

Host Plants and Larvae of Three Sawfly Species of the Genus *Tenthredo* (Hymenoptera, Tenthredinidae) in Japan

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Abstract Based on rearing experiments, host plants are newly recorded for three sawfly species of the genus *Tenthredo* Linné, 1758: *Euptelea polyandra* Siebold et Zucc. [Eupteleaceae] for *T. emphytiformis* Malaise, 1931 and *Staphylea bumalda* DC. [Staphyleaceae] for *T. fentoni* (Kirby, 1882) and *T. flavipectus* (Matsumura, 1912). Brief notes are given on the life history of the three species and the larvae are described and illustrated in color for the first time.

Key words: Tenthredininae, *Tenthredo*, new host record, larvae.

Introduction

Tenthredo Linné, 1758, is by far the largest sawfly genus in Japan, currently represented by 84 species in the country (Shinohara, in press). The species of the genus are usually large-sized, often colorful and conspicuous sawflies, but the host plants and immature stages are rather poorly known for the Japanese species. Host records are available for 16 species and descriptions or photographs of the larvae have been published only for seven species (Shinohara and Ibuki, 2018).

Here we report on the host plants and larvae of three species of *Tenthredo*, *T. emphytiformis* Malaise, 1931, *T. fentoni* (Kirby, 1882) and *T. flavipectus* (Matsumura, 1912), based on rearing experiments conducted by Ibuki in 2017–2019 in eastern part of Tochigi Prefecture, central Honshu. The host plants and larvae of *T. emphytiformis* and *T. flavipectus* were unknown. For *T. fentoni*, Yamamoto (1958) already recorded one host plant and presented a black-and-white picture, in the rather poor quality typical at that time. Here we give a new host plant record, with color photographs and a brief description.

Materials and Methods

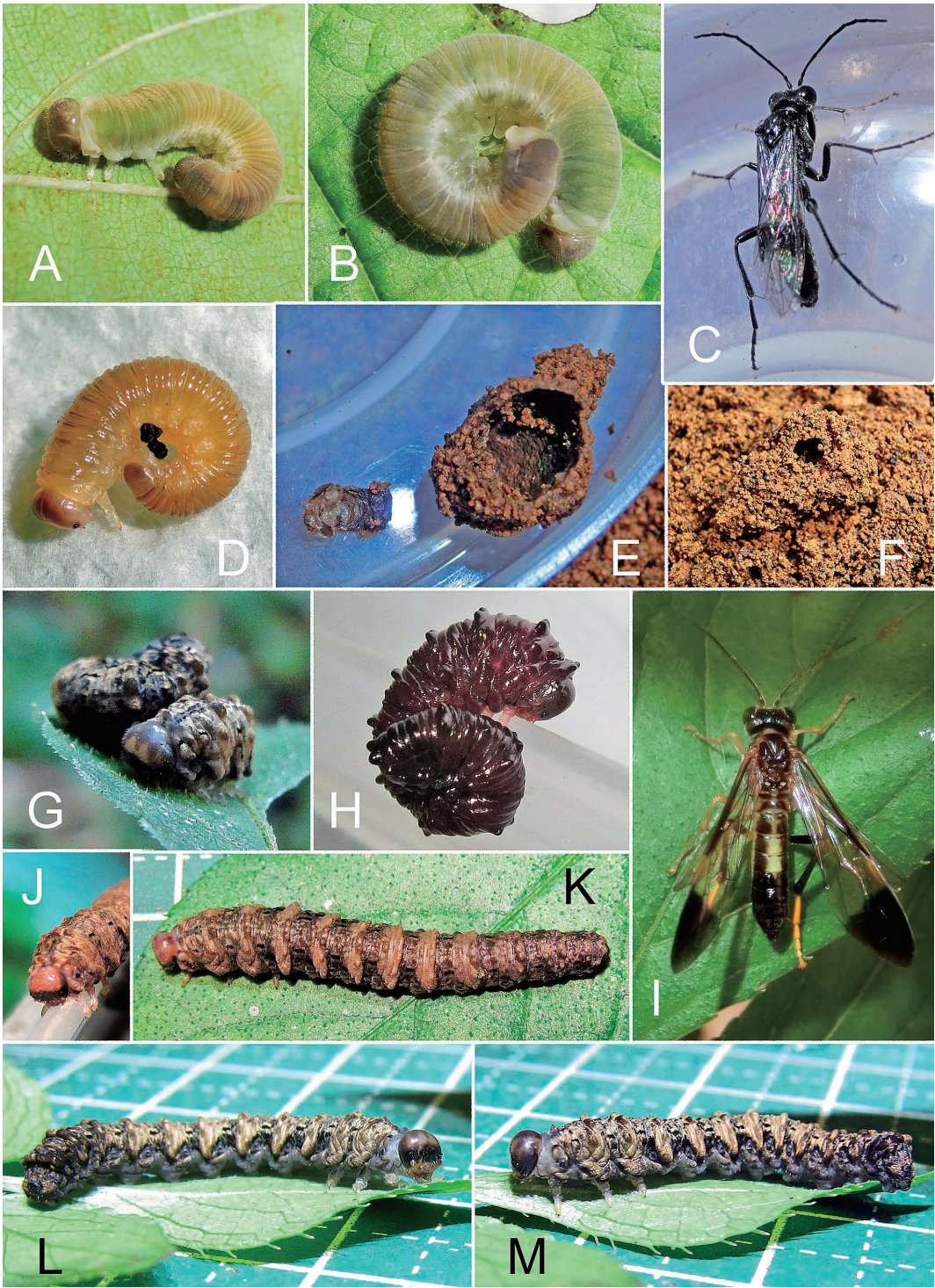
Rearing was undertaken in a room at Bambi Farm in Wami (N36°47', E140°10', about 240 m alt.), Nakagawa Town, Tochigi Prefecture, Honshu. The temperature and day length were not controlled in the room, but the light was usually on for about 16 hours a day. All the photographs were taken by Ibuki with digital cameras, SONY DSC-HX1 (Figs. 1G and 2A) and Canon Power shot S-95 (all others). The digital images were processed and arranged with Adobe Photoshop Elements 9 and 12 software. We followed Viitasaari (2002) for the larval morphological terminology and Yonekura and Kajita (2019) for plant names.

Results

Tenthredo emphytiformis Malaise, 1931
(Fig. 1A–F)

Host plant. Eupteleaceae: *Euptelea polyandra* Siebold et Zucc. (new record).

Field observations and rearing records. On



July 11, 2018, a solitary larva (Fig. 1A) was found on the undersurface of a leaf of the host plant in Seseraginosato-koen (N36°40'12.27", E140°11'38.37", 120 m), Nasukarasuyama City, Tochigi Prefecture. The larva matured (Fig. 1D) and went into the soil on July 19. A male adult emerged on April 24, 2019 (Fig. 1C). An earthen cell was found in the soil later (Fig. 1E, F).

Larva. *Middle or late instar* (Fig. 1A, B): Head brownish gray, narrow posterior margin pale greenish white and with dark brownish spot laterally; ocularium and stemmatum black. Trunk translucent opaque whitish olive green, more brownish gray posteriorly; creamy white on prothorax and along lateral sides and thoracic legs. *Mature larva* (Fig. 1D): Similar to above, but wholly tinted with dark yellow, cuticle very smooth and shiny.

Earthen cell (Fig. 1E, F). Without fiber and rather easily broken with fingers; inside wall rather smooth.

Remarks. This is the first host plant record for *T. emphytiformis*. This sawfly should be polyphagous, because it was originally described from Kamchatka (Malaise, 1931) and later recorded from the other areas of the Russian Far East, China and Japan (Hokkaido, Honshu, Shikoku, Kyushu) (Shinohara, in press), whereas *Euptelea polyandra* is endemic to Japan (Honshu, Shikoku, Kyushu) and no species of *Euptelea* occurs in Hokkaido or in the Russian Far East (Kadota, 2016).

The larva apparently has no peculiar features and is difficult to distinguish from other sawfly larvae. This is one of the two sawfly species known to be associated with *Euptelea polyandra* (Okutani, 1967; present work). The other species is *T. fentoni*, whose larva is easily distinguished

from that of *T. emphytiformis* by its peculiar features (compare Fig. 1A, B, D with G, J–M).

Tenthredo fentoni (Kirby, 1882)

(Fig. 1G–M)

Host plant. Staphyleaceae: *Staphylea bumalda* DC. (new record). Eupteleaceae: *Euptelea polyandra* Siebold et Zucc. (Okutani, 1956, 1967; Yamamoto, 1958).

Field observations and rearing records. On November 2, 2017, one solitary larva (Fig. 1G, L, M) was found on *Staphylea bumalda* in Banboku-toge (N36°41'21.77", E140°13'23.85", 292 m), Nakagawa Town, Tochigi Prefecture. The larva matured and went into the soil on November 12. A female adult emerged on May 19, 2018. On November 6, 2017, three solitary larvae (one of them in Fig. 1J, K) were found on *S. bumalda* in Tomiyama (N36°41'9.56", E140°12'41.59", 134 m), Nakagawa Town, Tochigi Prefecture. One larva each matured on November 8, 9 (Fig. 1H) and 10. A female adult emerged on May 20, 2018 (Fig. 1I). The other two larvae were dead in the soil. An attempt to make the emerged female oviposit on the leaves of *Staphylea bumalda* failed.

Larva. *Late instar* (Fig. 1G, J–M): Color pattern rather complex; ground color very pale olive to pale brown. Head with variable extent of black areas, ocularium and stemmatum always black. Thoracic segments and abdominal segments 1 to 6, each with posterior lateral part largely black; abdominal segment 7 and more posterior segments largely pale above and largely blackish laterally. Each laterodorsal anterior pale part of meso- and metathoracic segments and

Fig. 1. *Tenthredo emphytiformis* (A–F) and *Tenthredo fentoni* (G–M), all photographed by S. Ibuki.—A, Larva in resting position on a leaf of *Euptelea polyandra*, Seseraginosato-koen, July 11, 2018; B, same larva, late instar, July 16 (three days before maturity); C, male adult, just emerged, April 24, 2019; D, mature larva, July 19, 2018; E, F, earthen cell found in the soil after emergence, cast skin of prepupa in the cell (left in E); G, larva in resting position on a leaf of *Staphylea bumalda*, Banboku-toge, November 2, 2017 (ten days before maturity); H, mature larva, Tomiyama, November 9, 2017; I, female adult, same individual as H, just emerged, May 20, 2018; J, K, late instar larva, Tomiyama, November 6, 2017 (two to four days before maturity); L, M, late instar larva (same individual as G), November 2.

abdominal segments 1 to 6 strongly convex with a few small swellings. *Mature larva* (Fig. 1H): Blackish red, with thoracic legs whitish; cuticle smooth and shiny. Swellings on each thoracic and abdominal segment conspicuous.

Remarks. This is a polyphagous species, now known to feed on Staphyleaceae (*Staphylea bumalda*) and Eupteleaceae (*Euptelea polyandra*), two rather distantly related eudicot families (APG III, 2009). Probably this species also feeds on other groups of eudicots.

Okutani (1956) was the first to record the host plant of this species based on a successful rearing of the larva feeding on *Euptelea polyandra* to the adult. Unfortunately, Okutani did not refer to the characteristics of the larva. Yamamoto's (1958) report was a black-and-white picture of a larva with a short comment reading "Last instar larva, host *Euptelea polyandra*, length 25–30 mm, head purplish black, trunk with very complex coloration, mottled with pale brown (appearing whitish in the picture), brown and black, occurring in August and September" (original in Japanese). From this report only, it is not clear how he identified the larva. Most probably, he succeeded in obtaining the adult by rearing this larva, but such a record was left unpublished and the reared adult specimen was not available for study. However, the characteristic larva feeding on *Euptelea polyandra* in his photograph certainly belongs to *T. fentoni*.

Unlike the larvae of the other two species treated in this paper, the larva of *T. fentoni* is quite conspicuous, easily distinguished from the other known sawfly larvae by the peculiar color pattern and structure (Fig. 1G, H, J–M).

Tenthredo flavipectus (Matsumura, 1912)

(Fig. 2)

Host plant. Staphyleaceae: *Staphylea bumalda* DC. (new record).

Field observations and rearing records. On July 2, 2017, two solitary larvae of different sizes were found on the host plant in Banboku-toge

(N36°41'21.77", E140°13'23.85", 292 m), Nakagawa Town, Tochigi Prefecture. The larger one (Fig. 2A, H) ceased feeding on July 6 and entered the soil on July 11; a male adult emerged on April 23, 2018 (Fig. 2B). Another smaller one (Fig. 2C–E) matured and entered the soil on August 3, but no adult emerged. On July 6, 2017, two small larvae were found on the host plant in Bicchuzawa (N36°45'33.14", E140°9'13.91", 121 m), Nakagawa Town, Tochigi Prefecture. One of them matured on July 30 and another one on August 5 (Fig. 2I). No adults emerged. On July 18, 2017, a middle-sized larva (Fig. 2F) was found on the host plant in Oyamada-shimogo (N36°46'44.31", E140°12'18.34", 222 m), Nakagawa Town, Tochigi Prefecture. On July 29, it matured (Fig. 2J) and went into the soil but no adult emerged in the next year.

Larva. *Early instar* (Fig. 2C): Head creamy white, ocularium and stemmatum black. Trunk pale grayish white, ventrally tinted with pale olive, laterally and dorsally covered with white wax powder. *Middle instar* (Fig. 2D, G): Length about 25 mm. Head very pale brown or beige, with blackish brown mark on vertex; ocularium and stemmatum black. Trunk pale brown or pale olive green, ventrally brownish or olive white, dorsally with sparse blackish brown dots (Fig. 2D) or without such spots (Fig. 2G); cuticle opaque. *Late instar* (2E, F, H): Color rather variable. Head pale purple to chocolate brown; ocularium and stemmatum black. Trunk grayish, purplish or brownish, with or without sparse blackish or pale yellowish dots; cuticle opaque. *Mature larva* (Fig. 2I, J): Head and ventral part of trunk, including thoracic legs, beige; trunk dorsally and laterally yellowish brown, cuticle smooth and shiny.

Remarks. The host plant and the immature stages of this species were unknown. The larva has no conspicuous features and is rather variable in coloration as described above. Two other sawfly species are known to feed on *Staphylea bumalda*, *T. fentoni*, which is treated in this paper, and another tenthrediniid, *Caliroa staphylae* Oishi, 1961 (Okutani, 1967). The larvae of

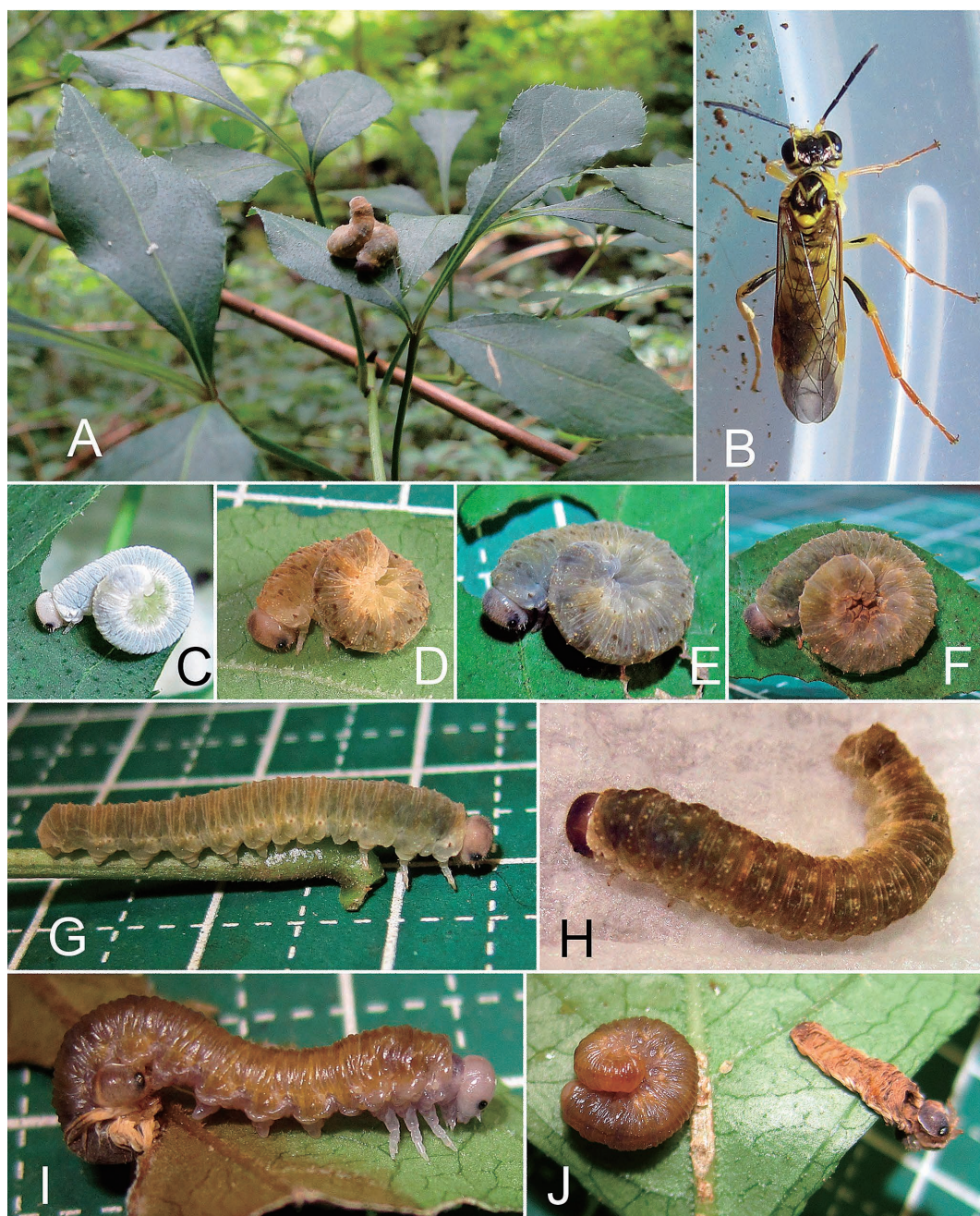


Fig. 2. *Tenthredo flavipectus*, all photographed in Nakagawa by S. Ibuki.—A, Larva in resting position on a leaf of *Staphylea bumalda*, Banboku-toge, July 2, 2017; B, male adult, just emerged, April 23, 2018; C, early instar larva (28 days before maturity), Banboku-toge, July 6, 2017; D, same individual, middle instar (18 days before maturity), July 16; E, same individual, late instar (nine days before maturity), July 25; F, another late instar larva (four days before maturity), Oyamada, July 25, 2017; G, middle instar larva (11 days before maturity), Bicchuzawa, July 25, 2017; H, late instar larva (nine days before maturity), Banboku-toge, July 2, 2017; I, mature larva (same individual as G), last molt, August 5; J, mature larva (left, same individual as F) and cast skin (right), July 29.

these two species are easy to separate from the larva of *T. flavipectus*. The larva of *T. fentoni* is very characteristic as noted above and the larva of *C. staphylae* is even more characteristic because of its small size and superficial resemblance to a slug as suggested by the common name of the genus *Caliroa*, the slug sawfly.

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