

Host Plant, Larva and Life History of *Spinarge pumila* (Hymenoptera, Argidae) in Japan

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Abstract *Elliottia paniculata* (Siebold et Zucc.) Hook. f. (Ericaceae) is recorded as a host plant of *Spinarge pumila* Hara and Shinohara, 2006, and the larva of this sawfly is briefly described. The host plant and larva of *S. pumila* were unknown. Field observations and rearing records suggest that this is a multivoltine species with polymodal adult emergence.

Key words: Hymenoptera, Argidae, *Spinarge pumila*, new host record, *Elliottia paniculata*, larva, life history.

Spinarge pumila Hara and Shinohara, 2006, is a rare argid sawfly known only from Honshu, Japan. It belongs to the *fulvicornis* group, which contains four East Asian species (Hara and Shinohara, 2006). Adults of the four species closely resemble each other, separated almost only by the shape of the ovipositor. The host plants and larvae are known for three of the four species, namely *S. fulvicornis* (Mocsáry, 1909), *S. prunivora* Hara and Shinohara, 2006, and *S. affinis* Hara and Shinohara, 2006, and they show distinct specific differences (Hara and Shinohara, 2006; Shinohara and Hara, 2010). The host plant and larva of *S. pumila* have been unknown.

Recently, Shinohara was able to obtain adults of *S. pumila* by rearing larvae feeding on *Elliottia paniculata* (Siebold et Zucc.) Hook. f. (Ericaceae). Here we give the new host record, a brief description of the larvae, and notes on the life history.

All material used in this work is housed in the collection of the National Museum of Nature and Science. Rearing was conducted in a laboratory in Tokyo, where the temperature was kept at about 25°C during the feeding period. The day

length was not rigidly regulated, but the light was usually on for about 16 hours a day. For the scientific names of the plant species, we follow Yonekura and Kajita (2011).

Arge pumila Hara and Shinohara, 2006

(Figs. 1–3)

Host plant. Ericaceae: *Elliottia paniculata* (Siebold et Zucc.) Hook. f. New record.

Rearing records. A) On September 10, 2010, Shinohara found five argid larvae feeding solitarily on the leaves of *Elliottia paniculata* in Nikko-Yumoto (1,480 m), Tochigi Prefecture, central Honshu (Fig. 1F–H). All were last-instar larvae, and two matured and cocooned on September 11, two others on September 14, and the remaining one on September 16. One female adult (Fig. 2B) emerged on October 14, 2010, from a cocoon spun on September 14 and another female adult (Fig. 2C) emerged on June 15, 2011, from a cocoon spun also on September 14. The other three died.

B) On October 1, 2010, Shinohara found one

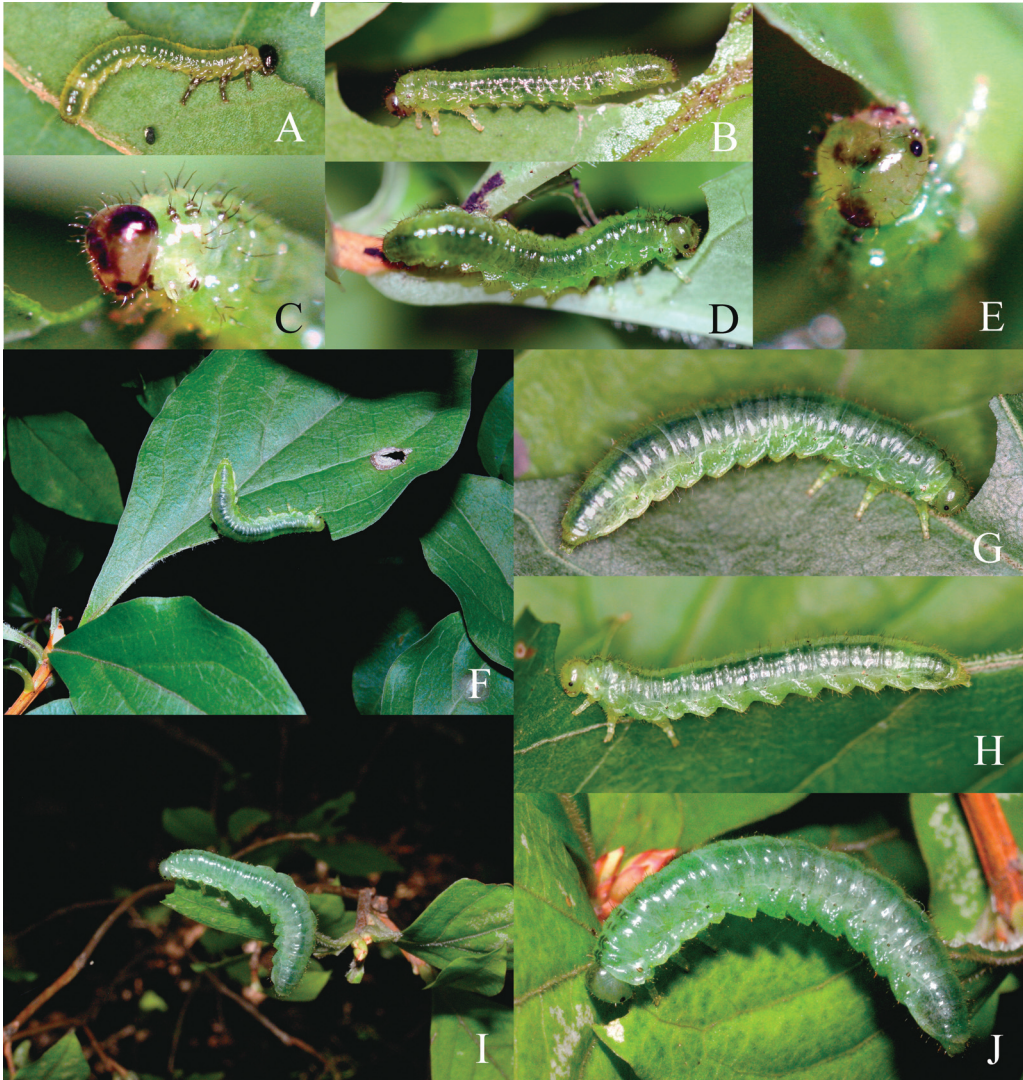


Fig. 1. *Spinarge pumila*, larvae. — A, Probably first instar collected at Shiga-kogen and photographed indoors on August 31, 2011; B, probably third instar collected at Nikko and photographed indoors on July 31, 2011; C, same as B; D, same individual as B, after molt, probably fourth instar, photographed indoors on August 1, 2011; E, same as D; F, last (probably sixth) instar, photographed in Nikko-Yumoto on September 10, 2010; G, same as F, photographed indoors on September 12, 2010; H, another last (probably sixth) instar larva collected in Nikko-Yumoto on September 10, 2010 and photographed indoors on September 12; I, another last (probably sixth) instar larva, photographed in Yokote-michi on October 1, 2010; J, same as I, photographed indoors on October 2, 2010. All photographs taken by A. Shinohara.

solitary larva on the same plant in Yokote-michi (870m), Mt. Daisen, Tottori Prefecture, western Honshu (Fig. 1I–J). The larva matured and cocooned on October 3 and a female adult (Fig. 2D) emerged on June 2, 2011.

C) On July 18, 2011, Shinohara found three

solitary last-instar larvae on *Elliottia paniculata* in Hanaishi-cho (650 m), Nikko, Tochigi Prefecture, central Honshu. One of them matured on July 20 and another on July 25, whereas the last one died before maturity. The former two are still in cocoons as of September 1, 2011.

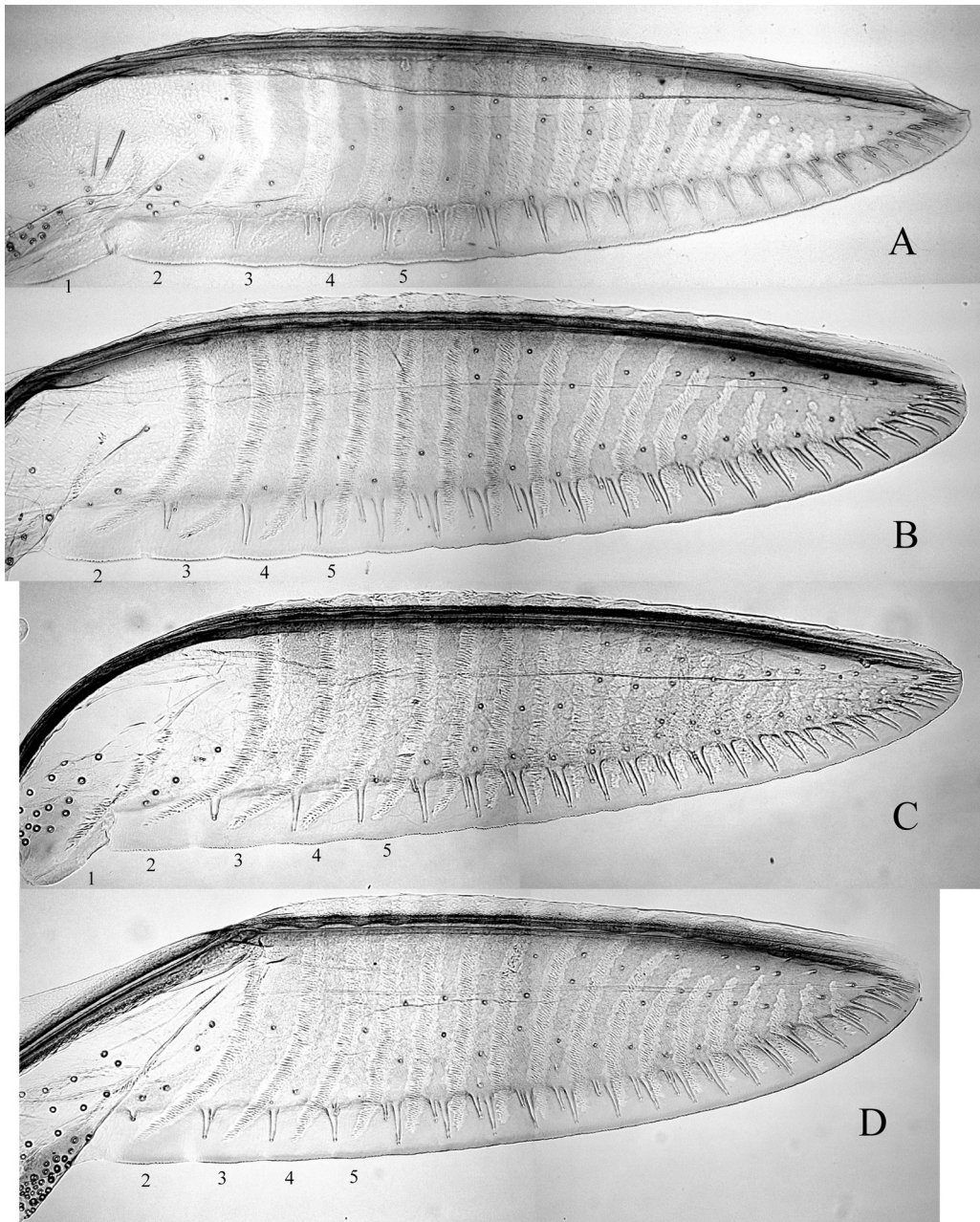


Fig. 2. *Spinarge pumila*, lancets. — A, Holotype; B, reared specimen, Nikko-Yumoto; C, another reared specimen, Nikko-Yumoto; D, reared specimen, Yokote-michi.

D) On July 31, 2011, Shinohara found three solitary larvae (a, b and c) on the same plant in the same locality as “C,” one of them (a) in its last instar and the other two (b and c) in their middle instars. The former (a) matured on Au-

gust 1 while the other two (b and c) molted on the same day. One of the latter (b) (Fig. 1B–E) molted again on August 3 and cocooned on August 8. The other (c) molted on August 4 and cocooned on August 10. A male adult emerged on

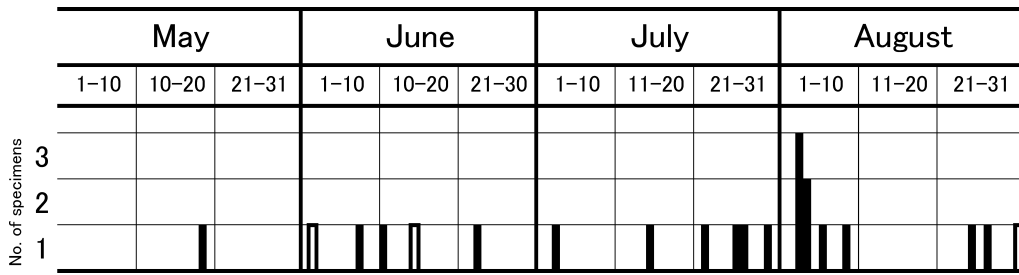


Fig. 3. Collection dates of adult specimens, all females, of *S. pumila* published by Hara and Shinohara (2006) (black columns) and emergence dates of two females and one male obtained in this study (white columns; see *Rearing records*). Three female paratypes labeled “Mt. Hira, VII. 1929, C. Teranishi” are not included.

August 31, 2011, from a cocoon made on August 8 (b). The other two individuals are still in cocoons as of September 1, 2011. The (b) larva was probably in the third instar when it was found because *Arge* species usually have five (male) or six (female) larval instars (Shinohara and Hara, 2009) and the larva molted twice after it was collected before reaching maturity.

E) On August 29–30, 2011, Shinohara found six early- and middle-instar larvae solitarily feeding on the same plant in Shiga-kogen (1,380–1,580 m), Nagano Prefecture, central Honshu. One of the early-instar larvae was possibly a first instar (Fig. 1A). All the larvae are in their feeding stage as of September 1, 2011.

Larva (Fig. 1). Early (probably first) instar (Fig. 1A): About 7 mm long. Covered with dark brownish or blackish hairs. Head, including mouthparts, black. Trunk pale green; thoracic legs blackish; very sparse minute black dots on trunk, cervical sclerite, and narrow apices of subspiracular lobes, and suranal lobe brownish or blackish. Middle (probably third) instar (Fig. 1B–C): About 10 mm long. Covered with dark brownish or blackish hairs. Head pale greenish brown, with blackish marking as in Fig. 1B–C. Trunk pale green; thoracic legs whitish; thoracic spiracles blackish. Last feeding instar (Fig. 1F–J): About 18 mm long. Ground color pale green, covered with dark brownish or blackish hairs. Head with dark longitudinal obscure mark on vertex; labrum and apices of mandibles dark brown. Thorax with paired rows of dark spots dorsomedially; thoracic legs pale. Spiracles

blackish. First to ninth abdominal segments each three-annulated; prolegs on second to sixth and tenth segments, those on second to sixth elongate; tenth tergum in dorsal view broadly rounded apically; subanal lobe extending posteriorly beyond suranal lobe. Solitary and cryptic. In alarm posture, larva inflates and expands its subtriangular and flattened subspiracular lobes but hardly raises or twists its abdomen.

Discussion

Comparative comments. *Spinarge pumila* is one of the four species representing the *fulvicornis* group (Hara and Shinohara, 2006). The adults of the four species are very similar in external characters and are separated almost only by the structure of the lancet. Among the four species, *S. pumila* is peculiar in having very flat serrulae (Fig. 2), which are useful for distinguishing the species (Hara and Shinohara, 2006). The three reared females obtained (Fig. 2B–D) show some variation in the general shape of the lancet, but the shape of the serrulae is quite stable.

The larva of *S. pumila* is easy to recognize by the host plant, color pattern and behavior. This is the only sawfly species known to feed on *Elliotia*, as noted below. The mostly pale green color pattern and the solitary and cryptic behavior of *S. pumila* larva resemble those of some other argid larvae (e.g., *A. nipponensis* Rohwer, 1910, on *Rosa*, *A. rejecta* (Smith, 1874) on *Rubus*, *Arge suzukii* (Matsumura, 1912) on *Abelia*), but the larva of *S. pumila* is quite different from those of

the other species of the *S. fulvicornis* group. The larvae of *S. fulvicornis* and *S. affinis* have a greenish or brownish ground color, often with scattered dorsal dark spots on the thorax and abdomen, and partly or entirely dark brownish or blackish subspiracular lobes (Shinohara and Hara, 2010). When disturbed, the middle or late-instar larvae of these two species raise and often twist their abdomens, fully inflating and expanding their subtriangular and flattened subspiracular lobes. The larva of *S. pumila* inflates and expands its subspiracular lobes, but it hardly raises or twists its abdomen. The larvae of *S. fulvicornis* live in small groups, while those of *S. affinis* and *S. pumila* are solitary. The larva of *S. prunivora* is a gregarious leaf-feeder, and its color pattern is quite different from that of *S. pumila*; the head is black and the trunk is pale yellow or greenish white with black spots and entirely black subspiracular lobes in *S. prunivora* (see Hara and Shinohara, 2006), while the head and trunk are almost entirely pale greenish in *S. pumila*.

Host plants. This is the first record of the host plant of *S. pumila*. Known host plants of the other three species of the *S. fulvicornis* group are *Sorbus*, *Aria*, *Pourthiaea* and *Malus* (Rosaceae) for *S. fulvicornis*, *Prunus* (Rosaceae) for *S. prunivora*, and *Rhododendron* (Ericaceae) for *S. affinis* (Shinohara and Hara, 2010). Although the adults of the four species of the *S. fulvicornis* group show little difference in morphology, they diverge in host preference and larval morphology and behavior. The speciation of these oligo- or monophagous sawflies is possibly associated with the shift of host preference.

The host plant, *Elliottia paniculata*, is endemic to Japan and toxic to humans if ingested (Yasue *et al.*, 1971). The few insects known to feed on the leaves of this plant include geometrid moths of the larentiine genera *Rheumaptera* and *Dysstroma* (Sugi *et al.*, 1987). No sawflies were known to feed on this plant.

Life History. *Spinarge pumila* is not common but is distributed widely in Honshu. The 22 adult specimens obtained in the field and included in

the type series (Hara and Shinohara, 2006) were collected in mid-May through late August, with an apparent peak of occurrence in early August (Fig. 3). These collection data are from various localities of various altitudes from Aomori to Tottori prefectures but nevertheless may suggest multivoltine life cycle of this sawfly.

As noted above, the larvae were found in mid- and late July in Nikko (650 m), late August in Shiga-kogen (1,380–1,580 m), mid-September in Nikko (1,480 m), and early October on Mt. Daisen (870 m). In three of the rearings, adults successfully emerged: 1) A last-instar larva found on September 10, 2010, in Nikko (1,480 m) cocooned on September 14 and a female emerged on October 14, 2010; 2) another last-instar larva collected on the same day at the same locality and cocooned on the same day as 1) overwintered and a female emerged on June 15, 2011; and 3) a middle-instar larva found on July 31, 2011, in Nikko (650 m) cocooned on August 8 and a male emerged on August 31, 2011. The first and second rearings are particularly interesting because the two larvae were collected together on the same day at the same locality and they even cocooned on the same day, but one of them emerged in the same year while the other went into a long diapause and the adult emerged in the next year. These larvae were collected only four days before maturity and reared under the same conditions. The cause of this irregularity is unknown, but it strongly indicates that the adult emergence of this sawfly is polymodal (Knerer, 1993).

The sparse information available thus suggests that *S. pumila* probably has a multivoltine life cycle with polymodal adult emergence, as in certain *Arge* species (e.g., Shinohara and Hara, 2008).

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