Note

Morphology and Ecology of Immature Stages of *Oxyethira acuta* KOBAYASHI (Trichoptera, Hydroptilidae)

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Abstract

Final instar larva, young larva and pupa of *Oxyethira acuta* KOBAYASHI are described. Young larvae do not make the case. Final instar larvae bear bottle-shaped cases made entirely of silk. The larvae live on the stems and leaves of higher water plants and feed on the filamentous green algae. They break the cell walls of the algae by their mandibles and suck out the cell contents. *O. acuta* has a one year life cycle in Lake Utonai, Hokkaido, northern Japan; young larvae occur in late summer, final instar larvae are found from early autumn to next summer, and pupae occur in summer.

1. Introduction

*Oxyethira acuta* KOBAYASHI, 1977, was described based on the male and female which were collected from a shallow lake in northern Japan. This study describes the immature stages and reports the habitat, food and annual life cycle of the species.

2. Materials and Methods

Materials were collected from Lake Utonai, near Tomakomai, Hokkaido, Japan. Lake Utonai is a closed phytopgenic lake. Maximum depth is 1.0 m and the area is 2.77 km². The lake is usually ice-covered from January to March. Temperature of surface water on sampling dates varied from 0.7(4.II.1978)–24.6(17.VII.1978) °C.

Larvae and pupae were collected near the west shore of the lake at about monthly intervals. Water plants or dead branches were taken by hand or by hand net, aquatic organisms were washed into a bowl and sieved out with a net (mesh openings ca. 0.2 mm × 0.2 mm) in the laboratory. Larvae and pupae were picked under a stereoscopic microscope and examined their morphology under a binocular microscope. To study the life cycle, case length is measured with a objective micrometer which can be read to 0.025 mm. Ecdysis into final instar, case making and feeding were observed under the stereoscopic microscope.

The stages of *O. acuta* are designated here by δ (adult male), Ψ (adult female), P (pupa), PP (prepupa), F (final instar larva) and Y (young larva; only the just before final instar larvae were collected in this study). The final instar larvae were identified by comparison with exuviae left in the cases of mature pupae. And young larvae were identified by observation on the ecdysis into the final instar. Materials are as follows:


3. Morphology

3-1. Final instar larva

Suberuciform (Fig. 1). Body length up to 3.7 mm. Head (Fig. 2) light brown with three dark brown markings: two round markings close to eyes and a transverse one near the posterior margin. Head 250–280 μ long and 180–200 μ wide; subsquare with slightly convex lateral margins in dorsal view. Primary seta 9 very long, twice as long as the head. Antenna situated near anterolateral corner of head capsule; unsegmented and with a seta on the inner middle about 90 μ in length. Labrum (Fig. 3) light brown; rather wide, convex laterally and concave in the middle anterior margin. Mandibles brown...
Figs. 1–9. Final instar larva of *O. acuta*. 1, lateral view; 2, head, dorsal view, primary setae numbered; 3, labrum, dorsal view; 4, right mandible dorsal view; 5, right and left mandibles, left-and-ventral view; 6, thorax; 7, fore leg; 8, middle leg; 9, abdominal segments IX–X, lateral view.
and asymmetrical; top of left mandible sharp and that of right one broad (Fig. 4); top of both mandibles as in key and keyhole (Fig. 5).

Dorsal plates on three thoracic segments (Fig. 6) light brown, each plate with a transverse dark brown marking and 5–10 setae. Pronotum round, but meso- and metanotum angulate and dark brown in the anterolateral corner. Fore leg (Fig. 7) massive and the shortest with a moderate process on the tibia. Middle (Fig. 8) and hind legs same in structure and about 2.5 times as long as fore leg.

Abdomen flattened laterally, with no lateral fringe or tubercle. Segments II–VII much higher than thorax, each segment with a very small weak sclerotized plate dorsally on the middle and with fine setae on the plate (Fig. 1). No dorsal or lateral hump on segment I. Ninth segment with a dorsal sclerite (Fig. 9). No gill on segment IX. Anal proleg (Fig. 9) short and fused to the lateral side of segment X. Anal claw small and with two stout accessory hooks on the dorsal edge.

3-2. Young larva (just before final instar larva)

Campodeiform (Fig. 10). Head and thorax light brown with no dark colored marking. Tarsal claw of the thoracic legs with no spur on the inner base; other structure of the legs as in final instar larva. Abdomen slender and flattened dorsoventrally. Four to eight setae each on dorsum of segments I–VIII. Eight long setae on dorsum of segment IX, two of them twice as long as the body. Anal proleg thin and projected backwards. Anal claw thin and with no accessory hook. All sclerotized parts except head and claws covered with very fine setae.

3-3. Pupa

Body (Fig. 11) flattened dorsoventrally, about 3 mm in length. Antenna longer than half of body. Mandible (Fig. 12) symmetrical with very fine sawlike teeth on the inner blade. Slender clinging apparatus (Fig. 13) near the anterior margin of segments III–VII and round one (Fig. 14) on the posterior margin of segments III–V; number of hooks on the apparatus variable among individuals. No lateral fringe. Top of wing reaches segment VIII.

3-4. Remarks for the species discrimination

Two species, *Oxyethira acuta* and *O. ezoensis*, were described from the same locality (KOBAYASHI, 1977). We examined the type series of *O. ezoensis* with particular attention to the genitalia, pupal case and larval exuviae in the case, and found that the type specimens represent varieties of the female *Hydroptila itoi* KOBAYASHI, 1977.\(^{11}\)

The final instar larva of *O. acuta* resembles *O. sp. OA*, the only larva known in Japan (TETSUKAWA, 1962), but differs from the latter in the color pattern of the head and pronotum: the transverse dark brown marking is present

in *O. acuta* and absent in *O. sp. OA*.

4. Ecology

4-1. Case

Young larvae do not build cases. Final instar larvae make semi-transparent cases made entirely of silk. With the larval growth the cases become long by addition of silk on the rear ends (Figs. 15-16). Completed larval cases are bottle-shaped in lateral view and bar-like in ventral and dorsal views (Figs. 16-17). Before pupation the larvae fix the cases on the stems or leaves of aquatic plants by three positions and turn themselves over in the cases (Fig. 18). Pupal cases are flattened dorsoventrally.

4-2. Habitat and food

Habitat and food of this species are like the larvae of *Hydroptila itoi*, which coexist in Lake Utonai (Ito and Kawamura, 1980). The larvae of *O. acuta* are inhabitants of water plants, e.g. *Myriophyllum* sp., *Typha* sp., and *Vallisneria* sp. The larvae live on their leaves and stems and feed on filamentous green algae such as Oedogoniales which are associated with the higher water plants. The larvae break the cell wall of the algae with their mandibles and suck out the cell contents in the same manner as larvae of *H. itoi*.

4-3. Annual life cycle in Lake Utonai

The density of the species was much lower than that of *H. itoi* in Lake Utonai. The seasonal change of the case length and the appearance of the young larva and pupa are shown in Fig. 19. The young larvae were found in late August and early September. The shortest cases of final instar larvae were collected in early autumn. The cases became long until next summer, and the longest ones were found in summer. The pupae occurred in July and August. Therefore, it is obvious that *O. acuta* has a one year life cycle in Lake Utonai. It is also apparent that young larvae occur only during a relatively short period, two months at most, and that all larvae winter in their final instar. The annual life cycle of *O. acuta* in Lake Utonai differs from that of *O. flavicornis* Pictet, a European species, because *O. flavicornis* has a bivoltine life cycle (Nielsen, 1948).

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References


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