Hokkaido; C, *S. affinis* sp. nov., holotype; D, *S. pumila* sp. nov., holotype. BA, sclerotized part of basal annulus.

(=Athermantini of Benson), because the middle tibia of the new genus has a preapical spur” (state C). However, in the Pergidae, which is regarded as the sister group of the Argidae (e.g., Schul-

meister, 2003), all the three character states (A–C) are found (Benson, 1938). Hence, the evolutionary polarity among these states in the Argidae is uncertain. We suggest that the presence or

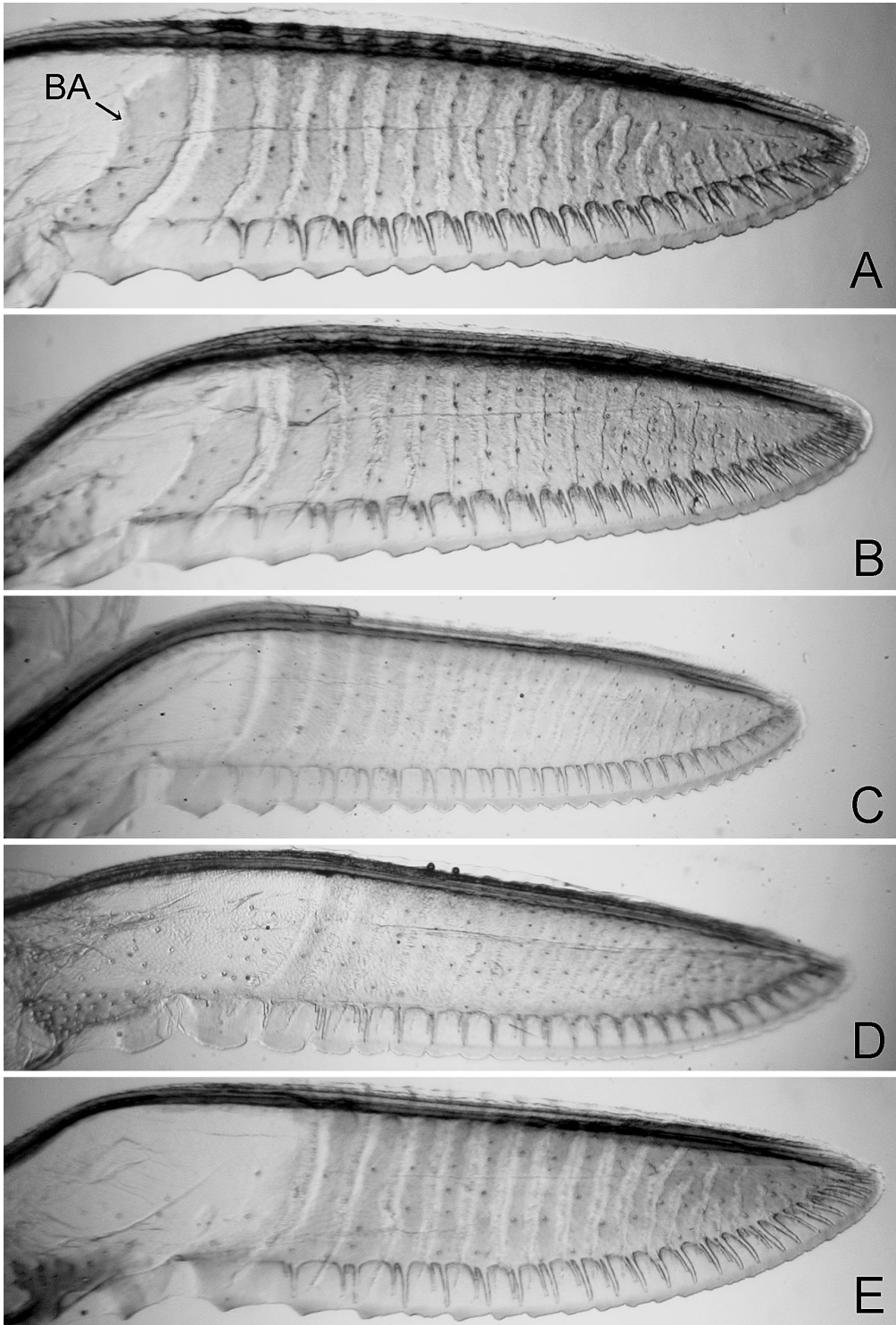


Fig. 10. Lancets of *Spinarge* spp. — A, *S. metallica* (Klug), Sosninskij River, Russia; B, *S. flavicostalis* sp. nov., holotype; C, *S. nigricornis* sp. nov., holotype; D, *S. chrysoptera* (Gussakovskij), Mt. Zheduoshan, China; E, *S. sichuanensis* Wei, ♀, Mt. Taibaishan, China. BA, sclerotized part of basal annulus.

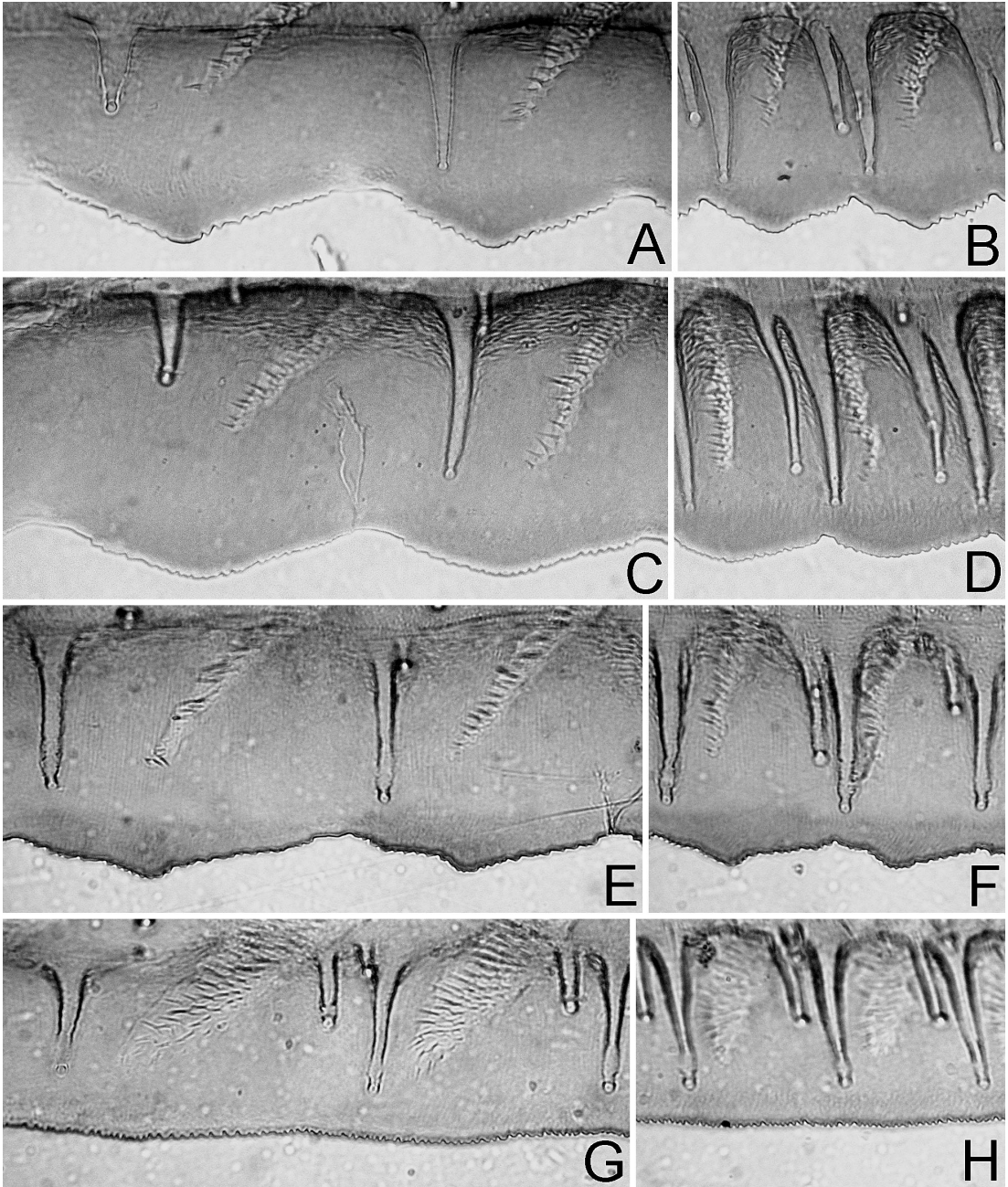


Fig. 11. Third–fourth and ninth–tenth serrulae of *Spinarge* spp. — A–B, *S. fulvicornis* (Mocsáry), No. HH040711D, Hokkaido; C–D, *S. prunivora* sp. nov., paratype (No. HH040731A), Hokkaido; E–F, *S. affinis* sp. nov., holotype; G–H, *S. pumila* sp. nov., holotype.

absence of the preapical spurs alone will not justify separation of the two tribes, because the character is not stable even in a genus. The tribal classification of the argid sawflies certainly needs

revision.

We propose to classify the members of *Spinarge* into five species-groups as shown in the following key.

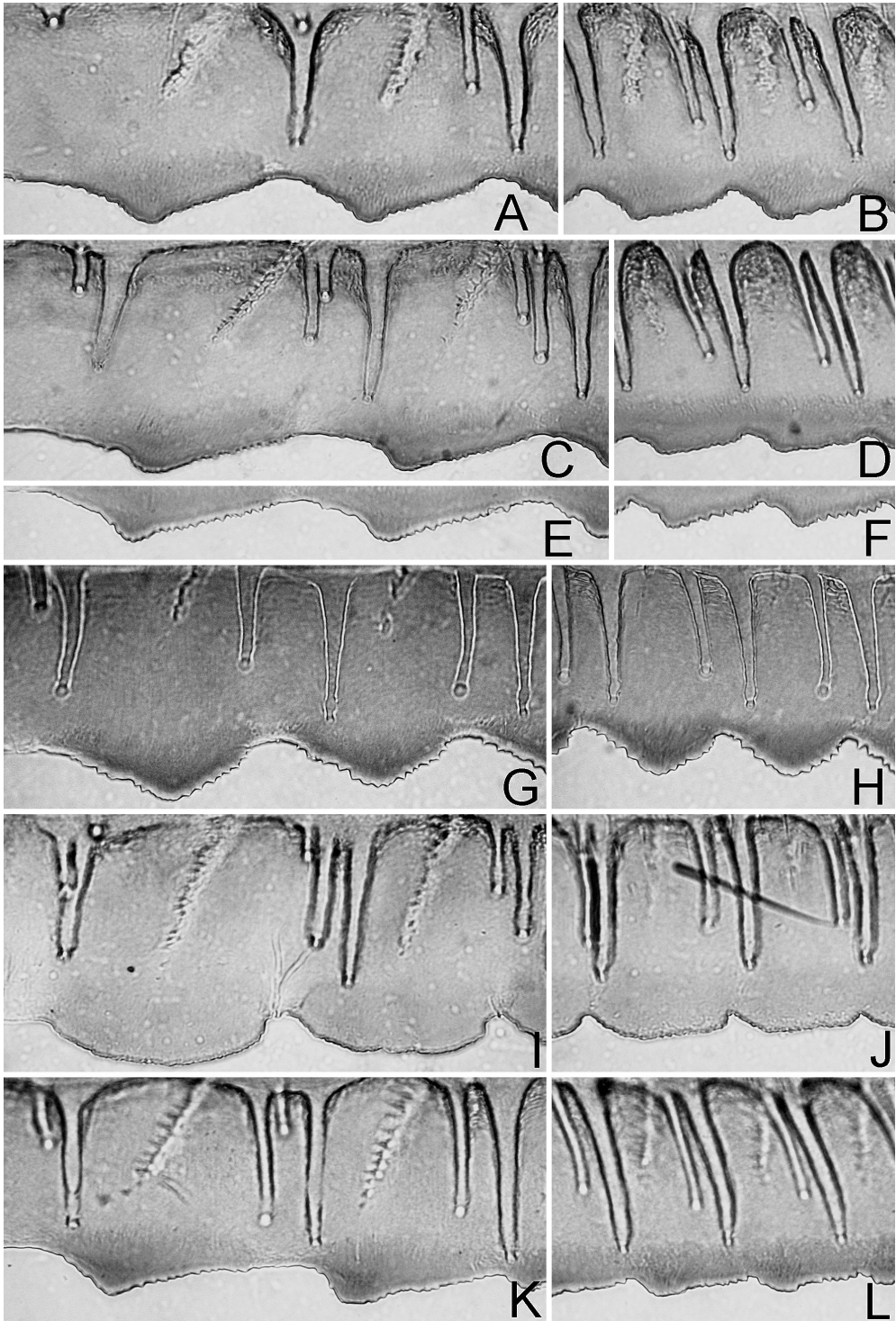


Fig. 12. Third-fourth and ninth-tenth serrulae of *Spinarge* spp. — A–B, *S. metallica* (Klug), Sosninskij River, Russia; C–D, *S. flavicostalis* sp. nov., holotype; E–F, do., paratype (No. HR920713E), Hokkaido; G–H, *S. nigricornis* sp. nov., holotype; I–J, *S. chrysoptera* (Gussakovskij), Mt. Zheduoshan, China; K–L, *S. sichuanensis* Wei, ♀, Mt. Taibaishan, China.

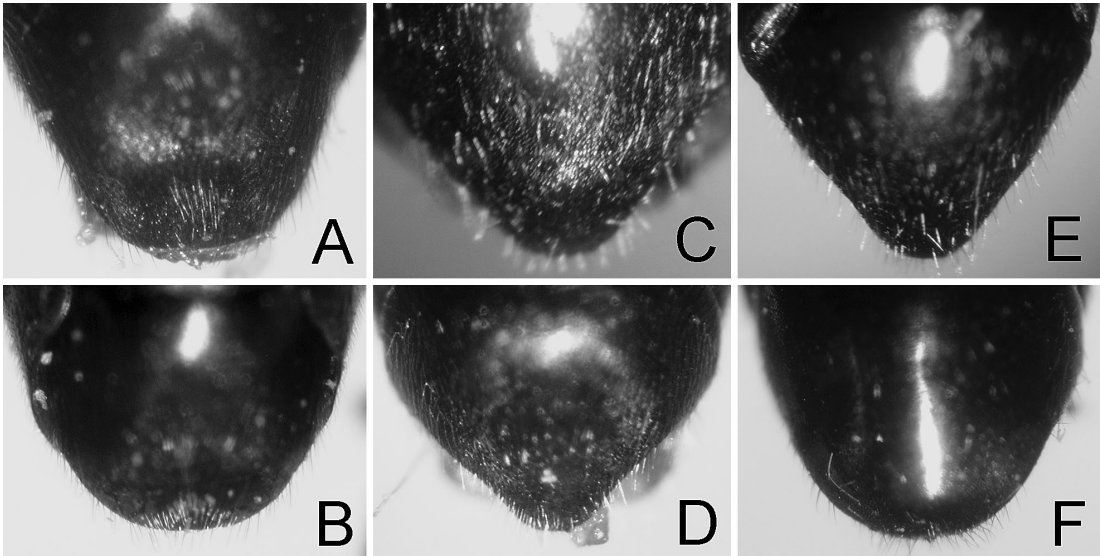


Fig. 13. Subgenital plates of *Spinarge* spp. — A, *S. fulvicornis* (Mocsáry), No. HH040711D, Hokkaido; B, *S. prunivora* sp. nov., paratype (No. HH040731A), Hokkaido; C, *S. metallica* (Klug), Sosninskij River, Russia; D, *S. flavicostalis* sp. nov., paratype, Asahidake-onsen, Hokkaido; E, *S. nigricornis* sp. nov., paratype, Mt. Sankakuyama, Hokkaido; F, *S. chrysoptera* (Gussakovskij), Mt. Zheduoshan, China.

Key to the species groups and species of *Spinarge*

1. Wings vivid yellowish orange, including veins and stigma (Fig. 2H) Group of *S. chrysoptera*: *S. chrysoptera* (Gussakovskij) [Additional group characters: Flagellum dark; legs without pale areas; setae on mesopleuron dark; head in dorsal view slightly dilated behind eyes; interantennal carinae dorsally separated from each other (Fig. 4N, P); distance between eyes longer than vertical diameter of eye; malar space wider than width of front ocellus; hind tibia with preapical spur; lancet with middle annuli oblique and basal annulus narrowly and weakly sclerotized only ventrally (Fig. 10D); subgenital plate gently rounded apically (Fig. 13F); gonostipes in ventral view with inner margin slightly concave posteriorly (Fig. 14J); harpe broad; valviceps in dorsal view with small lateral lobe posteriorly (Fig. 14K), in lateral view not convex anterodorsally, with posterodorsal lobe long (Fig. 15J). One species: *S. chrysoptera* (Gussakovskij). China.]
 - Wings predominantly hyaline, dark, yellowish or brownish, with stigma and veins predominantly or entirely dark 2
 2. Hind tibia with preapical spur. Setae on mesopleuron pale 3
 - Hind tibia without preapical spur. Setae on mesopleuron dark Group of *S. sichuanensis* [Additional group characters: Flagellum dark (Fig. 2I); legs without pale areas; wings mostly dark; head in dorsal view dilated behind eyes in female, not so in male; interantennal carinae dorsally separated from each other (Fig. 4R); distance between eyes longer than vertical diameter of eye; malar space wider than width of front ocellus; lancet with middle annuli oblique and basal annulus weakly and narrowly sclerotized (Fig. 10E); gonostipes in ventral view with inner margin slightly concave posteriorly (Figs. 6, 9 of Wei, 1998); harpe broad; penis valve in lateral view not convex anterodorsally, with posterodorsal lobe long (Figs. 7, 10 of Wei, 1998). Two species: *S. sichuanensis*

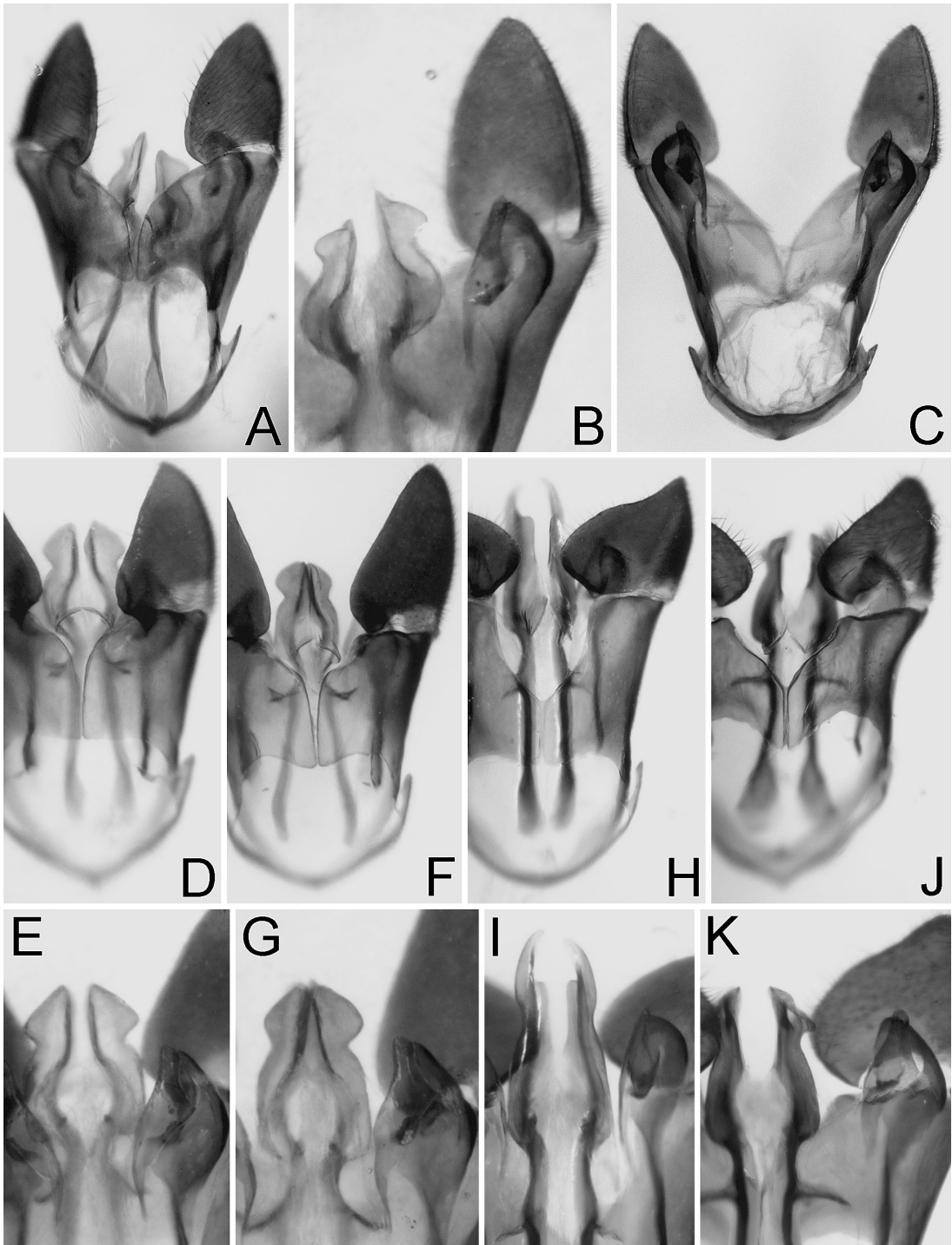


Fig. 14. Male genitalia of *Spinarge* spp. — A, *S. fulvicornis* (Mocsáry), collected in copula, Karurusu-onsen, Hokkaido, ventral view; B, do., dorsal view; C, *S. prunivora* sp. nov., paratype (No. HH040731A), Hokkaido, dorsal view; D, *S. metallica* (Klug), Sosninskij River, Russia, ventral view; E, do., dorsal view; F, *S. flavicostalis* sp. nov., paratype, Asahidake-onsen, Hokkaido, ventral view; G, do., dorsal view; H, *S. nigricornis* sp. nov., paratype, Mt. Sankakuyama, Hokkaido, ventral view; I, do., dorsal view; J, *S. chrysoptera* (Gussakovskij), Mt. Zheduoshan, China, ventral view; K, do., dorsal view.

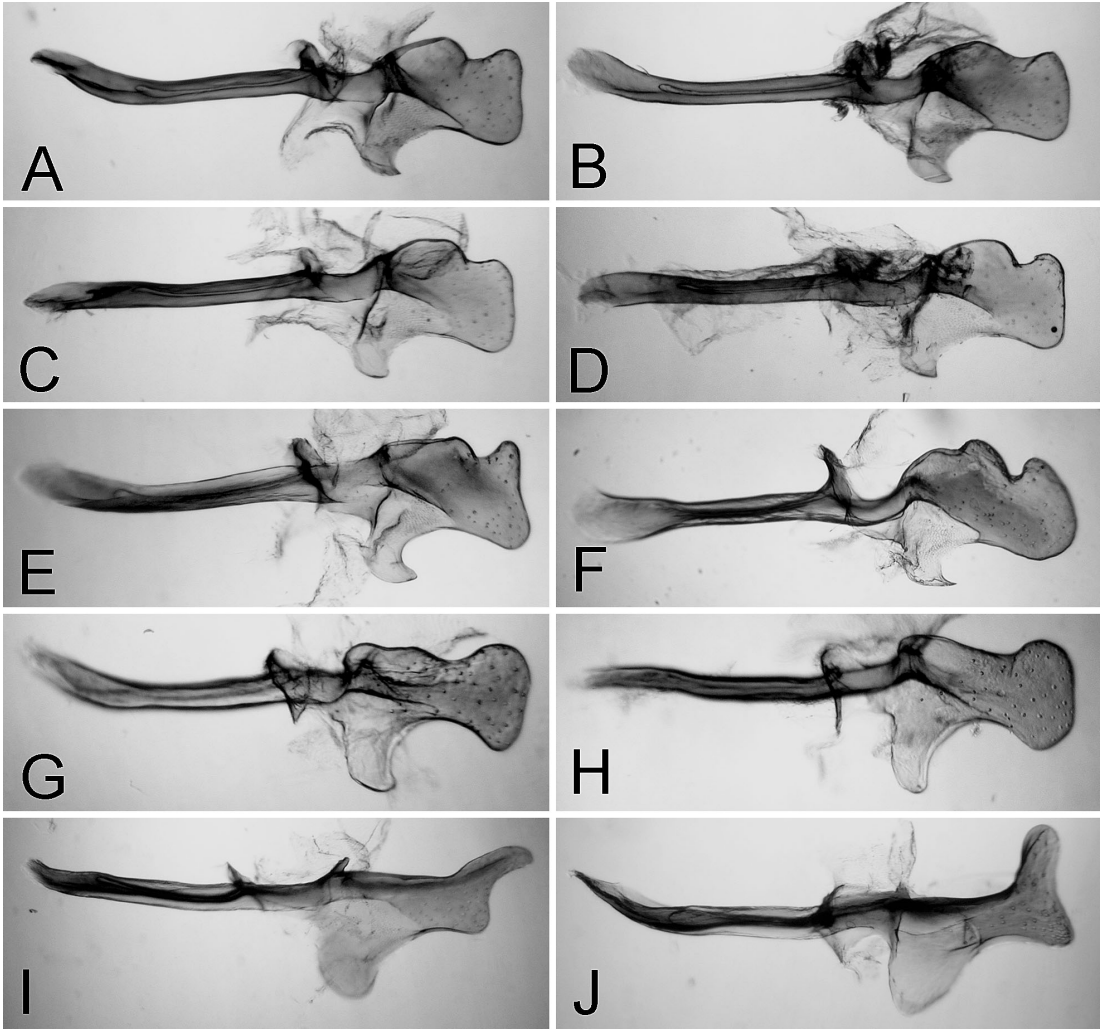


Fig. 15. Penis valves of *Spinarge* spp. — A, *S. fulvicornis* (Mocsáry), No. HH040711D, Hokkaido; B, do., another specimen of the same data; C, *S. prunivora* sp. nov., paratype (No. HH040731A), Hokkaido; D, do., another paratype of the same data; E, *S. sp.* (*fulvicornis* group), Nikko, Honshu; F, *S. sp.* (*fulvicornis* group), Nikko, Honshu; G, *S. metallica* (Klug), Sosninskij River, Russia; H, *S. flavicostalis* sp. nov., paratype, Asahidake-onsen, Hokkaido; I, *S. nigricornis* sp. nov., paratype, Mt. Sankakuyama, Hokkaido; J, *S. chrysoptera* (Gussakovskij), Mt. Zheduoshan, China.

sis Wei and *S. liui* Wei. China.]

- 2a. Body without purplish tinge. In male abdomen, median process of fifth tergum reaching posterior margin of sixth tergum apically *S. sichuanensis* Wei
 — Body with strong purplish tinge. In male abdomen, median process of fifth tergum not reaching posterior margin of sixth tergum apically *S. liui* Wei

3. Cells C and Sc of wings dark (Fig. 2F–G). Flagellum dark. Legs without pale areas. . . .
 Group of *S. nigricornis*: *S. nigricornis* sp. nov. [Additional group characters: Wings predominantly hyaline in female, mostly brownish in male; head in dorsal view dilated behind eyes in female, not so in male; interantennal carinae dorsally separated from each other (Fig. 4J, L); distance between

eyes longer than vertical diameter of eye; malar space narrower than or about as long as width of front ocellus; lancet with middle annuli oblique and basal annulus narrowly and weakly sclerotized only ventrally (Fig. 10C); subgenital plate tapering apically (Fig. 13E); gonostipes in ventral view long, with inner margin concave posteriorly (Fig. 14H); harpe broad; valviceps in dorsal view without lateral lobe (Fig. 14I), in lateral view not convex anterodorsally, with posterodorsal lobe long (Fig. 15I). One species: *S. nigricornis* sp. nov. Japan.]

- Cells C and Sc of wings usually hyaline or yellow, if dark, flagellum orange and/or legs pale at least in basal part of hind tibia. . . . 4
- 4. Interantennal carinae dorsally separated from each other (Fig. 4A, D, F, H). Setae on vein C of forewing yellow. In female, sawsheath long in posterodorsal view (Fig. 8F–G). In male, subgenital plate tapering apically (Fig. 13C–D) Group of *S. metallica* [Additional group characters: Flagellum orange, rarely dark brown; legs with pale areas (Fig. 2A–D); wings predominantly or mostly hyaline or yellowish, rarely slightly brownish in male; head in dorsal view slightly dilated behind eyes, sometimes not so in male; distance between eyes longer than vertical diameter of eye; malar space wider than width of front ocellus, sometimes slightly narrower in male; lancet with middle annuli nearly erect and basal annulus widely well sclerotized (Fig. 10A–B); gonostipes in ventral view with inner margin slightly concave posteriorly (Fig. 14D, F); harpe narrow; valviceps in dorsal view with small lateral lobe posteriorly (Fig. 14E, G), in lateral view slightly convex anterodorsally, with posterodorsal lobe widely rounded (Fig. 15G–H). Two species: *S. metallica* (Klug) and *S. flavicostalis* sp. nov. Europe to Kamchatka, Primorskij kraj, Sakhalin, Korea and Japan.]
 - 4a. Tibiae and tarsi entirely yellowish white to orange (Fig. 2A–B). Body reflection bronzy. Europe to Kamchatka, Primorskij kraj, Sakhalin and Korea.
 *S. metallica* (Klug)
 - At least hind tibia more or less darkened apically (Fig. 2C–D). Body reflection faint blue-green. Japan
 *S. flavicostalis* sp. nov.
- Interantennal carinae dorsally fused with each other or nearly so (Fig. 3), very rarely separated from each other. Setae on vein C of forewing dark (condition unknown in *S. hyalina*). In female, sawsheath short in posterodorsal view as in Fig. 8A (condition unknown in *S. hyalina*). In male, subgenital plate apically gently rounded or nearly truncate (Fig. 13A–B) 5
- 5. Flagellum dark. Interantennal carinae ventrally separated from each other. China . . . *S. hyalina* Wei & Nie (species group uncertain) [Additional characters (female unknown): “Wings hyaline, with transverse maculae, face very short and flat, head strongly narrowing behind eyes” (after Wei & Nie, 1998); in male, median process of fifth abdominal tergum not reaching posterior margin of sixth tergum apically (Fig. 9 of Wei & Nie, 1998); valviceps convex anterodorsally, with posterodorsal lobe small (Fig. 10 of Wei & Nie, 1998).]
 - Flagellum orange as in Fig. 1A. Interantennal carinae ventrally fused with each other as in Fig. 3B Group of *S. fulvicornis* [Additional group characters: Legs pale at least in basal part of hind tibia (very rarely faintly pale); wings mostly hyaline, rarely predominantly brownish (Fig. 1L) in female, mostly or predominantly hyaline, yellowish or brownish (Fig. 1C, O) in male; head in dorsal view usually slightly narrowing behind eyes; distance between eyes slightly longer or narrower than vertical diameter of eye; malar space narrower than or about as long as width of front ocellus; lancet with middle annuli nearly erect or slightly oblique and basal annulus relatively widely sclerotized (Fig. 9); gonostipes in ventral view

with inner margin not concave (Fig. 14A, C); harpe narrow; valvaceps in dorsal view with small lateral lobe posteriorly (Fig. 14B), in lateral view convex anterodorsally, with posterodorsal lobe small (Fig. 15A–F). Four species: *S. affinis* sp. nov., *S. fulvicornis* (Mocsáry), *S. prunivora* sp. nov. and *S. pumila* sp. nov. Japan, Sakhalin, Korea and northeast China.]

- 5a. Female 5b
 — Male Species not distinguishable
- 5b. Lancet with serrulae nearly flat and indistinct (Figs. 9D, 11G–H). Japan
 *S. pumila* sp. nov.
- Lancet with serrulae distinctly convex (Figs. 9A–C, 11A–F) 5c
- 5c. Serrulae rounded apically (Fig. 11C–D). Japan and Korea. . . *S. prunivora* sp. nov.
- Serrulae angular apically (Fig. 11A–B, E–F) 5d
- 5d. Lancet broad, with dorsal margin slightly roundly convex (Fig. 9A). Serrulae strongly convex (Fig. 11A–B). Japan, Sakhalin, Korea and northeast China. . .
 *S. fulvicornis* (Mocsáry)
- Lancet relatively narrow, with dorsal margin straight (Fig. 9C). Serrulae weakly convex (Fig. 11 E–F). Japan . . .
 *S. affinis* sp. nov.

***Spinarge fulvicornis* (Mocsáry, 1909),
 comb. nov.**

[Japanese name: Tsunoki-toge-churenji (new name)]

(Figs. 1A–F, 3A–D, 5A–B, 6A–B, 7D, 8A, 9A,
 11A–B, 13A, 14A–B, 15 A–B)

Arge fulvicornis Mocsáry, 1909: 5; Takeuchi, 1932: 37 [partim]; Seiyama & Tachikawa, 1983: 182; Naito *et al.*, 2004: 11 [partim].

Arge jonasi: Nakamura, 2003: 253 [partim]; Murakami, 2004: 103.

Description (female and male). [Conditions of holotype (female) in brackets.] Length 7.6–11.9 [11.5] mm in female, 7.2–7.7 mm in male; forewing length 6.9–11.4 [10.6] mm in female, 6.6–7.5 mm in male.

Black (Fig. 1A–C), except for following parts:

Ocelli red; ventral part of clypeus and labrum rarely brown [blackish brown]; flagellum orange; apical part of mandible widely red; maxillary and labial palpi dark brown, slightly pale at apical segment of maxillary palpus; female legs mostly brown to dark brown from apex of femur to basal part of tarsus of fore leg and apices of mid and hind femora, yellowish white to dark brown at basal 1/2–2/3 of mid tibia [brown], and yellowish white at basal 2/3–3/4 of hind tibia; in male, hind tarsus basally pale; tibial spurs dark brown; in female, subanal plate dark brown; female wings mostly hyaline, very faintly brownish apically (Fig. 1A); male wings slightly brownish, becoming pale apically, with forewing yellowish basal to level of stigma (Fig. 1C); dark transverse band below stigma reaching posterior wing margin; cell A of forewing widely brownish; veins mostly dark, with vein C yellowish white, usually darkened along anterior margin except for apical part [darkened], and with vein Sc and apical half of basal section and apical section of vein R1 yellowish white to yellow; stigma mostly dark brown. Reflection mainly weak blue-green, weak violet on basal four abdominal terga. Setae on body whitish, dorsally brownish, mostly whitish in bred specimens; setae on wings blackish, but those on membrane in basal halves of wings mostly whitish.

Head in dorsal view slightly narrowing behind eyes, rarely not so in female. Distance between eyes 1.0–1.2 [1.0] × vertical diameter of eye in female, 1.0 × in male; eye with vertical diameter 1.7–1.8 [1.7] × horizontal diameter in female, 1.6–1.7 × in male. Distances between eye and hind ocellus, hind ocelli, hind ocellus and posterior margin of head as 1.2–1.7 : 1.0 : 1.2–1.6 [1.3 : 1.0 : 1.3]. Frontal area (Fig. 3A, C) with shallow and wide depression before front ocellus, anteromedially not or slightly concave (very rarely deeply concave in female) [not concave]. Interantennal carinae dorsally fused with or very narrowly separated from each other (very rarely widely separated in female) [fused], ventrally fused with each other and confluent with median carina of supraclipeal area at center of supra-

clypeal area (Fig. 3B, D). Supraclypeal area with median ridge carinate, and slope from median ridge nearly flat or slightly rounded and faintly rugulose. Malar space $0.6\text{--}1.0 [0.8] \times$ width of front ocellus. Antennal length $1.2\text{--}1.5 [1.2] \times$ maximum width of head in female, $1.4\text{--}1.6 \times$ in male; female flagellum (Fig. 5A–B) slightly compressed, curved basally, and nearly pointed apically; male flagellum (Fig. 6A–B) weakly compressed, curved basally. Mesoscutellum in lateral view with dorsal margin roundly convex, roundly curved below near apex. Hind tibia with preapical spur; length of anterior apical spur of hind tibia $1.3\text{--}1.5 [1.4] \times$ apical height of hind tibia. In forewing, cell 1Rs2 with anterior length $0.9\text{--}1.2 [1.2] \times$ posterior length, crossvein 3r–m arched. Sawsheath (Fig. 8A) in posterodorsal view short and robust, with apex nearly rounded, in lateral view with ventral margin, except basal convexity, slightly roundly convex and apex rounded. Lancet as in Fig. 9A, relatively broad; serrulae (Fig. 11A–B) strongly convex angularly, with posterior slope slightly longer than anterior slope. In male abdomen, median process of fifth tergum not reaching sixth tergum posteriorly (Fig. 7D); subgenital plate as in Fig. 13A; genitalia as in Figs. 14A–B and 15A–B.

Larva. Final instar larva 18 mm long. Pale yellow green in middle instar (Fig. 1D), pale reddish brown in final instar (Fig. 1E–F), covered with weak dark spots; thorax with pair of dorsal median row of distinct dark spots; lateral lobes dark. Head brown in middle instar, pale reddish brown in final instar, dorsally and anteriorly darkened. Legs pale.

Distribution. Japan (Hokkaido, Honshu and Shikoku); Sakhalin, Korea and China (Jilin).

Material examined. Holotype: ♀ labeled “Japan ex. coll. Fruhstorfer” and “Typus 1909 *Arge fulvicornis* Mocs.” (HNHMB). This species was described on the basis of one female (Mocsáry, 1909).

Other material examined: JAPAN–Hokkaido: 1 ♀, Souya, Rishiri Is., 7. VIII. 1990, S. Uéno; 1 ♀, Souya, Toyotomi, Wakkasakanai, 3. VIII. 1961, S. Takagi (HU); 1 ♀, Tokachi, Tomuraushi,

VI. 1949, C. Watanabe (HU); 1 ♀, same locality, 6. VIII. 1952, C. Watanabe (HU); 1 ♀, Sorachi, Bibai, Koshunai, 29. VII–2. VIII. 2002, H. Hara; 2 ♀ 1 ♂, Sorachi, Bibai, Garou, reared from group HH040717A of 11 eggs on *Sorbus alnifolia*, 26. VI. 2004, hatched 29. VI, cocoon 27–31. VII, em. 15–21. VIII. 2004, H. Hara; 1 ♀, Sorachi, Mikasa, Kayano, reared from group HH050710B of 5 gregarious larvae on *Sorbus alnifolia*, 10. VII. 2005, cocoon 26. VII, em. 16. VIII. 2005, H. Hara; 2 ♀, same locality, reared from group HH050710D of 4 gregarious larvae on *Sorbus alnifolia*, 10. VII. 2005, cocoon 28. VII, em. 18. VIII. 2005, H. Hara; 2 ♀, same locality, reared from group HH050717C of 2 gregarious larvae on *Sorbus alnifolia*, 17. VII. 2005, cocoon 26. VII, em. 14. VIII. 2005, H. Hara; 1 ♀, Sorachi, Kurisawa, Manji, 10–26. VI. 2003, H. Hara; 2 ♀ 3 ♂, same locality, reared from group HH040711D of 6 gregarious larvae on *Sorbus alnifolia*, 3. VII. 2004, cocoon 21–28. VII, em. 13–17. VIII. 2004, H. Hara; 1 ♀, Ishikari, Tobetsu, Nakagoya, 14. VI. 1998, H. Hara; 1 ♀, Ishikari, Sapporo, Mt. Moiwayama, 7. VIII. 1981, Y., T. & H. Suda (HSC); 2 ♀, Ishikari, Sapporo, Makomanai, 19. VI. 1932, H. Sugiura; 1 ♀, Ishikari, Chitose, 7. VIII. 2000, H. Hara; 1 ♀ 1 ♂ (in copula), Ihuri, Noboribetsu, Karurusu-onsen, 3. VIII. 1966; 1 ♀, same data. Honshu: Aomori Pref.: 1 ♀, Shingo, Mt. Heraidake, 9. VIII. 1987, M. Yamada (MYC); 1 ♀, Towada, Oirase, 18. VI. 1977, Shimoyama; 1 ♀, Towada, Tsuta, 24. VIII. 1986, M. Yamada (MYC). Iwate Pref.: 1 ♀, “Matsukusa”, 19. VIII. 1931, K. Sato; 1 ♀, Morioka, 12. VIII. 1925, Hasegawa [probably cited by Takeuchi, 1932] (OPU); 1 ♀, Miyako, Omoe, 8. VII. 1967, T. Nakane. Tochigi Pref.: 1 ♀, Nikko, Sannai, Takio-jinja, 30. VIII. 1977, T. Saito (TSC); 1 ♀, Nasu, “Shizen-no-ie”, 18. VIII. 2005, K. Nakamura (KNC); 1 ♀, Bato, 26. V. 2004, S. Ibuki; 1 ♀, Shiobara, “Motoyu”, 2. VIII. 1981, K. Nakamura (KNC); 1 ♀, Kuriyama, Kawamata, 8. VII. 2001, M. Sugai (TMC) [cited by Nakamura, 2003, as ♂ of *Arge jonasi*; cited by Murakami, 2004, as *Arge jonasi*]; 1 ♀, Nikko, Yumoto, 27. VII. 1993, A. Shinohara. Saitama Pref.: 1 ♀,

Chichibu, 16. VI. 1921. Kanagawa Pref.: 1 ♀, “Mt. Koubouzan”, 20. V. 1984, H. Matsuura. Niigata Pref.: 1 ♀, “Takanosu”, 28. VIII. 1963, T. Okada. Ishikawa Pref.: 2 ♂, Mt. Hakusan, reared from larvae on *Sorbus alnifolia*, 9. VIII, cocoon 23. VIII, em. 13. IX. 1976, I. Togashi; 1 ♂, “Mt. Hakusan, em. 11. V, *Sorbus alnifolia*”; 1 ♀, same locality, 11. VII. 2000, I. Togashi. Yamanashi Pref.: 1 ♀, Oizumi, Yatsugatake Mts., Utsukushinomori, 24. VIII. 1978, Y. T. & H. Suda (HSC); 1 ♀, Kawaguchiko, Mt. Tenjoyama, 18. VIII. 1980, Y. T. & H. Suda (HSC). Nagano Pref.: 1 ♀, Takayama, Shichimi-onsen, 8. VIII. 1986, A. Shinohara; 1 ♀, Nojiriko, 26. VII. 1954, H. Nagase (HNC); 1 ♀, Mt. Kurohimeyama, 24. VII. 1954, H. Nagase (HNC); 1 ♀, Mt. Shiroumadake, 27. VII. 1937, Takeuchi (OPU); 1 ♀, Kamikochi, 10. VII. 1918, K. Sato; 2 ♀, Yatsugatake Mts., Minoto, 29. VII–3. VIII. 1986, A. Shinohara; 1 ♀, Yatsugatake Mts., Karasawa-kosen, 26–27. VII. 2001, A. Shinohara; 1 ♀, Kawakami, Senjyogahara, 22. VIII. 1978, Y. T., & H. Suda (HSC). Mie Pref.: 1 ♀, “Hirakura”, 6. VI. 1965, A. Nakanishi (KU). Kyoto Pref.: 1 ♀, Kyoto, Hanase, 25. VII. 1951, Takeuchi (OPU); 1 ♀, Kyoto, “Okukifune”, 6. IX. 1936, T. Kimura (KU); 1 ♀, Kyoto, “Seryo”, 6. VIII. 1980, M. Tomokuni. Osaka Pref.: 1 ♀, Kawachinagano, Mt. Iwawakisan, 10. VII. 1913, T. Isshiki (HU); 1 ♀, Kaizuka, Mt. Izumikatsuragisan, 23. VIII. 2003, R. Matsumoto (OMNH). Hyogo Pref.: 1 ♀, Hataganaru, 19–23. VII. 1959, H. Inoue (KU); 1 ♀, same locality, 15. VII. 1999, T. Ikeda [cited by Naito *et al.*, 2004] (MNHAH); 1 ♀, same locality, 20. VI. 1992, H. Suzuki [cited by Naito *et al.*, 2004] (MNHAH); 1 ♀, Mt. Myokenzan, 26. VI. 1966, T. Okutani (KU); 1 ♀, Ooya, Yokoiki-keikoku, 30. VIII. 1992, H. Suzuki [cited by Naito *et al.*, 2004] (MNHAH); 1 ♀, “Seppiko”, 20. V. 1978, Morita (KU). Nara Pref.: 1 ♀, Nara, Mt. Kasugayama, 11. VI. 1989, H. Ohishi (OMNH). Shikoku: Ehime Pref.: 1 ♀, Omogo, 24. VII. 1947, M. Miyatake (EU); 1 ♀, Matsuyama, Komenono, 14. VII. 1979, M. Sakai [cited by Seiyama & Tachikawa, 1983] (EU). Locality unknown: 1 ♀, “Kamui, 16. VII.” (KU). RUSSIA–

Sakhalinskaja oblast’: 1 ♀, 1922, M. Yano; 1 ♀, Matsumura (OPU). KOREA–Kangwon-do: 1 ♀, Mt. Kumgangsan, 3. VIII. 1924, T. Kurisue; 1 ♀, Chongpyongsa, nr. Chunchon, 4. VI. 1987, A. Shinohara. CHINA–Jilin: 1 ♀, Mt. Changbaisan, 30–31. VII. 1948, J. Murayama (OPU).

Biology. Host plants: *Sorbus alnifolia* and *S. commixta* (Rosaceae).

This species has two or more generations a year, and pass winter within a cocoon. Eggs are laid along the margin of a leaf or two or more adjacent leaves in one or more rows. Two to six larvae are found on a leaf or two or more adjacent leaves. A clutch of the larvae is smaller than those of *S. prunivora* and *S. flavicostalis*. The larvae have been found mainly on *Sorbus alnifolia*, but Hara collected two larvae feeding on *S. commixta* at Shinrin-kouen, Sapporo, Hokkaido, on October 2, 2005; they made cocoons on October 10, and are still alive in the laboratory in Bibai as of April, 2006.

Remarks. This species, *S. affinis*, *S. prunivora* and *S. pumila* constitute the *S. fulvicornis* group. These four species are distinguished from each other only by the shape of the lancet and its serrulae in the female as shown in the foregoing key. This species is especially similar to *S. affinis*, but it is distinguished from the latter by the relatively broad and dorsally rounded lancet and the strongly convex serrulae (compare Fig. 9A with Fig. 9C). Although the differences are subtle, the lancets and serrulae of the nine bred females of *S. fulvicornis* show small variations and are easily separable from those of *S. affinis*. The serrulae, especially posterior ones, are often severely worn with their denticles lost. The severely worn serrulae are unreliable for the species recognition. Even in such cases, however, *S. fulvicornis* is separable from *S. pumila* in having a relatively broad and distinctly serrate lancet (compare Fig. 9A with Fig. 9D); *S. fulvicornis* is difficult to separate from *S. prunivora* by the shape of lancet.

We have been unable to separate the males of these species with certainty. At least the males of *S. fulvicornis* and *S. prunivora* are quite similar,

judging from the reared material or the males collected with the females when they are in copula. However, there are some differences among the males of this species group. The forewing basal to the stigma is yellowish (Fig. 1C, H), the antenna is 1.4–1.6 times as long as the head width, and the valviceps is posteriorly nearly truncate, posterodorsally widely rounded and anterodorsally not dented (Fig. 15A–D) in the correctly identified males of *S. fulvicornis* and *S. prunivora*, whereas the forewing is strongly brownish basal to stigma (Fig. 1O), the antenna is 1.7–1.8 times as long as the head width, and/or the valviceps is posteriorly slightly concave and posterodorsally narrowly rounded (Fig. 15E) or posteriorly rounded and anterodorsally dented (Fig. 15F) in some other specimens captured in the field. The latter specimens may be the males of *S. affinis* or *S. pumila*, but we need the males certainly associated with the females of *S. affinis* or *S. pumila* to confirm this view. We have examined a total of 103 male specimens of this species group from various localities in Japan, Sakhalin and Korea, but we leave them unidentified for the moment, except for those reared from larvae or collected with females in copula.

Among the four species, the immature stages are known for *S. fulvicornis* and *S. prunivora*. Their larvae are quite different from each other in coloration (compare Fig. 1D–F with Fig. 1I–K). Their host plants are also different.

Various authors have made reference to “*Arge fulvicornis*” in the previous literature. We have examined the specimens studied by Takeuchi (1932) (1 ♀, Sounkyo), Okutani (1973) (1 ♀ 1 ♂, Naebayama), Okutani (1982) (1 ♂, Asahimura), Takahashi & Shiraiishi (2000, 2003) (4 ♀, originally cited as ♂, Omogo-mura, in 2000 and 1 ♂, Mt. Takanawayama, in 2003) and Nagase (2004) (1 ♀, Tanzawa) and found that all of them belong to *Arge*, not *Spinarge*. The male from Nikko studied by Nakamura (2003), which we have examined, certainly belongs to the *S. fulvicornis* group, but it can not be identified with certainty. The identity of the species cited under “*Arge fulvicornis*” in other papers (e.g., Gussakovskij,

1935; Takeuchi, 1950; Okutani, 1954, 1956, 1972; Togashi, 1954, 1961, 1965, 1970, 1997, 1998; Miwa, 1958; Izaki, 1964; Kim, 1970, 1980; Kondo & Miyake, 1976; Murota & Kurokawa, 1985; Miyoshi, 1988; Kim *et al.*, 1994; Murase, 1995; Zhelochovtsev & Zinovjev, 1995; Haneda *et al.*, 1998) should be confirmed by examining their respective material.

Previous Japanese names of this species were “Tsunoki-unmon-churenji” (e.g., Abe & Togashi, 1989), “Tsunoki-churenji” (e.g., Miwa, 1958), “Tsunoki-unmon-habachi” (e.g., Togashi, 1965) and “Tsunoki-unmon-churenji-habachi” (e.g., Okutani, 1973). It is here renamed “Tsunoki-toge-churenji” to show its generic position.

Spinarge prunivora sp. nov.

[Japanese name: Sakura-toge-churenji]

(Figs. 1G–L, 3E–H, 5C–D, 6C–D, 7A–C, 7E, 7K, 8B–C, 9B, 11C–D, 13B, 14C, 15C–D)

Arge fulvicornis: Yoshida, 2002: 62.

Description (female and male). [Conditions of holotype (female) in brackets.] Length 8.7–11.4 [8.8] mm in female, 7.2–8.2 mm in male; forewing length 7.2–10.4 [7.2] mm in female, 5.9–6.9 mm in male.

Black (Fig. 1G–H, L), except for following parts: Ocelli red; flagellum orange; apical part of mandible widely red; maxillary and labial palpi dark brown, somewhat pale at apical segment of maxillary palpus; female legs mostly yellow to brown from apex of femur to basal part of tarsus of fore leg and apices of mid and hind femora, yellowish white to brown at basal 1/3–3/4 of mid tibia [yellowish white], and yellowish white at basal 1/2–3/4 of hind tibia; in male, hind tarsus basally pale; tibial spurs dark brown; in female, subanal plate brown to dark brown; female wings mostly hyaline, very faintly brownish apically (Fig. 1G), rarely predominantly brownish (Fig. 1L) [mostly hyaline]; male wings slightly brownish, becoming pale apically, with forewing yellowish basal to level of stigma (Fig. 1H); dark transverse band below stigma reaching posterior wing margin; cell A of forewing brownish; veins

mostly dark, with vein C yellowish white, usually darkened along anterior margin except for apical part [darkened], and with vein Sc and apical part of basal section and apical section of vein R1 yellowish white to yellow; stigma mostly dark brown. Reflection mainly weak blue-green, usually weak violet on basal four to five abdominal terga. Setae on body whitish, dorsally brownish, sometimes mostly whitish [mostly whitish]; setae on wings blackish, but those on membrane in basal halves of wings mostly whitish.

Head in dorsal view slightly or barely narrowing behind eyes. Distance between eyes 1.0–1.1 [1.0]× vertical diameter of eye in female, 0.9–1.0× in male; eye with vertical diameter 1.6–1.8 [1.7]× horizontal diameter in female, 1.6× in male. Distances between eye and hind ocellus, hind ocelli, hind ocellus and posterior margin of head as 1.2–1.6:1.0:1.1–1.4 [1.3:1.0:1.1]. Frontal area (Fig. 3E, G) with shallow and wide depression before front ocellus, anteromedially not or slightly concave [not concave]. Interantennal carinae dorsally fused with or very narrowly separated from each other [fused], ventrally fused with each other and confluent with median carina of supraclypeal area at center of supraclypeal area (Fig. 3F, H). Supraclypeal area with median ridge carinate, and slope from median ridge flat or slightly rounded and faintly rugulose. Malar space 0.8–1.0 [0.8]× width of front ocellus. Antennal length 1.2–1.3 [1.2]× maximum width of head in female, 1.4–1.5× in male; female flagellum (Fig. 5C–D) slightly compressed, curved basally, and nearly pointed apically; male flagellum (Fig. 6C–D) weakly compressed, curved basally. Mesoscutellum in lateral view with dorsal margin roundly convex, roundly curved below near apex. Hind tibia with preapical spur; length of anterior apical spur of hind tibia 1.3–1.4 [1.4]× apical height of hind tibia. In forewing, cell 1Rs2 with anterior length 1.0–1.2 [1.2]× posterior length, crossvein 3r–m arched. Sawsheath (Fig. 8B–C) in posterodorsal view short and robust, with apex nearly rounded, in lateral view with ventral margin, except basal convexity, weakly roundly convex and apex

rounded. Lancet as in Fig. 9B, relatively broad, with dorsal margin slightly roundly convex; serulae (Fig. 11C–D) convex roundly, with posterior slope longer than anterior slope. In male abdomen, median process of fifth tergum not reaching sixth tergum posteriorly (Fig. 7E); subgenital plate as in Fig. 13B; genitalia as in Figs. 14C and 15C–D.

Larva. Final instar larva 20 mm long. Yellow or pale yellow green (Fig. 11I–K), covered with dark spots at final instar; lateral lobes black. Head black. Legs pale.

Distribution. Japan (Hokkaido and Honshu); Korea.

Material examined. Holotype: ♀ labeled “Part, HH040731A, 20 gregarious larvae on *Prunus sargentii*, col. 2004/7/31, cocoon. 8/8–13.” and “Japan, Hokkaido, Sapporo, Nopporo, Shinrin-kouen, em. 2004/8/24–9/2, H. Hara.”

Paratypes: JAPAN–Hokkaido: 1 ♀, Daise-tsuzan Mts., 4–10. VIII. 1926, Uchida & Kono (HU); 4 ♀ 2 ♂, same data as holotype; 3 ♂, same data as holotype, but em. 10–20. IX. 2004; 1 ♀ 1 ♂ (in copula), same locality as holotype, on *Prunus sargentii*, 21. VIII. 2004, H. Hara; 6 ♀, Ebetsu, Nishinopporo, reared from group HH050910A of 12 gregarious larvae on *Prunus sargentii*, 10. IX. 2005, cocoon 12–13. IX, em. 14–18. V. 2006, H. Hara; 1 ♀, Iburi, Noboribetsu, Karurusu-onsen, 3. VIII. 1966. Honshu: Fukushima Pref.: 1 ♀, Mt. Bandaian, 4. VIII. 1927, Matsumura (HU). Chiba Pref.: 1 ♀, Ichinomiya, 25. VII. 1998, K. Kubo; 1 ♀, Nagara, Furusato, 10. VIII. 2004, H. Suda (HSC). Tokyo Met.: 1 ♀, Oume, Shinmachi, 29. V. 1992, H. Takahashi. Nagano Pref.: 1 ♀, Karuizawa, 28. VI. 1934, K. Sato; 1 ♀, Omachi, Aoki-ko, reared from larvae on *Prunus yedoensis*, 28. VIII. 2004, cocoon 29. VIII, em. VII. 2005, A. Shinohara. Hyogo Pref.: 1 ♀, Sasayama, 30. VI. 1953, T. Okutani (KU); 1 ♀, Kobe, Kita-ku, Yamada, 17. VII. 1999, H. Yoshida [cited by Yoshida, 2002] (OMNH). Locality unknown: 1 ♀, “Okuike, 29. VII. 1968”. KOREA–Kyonggi-do: 1 ♀, “Suigen [=Suwon]”, VI. 1926, K. Sato.

Biology. Host plants: *Prunus sargentii* and *P. yedoensis* (Rosaceae).

At Shinrin-kouen, Hokkaido, a group of 20 gregarious larvae (No. HH040731A) were collected in late July. They spun cocoons in early to middle August. The adults emerged in late August to middle September. At the same site, a copulating couple on a leaf of *P. sargentii* was collected in late August. The female laid 45 eggs along leaf margins of *P. sargentii* in rows in a cage. At Nishinoppo (near Shinrin-kouen), Hokkaido, 12 larvae (HH050910A) gregariously feeding on the leaves of *P. sargentii* were collected in middle September. They immediately made cocoons and passed winter. In May of the following year, six female adults emerged in the laboratory. This species most probably has two or more generations a year.

Remarks. This species is very similar to *S. affinis*, *S. fulvicornis* and *S. pumila*, but is separated from them by the roundly convex serrulae in the female (compare Fig. 11C–D with Fig. 11A–B, E–H). For further information, see under the remarks of *S. fulvicornis*.

***Spinarge affinis* sp. nov.**

[Japanese name: Hoso-toge-churenji]

(Figs. 1M, 3I–J, 5E–F, 8D, 9C, 11E–F)

Arge fulvicornis: Takeuchi, 1932: 37 [partim]; Naito *et al.*, 2004: 11 [partim].

Description (female). [Conditions of holotype in brackets.] Length 8.7–11.3 [10.8] mm; forewing length 8.0–11.2 [10.3] mm.

Black (Fig. 1M), except for following parts: Ocelli red; flagellum orange; apical part of mandible widely red; maxillary and labial palpi brown to dark brown; legs mostly brown from apex of femur to basal part of tarsus of fore leg and apices of mid and hind femora, yellowish white to dark brown at basal part of mid tibia [brown], yellowish white at basal 1/2–2/3 of hind tibia; tibial spurs dark brown; subanal plate dark brown; wings mostly hyaline, faintly brownish apically (Fig. 1M); dark transverse band below stigma reaching posterior wing margin; cell A of

forewing widely brownish; veins mostly dark, with vein C yellowish white to yellow, darkened along anterior margin except for apical part, and with vein Sc and apical part of basal section and apical section of vein R1 yellowish white to yellow; stigma mostly dark brown. Reflection mainly weak blue-green, faint violet on basal four abdominal terga. Setae on body whitish, dorsally partly or mainly brownish; setae on wings blackish, but those on membrane in basal halves of wings mostly whitish.

Head in dorsal view barely or slightly narrowing behind eyes. Distance between eyes 1.0–1.1 [1.1] × vertical diameter of eye; eye with vertical diameter 1.7–1.8 [1.7] × horizontal diameter. Distances between eye and hind ocellus, hind ocelli, hind ocellus and posterior margin of head as 1.3–1.5 : 1.0 : 1.0–1.3 [1.4 : 1.0 : 1.0]. Frontal area (Fig. 3I) with shallow and wide depression before front ocellus, anteromedially not or slightly concave [slightly concave]. Interantennal carinae dorsally fused with or very narrowly separated from each other [fused], ventrally fused with each other and confluent with median carina of supraclypeal area at center of supraclypeal area (Fig. 3J). Supraclypeal area with median ridge carinate, and slope from median ridge nearly flat and faintly rugulose. Malar space 0.8–1.0 [0.9] × width of front ocellus. Antennal length 1.1–1.5 [1.3] × maximum width of head; flagellum (Fig. 5E–F) slightly compressed, curved basally, and nearly pointed apically. Mesoscutellum in lateral view with dorsal margin weakly roundly convex, roundly curved below near apex. Hind tibia with preapical spur; length of anterior apical spur of hind tibia 1.3–1.5 [1.5] × apical height of hind tibia. In forewing, cell 1Rs2 with anterior length 1.0–1.2 [1.1] × posterior length, crossvein 3r–m arched. Sawsheath (Fig. 8D) in posterodorsal view short and robust, with apex nearly rounded, in lateral view with ventral margin, except basal convexity, slightly roundly convex and apex rounded. Lancet as in Fig. 9C, relatively narrow, with dorsal margin straight; serrulae (Fig. 11E–F) weakly convex angularly, with posterior slope longer than anterior slope.

Distribution. Japan (Hokkaido, Honshu and Kyushu).

Material examined. Holotype: ♀ labeled “[JAPAN: Kyushu], Mt. Kura-dake ca. 1000 m, Kumamoto Pref., 17. V. 1997, A. Shinohara.”

Paratypes: JAPAN–Hokkaido: 1 ♀, Ishikari, Jyozankei, 9. VIII. 1952, K. Tsuneki (OPU). Honshu: Aomori Pref.: 1 ♀, Towada, 30. VII. 1958 (MNHAH); 1 ♀, Shingo, Mt. Heraidake, 18. VII. 1987, M. Yamada (MYC); 1 ♀, same locality, 9. VIII. 1987, M. Yamada (MYC); 1 ♀, “Okawara”, 10. VII. 1963, M. Yamada (MYC). Akita Pref.: 1 ♀, Tazawako, Nyuto-onsen, 3. VIII. 1974, Y. T. & H. Suda (HSC). Miyagi Pref.: 2 ♀, Mt. Zaousan, Sainogawara, 23. VII. 1976, K. Akiyama; 1 ♀, Mt. Zaousan, Kamoshika-onsen, 24. VII. 1976, A. Shinohara. Tokyo Met.: 1 ♀, Okutama, “Nippara-hontani”, 17. VIII. 1985, H. Takahashi. Niigata Pref.: 1 ♀, Shibata, Mt. Yakiminesan, 24. VII. 1992, H. Itami; 1 ♀, Itoigawa, Renge-onsen, 24. VII. 1984, A. Shinohara. Fukui Pref.: 1 ♀, Koike, 26. VII. 1973, K. Tsuneki. Yamanashi Pref.: 1 ♀, Mitomi, Nishizawa-keikoku, 23. VII. 1974, Y. T. & H. Suda (HSC); 1 ♀, Sutama, Tokusa-toge, 18. VII. 1968, H. Suda (HSC); 1 ♀, Yatsugatake Mts., Utsukushinomori, 7. VIII. 1986, A. Shinohara; 1 ♀, Sasago-toge, 14. VI. 1931, Takeuchi (OPU); 1 ♀, Mt. Mitsutogeyama, 1. VIII. 1981, Y. Kurosawa; 2 ♀, same locality, 8. VIII. 1990, H. Suda (HSC); 1 ♀, same locality, 20. VII. 2001, H. Takahashi; 1 ♀, Kawaguchiko, 8. VIII. 1990, H. Suda (HSC). Nagano Pref.: 1 ♀, Mt. Ougatou, 2. VIII. 1965, A. Endo; 2 ♀, Mt. Kirigamine, 6. VIII. 1965, R. Inomata (MNHAH). Kyoto Pref.: 1 ♀, Kyoto, 24. VI. 1938, Takeuchi (OPU); 1 ♀, Kyoto, Hanase, 7. VIII. 2003, R. Matsumoto (OMNH). Hyogo Pref.: 2 ♀, Mt. Dangamine, 5. VIII. 1961, R. Inomata (MNHAH); 1 ♀, Mt. Myokenzan, 26. VI. 1966, T. Okutani (KU); 1 ♀, Yumesaki, 4. VI. 1994, T. Morita [cited by Naito *et al.*, 2004] (MNHAH). Wakayama Pref.: 1 ♀, Mt. Koyasan, 24. VIII. 1931, Takeuchi [probably cited by Takeuchi, 1932] (OPU). Yamaguchi Pref.: 1 ♀, “Kichibe”, 19. V. 1953, J. Yoshioka. Locality unknown: 1 ♀, “Tamagawa”, 18. VI. 1951, Takeuchi

(OPU).

Biology. Unknown.

Remarks. This species, *S. fulvicornis*, *S. prunivora* and *S. pumila* constitute the *S. fulvicornis* group, and are separated from each other only by the female lancet and serrulae as shown in the foregoing key. For more discussion, see under the remarks of *S. fulvicornis*.

***Spinarge pumila* sp. nov.**

[Japanese name: Hime-toge-churenji]

(Figs. 1N, 3K–L, 5G–H, 8E, 9D, 11G–H)

Arge fulvicornis: Takeuchi, 1932: 37 [partim]; Naito *et al.*, 2004: 11 [partim].

Description (female). [Conditions of holotype in brackets.] Length 7.2–9.7 [8.2] mm; forewing length 7.2–9.4 [7.8] mm.

Black (Fig. 1N), except for following parts: Ocelli red; flagellum orange; apical part of mandible widely red; maxillary and labial palpi dark brown, slightly pale at apical one or two segments of maxillary palpus; legs mostly brown from apex of femur to basal part of tarsus of fore leg, apices of mid and hind femora and at basal 1/2–3/4 of mid tibia, and yellowish white at basal 1/2–2/3 of hind tibia (basal 2/3 of mid tibia rarely yellowish white [brown]); tibial spurs dark brown; subanal plate dark brown; wings mostly hyaline, faintly brownish apically (Fig. 1N), rarely predominantly slightly brownish [mostly hyaline]; dark transverse band below stigma reaching posterior wing margin; cell A of forewing widely brownish; veins mostly dark, with vein C yellowish white to yellow, darkened along anterior margin except for apical part, vein Sc yellowish white to yellow, and apical half of basal section and apical section of vein R1 more or less pale; stigma mostly dark brown. Reflection mainly weak blue-green, faint violet on basal four or five abdominal terga. Setae on body whitish, dorsally partly or mainly brownish; setae on wings blackish, but those on membrane in basal halves of wings mostly whitish.

Head in dorsal view slightly narrowing behind eyes. Distance between eyes 1.0–1.1 [1.1] × ver-

tical diameter of eye; eye with vertical diameter 1.6–1.7 [1.7] × horizontal diameter. Distances between eye and hind ocellus, hind ocelli, hind ocellus and posterior margin of head as 1.2–1.6 : 1.0 : 1.0–1.4 [1.6 : 1.0 : 1.0]. Frontal area (Fig. 3K) with shallow and wide depression before front ocellus, anteromedially slightly concave or not concave [concave]. Interantennal carinae dorsally fused with or very narrowly separated from each other [narrowly separated], ventrally fused with each other and confluent with median carina of supraclypeal area at center of supraclypeal area (Fig. 3L). Supraclypeal area with median ridge carinate, and slope from median ridge flat or slightly rounded and faintly rugulose. Malar space 0.5–0.9 [0.9] × width of front ocellus. Antennal length 1.2–1.5 [1.4] × maximum width of head; flagellum (Fig. 5G–H) slightly compressed, curved basally, and nearly pointed apically. Mesoscutellum in lateral view with dorsal margin roundly convex, roundly curved below near apex. Hind tibia with preapical spur; length of anterior apical spur of hind tibia 1.3–1.6 [1.3] × apical height of hind tibia. In forewing, cell 1Rs2 with anterior length 1.1–1.3 [1.2] × posterior length, crossvein 3r–m arched, rarely straight [arched]. Sawsheath (Fig. 8E) in posterodorsal view short and robust, with apex nearly rounded, in lateral view with ventral margin, except basal convexity, slightly roundly convex and apex rounded. Lancet as in Fig. 9D, narrow, with dorsal margin slightly convex; serrulae (Fig. 11G–H) not convex.

Distribution. Japan (Honshu).

Material examined. Holotype: ♀ labeled “Nyutoh spa, Tazawako Town, Senboku, Akita, 3. VIII. 1974, Y., T. & H. Suda.”

Paratypes: Honshu: Aomori Pref.: 1 ♀, Shingo, Mt. Heraidake, 9. VIII. 1987, M. Yamada (MYC). Iwate Pref.: 1 ♀, Mt. Hayatinesan, 4. VIII. 1964, S. Takagi (HU). Tochigi Pref.: 1 ♀, Mt. Shakagatake, 20. VII. 1970, T. Saito (TSC); 1 ♀, Nasu, Nasu-kogen, 22. VII. 1976, Y., T. & H. Suda (HSC). Gunma Pref.: 2 ♀, “Houshi”, 3–6. VIII. 1953, J. Yoshioka. Nagano Pref.: 1 ♀, No-jiriko, 26. VII. 1954, H. Nagase (HNC); 1 ♀, Mt.

Asamayama, 27–28. VII. 1972, M. Kuboki; 1 ♀, Hotaka, Nakabusa-onsen, 4. VIII. 1967, A. Shinohara; 1 ♀, Kamikochi, 30. VII. 1990, A. Shinohara. Gifu Pref.: 1 ♀, Gifu, 15. VII. 1918, Takeuchi (OPU). Ishikawa Pref.: 1 ♀, Mt. Haksan, 23. VI. 1996, I. Togashi. Shiga Pref.: 1 ♀, “Mt. Hira”, 19. V. 1918, Takeuchi [probably cited by Takeuchi, 1932] (HU); 3 ♀, “Mt. Hira”, VI. 1929, C. Teranishi; 1 ♀, “Mt. Buna”, 3. VII. 1939, Takeuchi (OPU). Kyoto Pref.: 1 ♀, Kyoto, 25. VIII. 1957, Takeuchi (OPU); 1 ♀, Kyoto, Kibune, 27. VIII. 1939, Takeuchi (OPU); 1 ♀, Kyoto, Daigo, 11. VI. 1956, Takeuchi (OPU). Hyogo Pref.: 1 ♀, “Tajima, Kiritaki”, 6. VIII. 1970, T. Okutani (KU); 1 ♀, Sasayama, Mt. Koganedake, 8. VI. 1997, T. Morita [cited by Naito *et al.*, 2004] (MNHAH).

Biology. Unknown.

Remarks. This species belongs to the *S. fulvicornis* group, and is separated from the other members of the group by the narrow and non-serrate lancet in the female. For further information, see under the remarks of *S. fulvicornis*.

***Spinarge metallica* (Klug, 1834), comb. nov.**

(Figs. 2A–B, 4A–E, 5I–J, 6E–F, 7F, 8F, 10A, 12A–B, 13C, 14D–E, 15G)

Hylotoma metallica Klug, 1834: 232.

Arge metallica: Konow, 1905: 19; Konow, 1905–1908: 187; Enslin, 1917: 599; Takeuchi, 1932: 36; Guskovskij, 1935: 283, 408; Conde, 1937: 110; Saarienen, 1946: 60; Benson, 1951: 34; Lorenz & Klaus, 1957: 248; Kim, 1963: 279; Kim *et al.*, 1994: 218; Zhelochovtsev, 1988: 36; Zhelochovtsev & Zinovjev, 1995: 400.

Description (female and male). Length 9.1–11.5 mm in female, 7.2–8.7 mm in male; forewing length 8.7–10.5 mm in female, 7.2–8.3 mm in male.

Black (Fig. 2A–B), except for following parts: Ocelli red; flagellum orange; apical part of mandible widely red; maxillary and labial palpi dark brown, yellow to orange at apical three segments of maxillary palpus; legs yellow to orange from apices of femora to tarsi, yellowish white at basal parts of tibiae; female wings yellowish,

with cells C and Sc yellow and dark transverse band below stigma extending to posterior margin of forewing; male wings as in female, but slightly brownish, with cells C and Sc yellowish and mark below stigma weakened beyond vein M posteriorly; veins predominantly dark, yellow at veins C and Sc, brown at apical part of basal section and apical section of vein R1 and vein A; stigma mostly dark brown to black; in female, subanal plate dark brown. Reflection mainly bronzy. Setae mainly whitish; setae on basal parts of wings, including those on veins, yellowish, sometimes brownish in male; setae on apical parts of wings blackish.

Head in dorsal view slightly dilated behind eyes, sometimes not in male. Distance between eyes 1.2–1.3× vertical diameter of eye in female, 1.2× in male; eye with vertical diameter 1.7–1.8× horizontal diameter in female, 1.6× in male. Distances between eye and hind ocellus, hind ocelli, hind ocellus and posterior margin of head as 1.2–1.4 : 1.0 : 0.8–1.1. Frontal area (Fig. 4A, D) with shallow depression before front ocellus, anterolaterally raised. Interantennal carinae dorsally separated from each other, ventrally disappearing above center of supraclypeal area in female (Fig. 4B), fused with each other in male (Fig. 4E). Supraclypeal area with median ridge dull or faintly carinate, and slope from median ridge rounded and rugulose. Malar space 0.8–1.4× width of front ocellus. Antennal length 1.4–1.5× maximum width of head in female, 1.9–2.0× in male; female flagellum (Fig. 5I–J) club-like, not or very slightly compressed, weakly curved basally, rounded apically; male flagellum (Fig. 6E–F) slightly compressed, slightly curved throughout or basally in lateral view. Mesoscutellum in lateral view with dorsal margin roundly convex or flat, roundly or angularly curved below near apex. Hind tibia with preapical spur; length of anterior apical spur of hind tibia 1.0–1.3× apical height of hind tibia. In forewing, cell 1Rs2 with anterior length 1.0–1.3× posterior length, crossvein 3r–m arched. Sawsheath as in Fig. 8F. Lancet as in Fig. 10A; serrulae (Fig. 12A–B) convex angularly,

with posterior slope much longer than anterior slope. In male abdomen, median process of fifth tergum not reaching sixth tergum posteriorly (Fig. 7F); subgenital plate as in Fig. 13C; genitalia as in Figs. 14D–E and 15G.

Distribution. Europe to Kamchatka and Primorskij kraj (Gussakovskij, 1935), Mongolia (Zhelochovtsev, 1988), Sakhalin (Takeuchi, 1932) and Korea (Kim, 1963).

Material examined. THE NETHERLANDS – 1 ♀, “Museum Leiden, Dr. A. M. Speijer”, “De Schaffelaar”, “Berneveld, 15–v–1943” (RMNHL); 1 ♀, “Meatferland 30/5 1968, B. v. Aartsen” (RMNHL). GERMANY – 1 ♀, “Döläuer Heude, Halle a. S. 6.6” (ZSSM); 1 ♂, “Thuring”, “Arge metallica Kl. ♂, Dr. Enslin det.” (ZSSM). POLAND – 1 ♀, “26. 6. 18”, “enwoynik”, “Russland, Bialowies [=Bialowieza], Bischoff S”. RUSSIA – Kamchatskaja oblast’: 1 ♀, “r. Khapichka prit. Kamchat. i Kamaki, A. Derzhavin, 23. VI. 09” (ZSSM). Khabarovskij kraj: 6 ♀ 3 ♂, Sosninskij River, 5 km SW of Bychikha, 14–15. VI. 1994, A, Shinohara. Sakhalinskaja oblast’: 1 ♀, “Hoye”, 16. VII. 1933, Uchida, Okada & Sawamoto (OPU); 1 ♀, “Ichinosawa, 20. VII. 1924, Takeuchi”, “metallica Klug” (OPU); 1 ♂, “Ichinosawa”, 25. VII. 1924, Uchida (OPU). KOREA – 1 ♀, “Chosen, Takano, Uchida, 23/2” (HU). Hamgyongbuk-do (Yanggang-do): 1 ♀, “23. VII. 1935, Tonai [=Soman], Takeuchi” (OPU). Kangwon-do: 1 ♂, Mt. Odaesan, Mirugam, 29. V. 1992, A. Shinohara. Kyongsangnam-do: 1 ♀, Mt. Jirisan, 28. V. 1987, A. Shinohara.

Biology. Host plant: *Betula verrucosa* (Betulaceae) (Lorenz & Kraus, 1957). For the information on the larva and biology, see also Conde (1937) and Saarinen (1946).

Remarks. This species is distinguished from the other members of the genus in having the entirely pale tibiae and tarsi and the bronzy reflection.

Takeuchi (1939) first recorded “*Arge metallica*” from Korea, but his material, which we have examined, belongs to an *Arge* species. Okutani (1955, 1974), Togashi (1997, 2002),

Nakamura (2003), Murakami (2004), and Naito *et al.* (2004) recorded "*Arge metallica*" from Japan. We have studied the specimens which were actually used in those works and found that all these records were based on misidentification. All the specimens in reality belong to *Arge*. For the moment, there is no evidence for the occurrence of *S. metallica* in Japan.

Spinarge flavicostalis sp. nov.

[Japanese name: Maeki-toge-churenji]

(Figs. 2C–E, 4F–I, 5K–L, 6G–H, 7G–H, 8G–H, 10B, 12C–F, 13D, 14F–G, 15H)

Description (female and male). [Conditions of holotype (female) in brackets.] Length 9.2–11.4 [11.0] mm in female, 8.2–9.4 mm in male; forewing length 9.8–11.2 [11.2] mm in female, 7.4–8.0 mm in male.

Black (Fig. 2C–D), except for following parts: Ocelli red; flagellum orange, rarely dark brown [orange]; apical part of mandible widely red; maxillary and labial palpi dark brown, yellow at apical three segments of maxillary palpus; female legs yellow from apex of femur to tarsus of fore leg, but apices of fore tibia and tarsus more or less darkened, narrowly brown at apices of middle and hind femora, slightly pale or yellow at basal parts of middle and hind tarsi [slightly pale], and with middle and hind tibiae yellowish white and darkened at apical 1/3–1/4, but narrowly brown at apical extremities; male legs yellow from apical 1/3 of femur to tarsus of fore leg, from tibia to tarsus of middle leg and at hind tarsus throughout or except for its dorsum and apex, brown at apices of middle and hind femora, and with hind tibia yellowish white, darkened at apical 1/3 and narrowly brown at apex, or brown at apical 1/3 and darkened dorsoapically; tibial spurs yellow; wings predominantly hyaline, slightly yellowish on forewing basal to level of stigma in female, mostly yellowish in male; cells C and Sc yellow; veins predominantly darkened, yellow at veins C, Sc, R1, A and cu-a; stigma mostly dark brown to black; dark transverse band below stigma extending to posterior margin of

forewing; in female, subanal plate dark brown. Reflection mainly weak blue-green. Setae whitish, dorsally mainly brownish; setae on basal parts of wings, including those on veins, yellowish, but those on apical parts of wings blackish.

Head in dorsal view dilated behind eyes, sometimes not so in male. Distance between eyes 1.2–1.3 [1.2] × vertical diameter of eye in female, 1.1–1.2 × in male; eye with vertical diameter 1.7–1.8 [1.7] × horizontal diameter in female, 1.6–1.7 × in male. Distances between eye and hind ocellus, hind ocelli, hind ocellus and posterior margin of head as 1.2–1.5 : 1.0 : 0.9–1.3 [1.2 : 1.0 : 1.0]. Frontal area (Fig. 4F, H) with shallow depression before front ocellus, antero-laterally raised. Interantennal carinae dorsally widely separated from each other, ventrally much weakened and nearly fused with each other above center of supraclypeal area (Fig. 4G, I). Supraclypeal area with median ridge faintly carinate, and slope from median ridge strongly rounded and barely or faintly rugulose. Malar space 1.0–1.4 [1.4] × width of front ocellus. Antennal length 1.5–1.6 [1.5] × maximum width of head in female, 1.9–2.1 × in male; female flagellum (Fig. 5K–L) club-like, very slightly compressed, curved basally and often apically [not curved apically], rounded apically; male flagellum (Fig. 6G–H) slightly compressed, slightly curved throughout or only basally in lateral view. Mesoscutellum in lateral view with dorsal margin slightly roundly convex or nearly flat [slightly convex], roundly curved below near apex. Hind tibia with preapical spur; length of anterior apical spur of hind tibia 0.9–1.3 [1.2] × apical height of hind tibia. In forewing, cell 1Rs2 with anterior length 0.8–1.2 [0.9] × posterior length, crossvein 3r–m arched. Sawsheath as in Fig. 8G–H. Lancet as in Fig. 10B; serrulae (Fig. 12C–F) convex angularly, with posterior slope much longer than anterior slope. In male abdomen, median process of fifth tergum not reaching sixth tergum posteriorly (Fig. 7G–H); subgenital plate as in Fig. 13D; genitalia as in Figs. 14F–G and 15H.

Larva. Middle instar larva (Fig. 2E) yellow, with head and legs black and suranal plate

brownish; lateral lobe strikingly yellow. Final instar larva entirely pale, including head and legs (only exuviae in cocoons examined).

Distribution. Japan (Hokkaido and Honshu).

Material examined. Holotype: ♀ “[JAPAN: Hokkaido], Nakayama-toge, 42 50N 141 05E, 770 m, Shiribeshi, 30. VI. 2005, A. Shinohara”.

Paratypes: JAPAN–Hokkaido: 1 ♀, Tokachi, Kamishihoro, Nukabira, 14. VII. 1959, K. Kami-jo (HU); 1 ♂, Tokachi, Shikaoi, Yamada-onsen, 9–11. VII. 1996, A. Shinohara; 2 ♀, Tokachi, Shintoku, reared from group of 12 larvae (HR920713E) on *Betula ermanii*, 13. VII. 1992, matured 25. VII. 1992, em. 5. VIII. 1993, H. Hara; 4 ♂, Kamikawa, Higashikawa, Asahidake-onsen, 14. VII. 1998, A. Shinohara & H. Hara; 1 ♀, same locality, 29–30. VI. 2000, A. Shinohara; 1 ♀, Kamikawa, Mt. Tokachidake, 1. VIII. 1939, T. Sawamoto (HU); 1 ♀, Sorachi, Bibai, Koshunai, 17–29. VI. 2005, H. Hara; 1 ♂, Sorachi, Yubari, foot of Mt. Yubaridake, 18. VI. 1996, A. Shinohara; 1 ♀, Shiribeshi, Nakayama-toge, 8. VII. 1996, A. Shinohara. Honshu: Aomori Pref.: 1 ♀, Hirosaki, Mt. Kudojizan, 9. VII. 1989, M. Yamada (MYC); 1 ♀, Nurukawa, 24. VII. 1986, T. Niisato; 1 ♀, Towadako, Sukayu, 2. VIII. 1987, M. Yamada (MYC). Tochigi Pref.: 1 ♂, Kuriyama, Mt. Tashiroyama, 5. VIII. 1993, K. Mizuno. Nagano Pref.: 1 ♀ 1 ♂, Kamikochi, 10. VII. 1918, K. Sato; 1 ♀, same locality, 10. VII. 1922, S. Sato (OPU); 1 ♀ 1 ♂, same locality, 18–20, 22. VII. 1989, A. Shinohara. Locality unknown: 1 ♀, “Yoshi–Maru[?]”, 30. VI. 1930 (OPU).

Biology. Host plant: *Betula ermanii* (Betulaceae).

A group of 12 gregarious middle instar larvae were collected in middle July at Shintoku, Hokkaido. They spun cocoons in late July, and two females emerged in the following summer. This species probably has one generation a year.

Remarks. This species is very similar to *S. metallica* and distinguishable from it only by the coloration, as shown in the foregoing key.

In general coloration, *S. flavicostalis* is similar to the members of the *S. fulvicornis* group, but it

is easily distinguished from the latter by the vein C yellow with yellow hairs (white to yellow, but usually darkened along anterior margin, with dark hairs), the cells C and Sc strongly tinged with yellow in the female (hyaline in the latter), and the subgenital plate tapering apically in the male (gently rounded apically in the latter).

Spinarge nigricornis sp. nov.

[Japanese name: Kuro-toge-churenji]

(Figs. 2F–G, 4J–M, 5M–N, 6I–J, 7I, 8I–K, 10C, 12G–H, 13E, 14H–I, 15I)

Description (female and male). [Conditions of holotype (female) in brackets.] Length 9.0–11.2 [9.5] mm in female, 7.5–9.0 mm in male; forewing length 9.1–11.4 [9.7] mm in female, 7.2–7.9 mm in male.

Black (Fig. 2F–G), except for following parts: Ocelli red; apical part of mandible widely red; maxillary and labial palpi dark brown, with apical segment of maxillary palpus somewhat pale; tibial spurs dark brown; in female, forewing predominantly hyaline, basally slightly brownish, with cells C and Sc dark brown, cell A dark brown, and mark below stigma dark brown, much narrowing beyond vein M posteriorly, and hind wing mostly hyaline; male wings brownish, becoming pale apically, with cells C and Sc dark brown, and mark below stigma weak and extending to vein M posteriorly; stigma dark brown, with apex narrowly slightly pale; veins of wings brown to black; in female, subanal plate dark brown. Reflection mainly blue, purplish blue on basal four to five abdominal terga. Setae whitish, dorsally brownish; setae on wings blackish.

Head in dorsal view dilated behind eyes in female, barely or slightly narrowing behind eyes in male. Distance between eyes 1.1–1.3 [1.2] × vertical diameter of eye in female, 1.1 × in male; eye with vertical diameter 1.6–1.8 [1.6] × horizontal diameter in female, 1.5–1.6 × in male. Distances between eye and hind ocellus, hind ocelli, hind ocellus and posterior margin of head as 1.4–1.8 : 1.0 : 1.0–1.5 [1.8 : 1.0 : 1.5]. Frontal area (Fig. 4J, L) with narrow median furrow weakened posteri-

only, raised anterolaterally. Interantennal carinae dorsally widely separated from each other, ventrally more or less weakened and fused with each other above center of supraclypeal area or not [not fused] (Fig. 4K, M). Supraclypeal area with median ridge dull or faintly carinate [dull] in female, weakly carinate in male, and slope from median ridge rounded and not rugulose. Malar space $0.7\text{--}1.0$ [0.9] \times width of front ocellus. Antennal length $1.3\text{--}1.4$ [1.4] \times maximum width of head in female, $1.8\text{--}1.9$ \times in male; female flagellum (Fig. 5M–N) club-like, very slightly compressed, rounded apically; male flagellum (Fig. 6I–J) slightly compressed, very slightly curved throughout in lateral view. Mesoscutellum in lateral view with dorsal margin slightly roundly convex or nearly flat [slightly convex], almost angularly curved below near apex. Hind tibia with preapical spur; length of anterior apical spur of hind tibia $0.9\text{--}1.3$ [1.0] \times apical height of hind tibia. In forewing, cell 1Rs2 with anterior length $0.9\text{--}1.1$ [1.1] \times posterior length, crossvein 3r–m strongly arched. Sawsheath (Fig. 8I–K) in posterodorsal view with apex nearly rounded or angular [rounded], in lateral view with ventral margin, except basal convexity, roundly convex and apex rounded. Lancet as in Fig. 10C; serrulae (Fig. 12G–H) strongly convex, with posterior slope slightly shorter or slightly longer than anterior slope [shorter]. In male abdomen, median process of fifth tergum extending beyond sixth tergum posteriorly (Fig. 7I); subgenital plate as in Fig. 13E; genitalia as in Figs. 14H–I and 15I.

Distribution. Japan (Hokkaido and Honshu).

Material examined. Holotype: ♀, “[JAPAN: Hokkaido], Sounkyo 650 m, Mts. Daisetsuzan, Kamikawa, 12. VII. 1998, T. Shinohara”.

Paratypes: JAPAN–Hokkaido: 1 ♀, Tokachi, Nukabira, 18. VI. 1998, A. Shinohara; 1 ♂, Sorachi, Kurisawa, Mt. Sankakuyama, 19. VII. 1999, H. Hara; 2 ♀, Ishikari, Chitose, Shikotsuko, 25. VI. 1991, K. Inomata (MNHAH). Honshu: Fukui Pref.: 1 ♀, Oono, Mt. Gankyojizan, 26. VIII. 1973, Y. Kurosawa. Nagano Pref.: 1 ♀, Kamikochi, 10–12. VIII. 1930, T. Shiraki (OPU); 1 ♀, same locality, 17. VII. 1989, A. Shinohara;

1 ♂, Kisofukushima, Kisokomakougen, 8. VIII. 1975, Y. T., & H. Suda.

Biology. Unknown.

Remarks. This species is distinguished from the other species of the genus by the combination of the entirely black antenna and legs, the dark brown cells C and Sc of the wings, the whitish setae on the mesopleuron, the dorsally separated interantennal carinae and the presence of a preapical spur on the hind tibia. The male genitalia of this species are similar to those of *S. chrysoptera*, *S. sichuanensis* and *S. liui* in having the broad harpe and the long posterodorsal lobe in the valviceps.

Spinarge chrysoptera (Gussakovskij, 1935),
comb. nov.

(Figs. 2H, 4N–Q, 5O–P, 6K–L, 7J, 8L–M, 10D,
12I–J, 13F, 14J–K, 15J)

Arge chrysoptera Gussakovskij, 1935: 266, 420.

Description (female and male). Length $9.4\text{--}10.4$ mm in female, 9.5 mm in male ($8\text{--}9$ mm in type series, Gussakovskij, 1935); forewing length $9.8\text{--}10.7$ mm in female, 9.1 mm in male.

Black (Fig. 2H), except for following parts: Ocelli red; apical part of mandible widely red; labial and maxillary palpi dark brown; tibial spurs dark brown; wings yellowish orange, apically becoming pale, narrowly darkened along apical margins or not; veins and stigma orange; in female, subanal plate dark brown. Reflection mainly weak blue, faint violet on basal five abdominal terga. Setae blackish or brownish, yellowish on wings.

Head slightly dilated behind eyes in dorsal view. Distance between eyes $1.4\text{--}1.6$ \times vertical diameter of eye in female, 1.5 \times in male; eye with vertical diameter $1.5\text{--}1.6$ \times horizontal diameter in female, 1.5 \times in male. Distances between eye and hind ocellus, hind ocelli, hind ocellus and posterior margin of head as $1.8\text{--}2.1:1.0:1.1\text{--}1.4$. Frontal area (Fig. 4N, P) short, nearly flat before front ocellus, anterolaterally raised. Interantennal carinae weak, dorsally separated from each other, ventrally converging and disap-

pearing above center of supraclypeal area (Fig. 4O, Q). Supraclypeal area with median ridge dull and slope from median ridge nearly flat and faintly rugulose. Malar space $1.4\text{--}1.8\times$ width of front ocellus. Antennal length $1.3\text{--}1.5\times$ maximum width of head in female, $1.9\times$ in male; female flagellum (Fig. 5O–P) club-like, not compressed, rounded apically; male flagellum (Fig. 6K–L) not compressed, curved throughout in lateral view, slightly widened apically in ventral view. Mesoscutellum in lateral view with dorsal margin nearly flat, roundly curved below near apex. Hind tibia with preapical spur; length of anterior apical spur of hind tibia $1.0\text{--}1.1\times$ apical height of hind tibia. In forewing, cell 1Rs2 with anterior length $0.9\text{--}1.1\times$ posterior length, crossvein 3r–m weakly arched. Sawsheath (Fig. 8L–M) in posterodorsal view with apex nearly angular, in lateral view with ventral margin, except basal convexity, slightly roundly convex and apex nearly angular. Lancet as in Fig. 10D, with dorsal margin nearly straight; serrulae in our material severely worn (Fig. 12I–J), its condition unclear. In male abdomen, median process of fifth tergum not reaching sixth tergum posteriorly (Fig. 7J); subgenital plate as in Fig. 13F; genitalia as in Figs. 14J–K and 15J.

Distribution. China (Sichuan).

Material examined. CHINA—Sichuan: 4 ♀ 1 ♂, Mt. Zheduoshan, 19–21. VI. 1991, T. Naito & M. Takeda (KU; NSMT; IZB).

Biology. Unknown.

Remarks. This species may easily be recognized by the almost entirely yellowish orange wings. Gussakovskij (1935) described it on the basis of one female and one male, but he did not make reference to the conspicuous median process on the fifth abdominal tergum in the male. The examination of the type material may be needed to confirm our identification, although our material generally agrees with the original description except for the smaller size of the type specimens.

***Spinarge sichuanensis* Wei, 1998**
(Figs. 2I, 4R–S, 5Q–R, 8N–O, 10E, 12K–L)

Spinarge sichuanensis Wei, 1998: 220.

Description (female). Length 8.8 mm (10 mm in the females of the type series, Wei, 1998); fore wing length 9.2 mm.

Black (Fig. 2I), except for following parts: Ocelli red; apical part of mandible reddish; labial and maxillary palpi blackish brown; forewing blackish, slightly becoming pale apically, with cells C and Sc very dark, with small weak dark spot below stigma; stigma and veins dark; vein R1 brownish before stigma. Reflection on body mainly weak blue, weak greenish blue on abdomen. Setae blackish on body and its appendages.

Head in dorsal view slightly dilated behind eyes. Distance between eyes $1.4\times$ vertical diameter of eye; eye with vertical diameter $1.5\times$ horizontal diameter. Distances between eye and hind ocellus, hind ocelli, hind ocellus and posterior margin of head as $1.4 : 1.0 : 1.0$. Frontal area (Fig. 4R) nearly flat before front ocellus, raised anterolaterally. Interantennal carinae separated from each other, ventrally converging and disappearing above center of supraclypeal area (Fig. 4S). Supraclypeal area with median ridge dull and slope from median ridge weakly rounded and barely rugulose. Malar space $1.2\times$ width of front ocellus. Antennal length $1.5\times$ maximum width of head; flagellum (Fig. 5Q–R) barely compressed, weakly curved throughout, rounded apically. Mesoscutellum in lateral view nearly flat dorsally, with dorsal margin roundly curved below near apex. Hind tibia without preapical spur; length of anterior apical spur of hind tibia $1.2\times$ apical height of hind tibia. In forewing, cell Rs with anterior length $1.2\times$ posterior length, crossvein 3r–m slightly arched. Sawsheath (Fig. 8N–O) in posterodorsal view with apex nearly angular, in lateral view with ventral margin, except basal convexity, slightly indented and apically rounded. Lancet as in Fig. 10E, with dorsal margin nearly straight; serrulae (Fig. 12K–L) apically angular, with posterior slope much longer than anterior

slope.

Material examined. CHINA—Shaanxi: 1 ♀, Kaitianguan, Mt. Taibaishan, 31. V.–2. VI. 2004, A. Shinohara.

Distribution. China (Sichuan and Shaanxi).

Remarks. *Spinarge sichuanensis* and *S. liui* are grouped by the absence of a preapical spur on the hind tibia and the combination of other characters as shown in the foregoing key. The male genitalia of the former two species figured by Wei (1998) are similar to those of *S. nigricornis* and *S. chrysoptera* in having the following characters: Gonostipes with ventral inner margin concave posteriorly; harpe broad; valviceps in lateral view with anteroventral lobe not strongly concave posteriorly, dorsal margin not convex anteriorly, and posterodorsal lobe long. This species is distinguished from *S. liui* by the characters given in the foregoing key.

Our material agrees with the original description of *S. sichuanensis*, except that the antenna is 1.5 times as long as the head width (1.0 times in the type series) and the apex of sawsheath is nearly angular in posterodorsal view (nearly rounded in the type series). However, we regard these differences as intraspecific variations, because some species of *Spinarge* show a wide range of variation in these characters (e.g., the antennal length is 1.1–1.5 times as long as the head width in *S. affinis*, and the sawsheath is apically rounded or angular in *S. nigricornis* as in Fig. 8I–J).

Spinarge liui Wei, 1998

Spinarge liui Wei, 1998: 221.

Distribution. China (Hunan).

Remarks. This species was described on the basis of one male. It is characterized by the strong purple reflections on the body (Wei, 1998). In the other species of the genus, the reflections on the body are mainly blue, bluish green, or bronzy. For more discussion, see under the remarks of *S. sichuanensis*.

Spinarge hyalina Wei & Nie, 1998

Spinarge hyalinus Wei & Nie, 1998: 347, 380.

Distribution. China (Zhejiang).

Remarks. This species, described on the basis of one male, is similar to the members of the *S. fulvicornis* group in having the combination of the following characters: Wings predominantly hyaline, with veins brown and transverse marking; hairs on body silvery; head narrowing behind eyes; interantennal carinae fused with each other dorsally; hind tibia with a preapical spur; valviceps in lateral view with anteroventral lobe strongly concave posteriorly, dorsal margin convex anteriorly and posterodorsal lobe small. This species, however, differs from the members of the *S. fulvicornis* group in having the blackish brown antenna and the ventrally separated interantennal carinae (the flagellum is orange and the interantennal carinae are ventrally fused with each other in the latter).

Acknowledgments

We wish to thank the following persons for making the material and literature available for the present study: C. van Achterberg and R. de Vries (RMNHL), S. Ibuki (Bato), M. Ishii and T. Hirowatari (OPU), H. Itami (Shibata), F. Koch (Museum für Naturkunde, Berlin), K. Kubo (Yokohama), R. Matsumoto (OMNH), K. Mizuno (Kyoto), T. Murakami (Nikko), T. Naito (KU), H. Nagase (Kamakura), K. Nakamura (Utsunomiya), A. Nakanishi (MNHAH), N. Ohbayashi and M. Sakai (EU), T. Saito (Yaita), S. Schmidt (ZSSM), H. Suda (Sakura), M. Suwa (HU), A. Taeger (Deutsches Entomologisches Institut, Müncheberg), H. Takahashi (Hachioji), I. Togashi (Tsurugi), M. Yamada (Hirosaki), H. Yoshida (Osaka), and L. Zombori (HNHMB). Shinohara thanks A. Lelej (Institute of Biology and Pedology, Vladivostok), H.-C. Park (Kyungbuk National University, Taegu), K.-T. Park (Kangwon National University, Chuncheon), and H.-z. Zhou (IZB) for their help during the field surveys.

References

- Abe, M. & 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.)
- Benson, R. B., 1938. On the classification of sawflies (Hymenoptera Symphyta). *Trans. R. Ent. Soc., London*, **87**: 353–384.
- Benson, R. B., 1951. Hymenoptera, 2. Symphyta. Section (a). *Handbk. Ident. Brit. Ins.*, **6**, 2(a): 1–49.
- Benson, R. B., 1963. The affinities of the Australian Argidae (Hymenoptera). *Ann. Mag. Nat. Hist.*, Ser. **13**, 5: 631–635.
- Conde, O., 1937. Ostbaltische Tenthredinoidea III. *Korrespondenzbl. Naturf. Ver. Riga*, **62**: 103–112.
- Enslin, E., 1917. Die Tenthredinoidea Mitteleuropas VI. *Dtsch. Ent. Z.*, 1917 (Beiheft): 539–662.
- 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.)
- Haneda, Y., T. Tano, H. Okuno, C. Nozaka, T. Murota, H. Kurokawa & S. Inoue, 1998. Hymenoptera. In: Fukui-ken Shizen-kankyo Hozen-chosa Kenkyu-kai Konchu Bukai (ed.), [*Catalogue of Insects of Fukui Prefecture, 2nd Ed.*], pp. 314–404. Fukui-ken, Kenminseikatsu-bu, Fukui. (In Japanese.)
- ICZN, 1999. *International Code of Zoological Nomenclature, Fourth Edition, adopted by the International Union of Biological Sciences*. 29+306 pp. International Trust for Zoological Nomenclature, London.
- Izaki, I., 1964. Sawflies of Fukui Prefecture (Hym.: Symphyta). *Akitu, Kyoto*, **12**: 5–8. (In Japanese.)
- Kim, C.-W., 1963. Hymenoptera of Korea. *Humanit. Sci. (Nat. Sci.)*, Korea Univ., **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., 1980. *Hymenoptera and Diptera. Distribution Atlas of the Insects of Korea, Series 3*. xxxix + xvii + 356 pp. Korea Univ. Press, Seoul.
- Kim, C. W., J. W. Lee, J. S. Park, B. J. Kim & 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 Univ. Press, Seoul.
- Klug, F., 1834. Uebersicht der Tenthredinetæ der Sammlung. In: Klug, J. C. F. (ed.), *Jahrbücher der Insektenkunde mit besonderer Rücksicht auf die Sammlung des Königl. Museum in Berlin herausgegeben, Erster Band*, pp. 223–253, 286, col. Taf. II, Fig. 5–10. Enslin, Berlin.
- Kondo, T. & 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*, fasc. (29): 176 pp. +3 pls.
- Konow, F. W., 1905–1908. Systematische Zusammenstellung der bisher bekannt gewordenen Chalastogastra, II. *Z. Syst. Hymenopterol. Dipterol.*, 5–8. 232 pp.
- Lorenz, H. & M. Kraus, 1957. Die Larvalsystematik der Blattwespen (Tenthredinoidea und Megalodontoidea). *Abhandl. Larvalsystem. Ins.*, (1): 1–339.
- Malaise, R., 1941. Gattungstabelle der Blattwespen (Hym. Tenth.) der Welt. *Ent. Tidsk.*, **62**: 131–140.
- Matsuura, M., 1963. [Hymenoptera of Mie Prefecture 5. Sawflies (Suborder Symphyta).] *Hirakura, Tsu*, **7**(2): 7–17. (In Japanese.)
- Miwa, Y., 1958. [Investigations on the Hymenoptera of Mie Prefecture (1).] *Hirakura, Tsu*, **2**(16): 37–40. (In Japanese.)
- Miyoshi, K., 1988. Hymenoptera. In: *The Insects of Yamaguchi Prefecture*, pp. 46, 187–197. Yamaguchi Museum, Yamaguchi.
- Mocsáry, A., 1909. Chalastogastra nova in collectione Musei Nationalis Hungarici. *Ann. Mus. Natn. Hung.*, **7**: 1–39.
- Murakami, T., 2004. [Records of Hymenoptera in Tochigi Prefecture (1).] *Insekuto, Utsunomiya*, (55): 103–112. (In Japanese.)
- Murase, M., 1995. [Rearing and collecting of sawflies, 5.] *Kinokuni, Wakayama*, (48): 13. (In Japanese.)
- Murota, T. & H. Kurokawa, 1985. Symphyta. In: [*Catalogue of Insects of Fukui Prefecture*], pp. 246–257. Fukui Pref. (In Japanese.)
- 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 & A. Nakanishi, 2004. Species diversity of sawflies in Hyogo Prefecture, central Japan. *Mus. Nat. Hum. Act., Hyogo, Mon. Nat. Hist. Env. Sci.*, (1): [1–2]+[pl.1–10]+1–85. (In Japanese.)
- 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.)
- Okutani, T., 1954. Studies on Symphyta (I). Symphyta of Sasayama with description of a new species. *Sc. Rept. Hyogo Univ. Agric.*, **1**(2): 75–80.
- Okutani, T., 1955. [Three insect species newly recorded from Honshu.] *Akitu, Kyoto*, **4**: 14. (In Japanese.)
- Okutani, T., 1956. New sawflies from Japan (Studies on

- Symphyta VI. *Ins. Matsum.*, **20**(3–4): 97–99.
- Okutani, T., 1972. Symphyta from Hataganaru Plateau. *Faunistic Studies of Mt. Ooginosen and its Neighboring Area*, **1**: 15–19. Nature Conservation Soc., Hyogo Pref. (In Japanese.)
- Okutani, T., 1973. Symphyta of Niigata Pref., with systematic notes on some species. *Essa-Konchu-dokokai Kaiho*, (42): 13–27. (In Japanese.)
- Okutani, T., 1974. [Insect fauna of the eastern end of Chugoku Mountain Range.] *Higashi Chugoku Sanchi Shizen Kankyo Chosa Hokoku*, pp. 173–233. (In Japanese.)
- Okutani, T., 1982. [Woodwasps & sawflies.] *In: [Insects of Gifu Prefecture]*, pp. 409–413. (In Japanese.)
- Saarinen, A., 1946. Tenthredinologische Mitteilungen 1–2. *Ann. Ent. Fenn.*, **12**: 57–61.
- Schulmeister, S., 2003. Simultaneous analysis of basal Hymenoptera (Insecta): introducing robust-choice sensitivity analysis. *Biol. J. Linn. Soc.*, **79**: 245–275.
- Seyama, S. & T. Tachikawa, 1983. The Symphyta of the Ehime University Forest (Researches on the insect-fauna of the Komenono Experimental Forest of Ehime University, 8). *Bull. Ehime Univ. Forest*, (20): 179–183. (In Japanese.)
- Smith, D. R., 1989. The sawfly genus *Arge* (Hymenoptera: Argidae) in the western Hemisphere. *Trans. Am. Ent. Soc.*, **115**: 83–205.
- Smith, D. R., 1992. A synopsis of the sawflies (Hymenoptera: Symphyta) of America South of the United States: Argidae. *Mem. Am. Ent. Soc.*, **39**: 1–201.
- Takahashi, H. & M. Shiraishi, 2000. Some records of Hymenoptera from Ehime Pref., Shikoku, Japan (III). *Gensei, Kochi*, (75): 7–10. (In Japanese.)
- Takahashi, H. & M. Shiraishi, 2003. Some records of Hymenoptera from Ehime Pref., Shikoku, Japan (V). *Gensei, Kochi*, (78): 3–5. (In Japanese.)
- Takeuchi, K., 1932. A revision of the Japanese Argidae. *Trans. Kansai Ent. Soc.*, **3**: 27–42.
- Takeuchi, K., 1939. A systematic study on the suborder Symphyta (Hymenoptera) of the Japanese Empire (II). *Tenthredo, Kyoto*, **2**: 393–439.
- Takeuchi, K., 1950. Argidae. *In: Ishii, T. et al. (eds.), Iconographia Insectorum Japonicorum, Editio Secunda, Reformata*, pp. 1359–1361. Hokuryukan, Tokyo. (In Japanese.)
- Togashi, I., 1954. [Sawflies of Mt. Kaga-hakusan.] 43 pp. Tsurugi-machi, Ishikawa Pref. (In Japanese.)
- Togashi, I., 1961. Sawflies (Hym. Symphyta) of Mt. Hakusan. *Life Study, Fukui*, **5**: 27–42. (In Japanese, with English summary.)
- Togashi, I., 1965. Argidae. *In: Asahina, S., et al., Iconographia Insectorum Japonicorum Colore Naturali Edita, Vol. 3*, p. 254, pl. 127. Hokuryukan, Tokyo. (In Japanese.)
- Togashi, I., 1970. The comparative morphology of the internal reproductive organs of the Symphyta (Hymenoptera). *Mushi, Fukuoka*, **43** (Supplement): 1–114.
- Togashi, I., 1997. Symphyta (Hymenoptera) collected by Dr. Y. Nishijima in Hokkaido, Japan. *Bull. Biogeogr. Soc. Japan*, **52**: 1–6.
- Togashi, I., 1998. Hymenoptera. *In: [Insects of Ishikawa Prefecture]*, pp. 252–304. Ishikawa Pref. Govt., Kanazawa. (In Japanese.)
- Togashi, I., 2002. Newly[sic] insects record occurring in Mt. Hakusan, Ishikawa Prefecture (4). *Ishikawa-ken Hakusan Shizen-hogo Center Kenkyu-hokoku*, **29**: 7–16. (In Japanese, with English summary.)
- Wei, M.-c., 1997. Taxonomical studies on Argidae (Hymenoptera) of China—A new genus and five new species of Sterictiphorinae. *Ent. Sinica, Beijing*, **4**: 295–305.
- Wei, M.-c., 1998. Taxonomic studies on Argidae of China I. A new genus and two new species of Athermantinae (Hymenoptera). *Entomotaxon.*, **20**: 219–222.
- Wei, M.-c. & H.-y. Nie, 1998. Hymenoptera: Pamphiliidae, Cimbicidae, Argidae, Diprionidae, Tenthredinidae and Cephidae. *In: Wu, H. (ed.), Insects of Longwangshan Nature Reserve*, pp. 344–391. China Forestry Publishing House, Beijing.
- Yoshida, H., 2002. [Hymenoptera of Aina, Kita-ku, Kobe-shi, (1) Sawflies.] *Kiberihamushi, Kobe*, **30**(1): 62–65. (In Japanese.)
- Zhelochovtsev, A. N., 1988. Podotryad Symphyta (Chalastogastra)—Sidyachebryukhie. *In: Zhelochovtsev, A. N., V. I. Tobias & M. A. Kozlov, Opredeliteli nasekomykh evropejskoj chasti SSSR, Tom III, Pereponchatokrylye, Shestaya chast'*, pp. 7–234. Nauka, Leningrad. USSR. [English translation (1994): Suborder Symphyta (Chalastogastra). *In: Zhelochovtsev, A. N., V. I. Tobias & M. A. Kozlov, Key to the Insects of the European Part of the USSR, Vol. III, Part VI*, pp. 1–387.
- Zhelochovtsev, A. N. & A. G. Zinovjev, 1995. A list of the sawflies and horntails (Hymenoptera, Symphyta) of the fauna of Russia and adjacent territories. I. *Ent. oboz.*, **74**(2): 395–415. (In Russian.)