

Silk production in an Italian endemic species: *Apatania volsorum* Moretti, Cianficconi & Papagno, 1988 (Trichoptera: Limnephilidae)

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Abstract

Apatania volsorum Moretti, Cianficconi & Papagno has been found only in the Italian region of Lazio. It is endemic to a rheocrenic spring in Lake Posta Fibreno (Frosinone, Italy). In this study we examined the silk glands as well as the case organization and silk lining in both the larva and the pupa by means of light and scanning electron microscope. The silk glands are long, folded 4 times and occupy most of the body cavity. The case of the 5th instar larva is 7 mm long, conical, slightly curved and made of irregularly arranged pebbles of different sizes. The anterior opening is oblique and surrounded by larger pebbles. The posterior end is rounded and closed by a membrane with an irregular hole. The silk lining is made of layers of intersecting threads 4µm thick. The pupal case, about 10 mm long, has a wide anterior opening covered by an extended silk plug and partially attached to a large, flat pebble. The posterior silk plugging is a dense membrane with 3 small holes. Examination of the silk organization in this species showed that the case lining is made of densely woven threads arranged in superimposed layers.

Key words: Italian endemism, silk glands, larval case, pupal case, silk web

Introduction

The production of silk fibers in terrestrial arthropods has been extensively studied (Rudall & Kenchington 1971, Sehnal & Akai 1990, Craig 1997). In certain insect orders, silk is produced by a pair of labial glands which store a semi-liquid gel that polymerizes in 1 or more silk proteins (Sehnal & Sutherland 2008). In Trichoptera, the posterior section of the silk glands secretes the core of the silk filament made of proteins called fibroins [heavy (H) - and light (L) - chain fibroins]. The core is enveloped by glue-type proteins called sericins (Engster 1976a, b; Sehnal & Sutherland 2008; Yonemura *et al.* 2006). The silk fiber is a flat double stranded ribbon each made of bundles of 15-25 Å thick filaments (Engster 1976b). Amino-acid composition of the silk proteins shows a predominance of glycine, serine and arginine (Craig *et al.* 1999). Examination of the labial gland protein patterns (Park *et al.* 2003) and characterization of a novel salivary gland protein (Eum *et al.* 2005) have been undertaken in Trichoptera Hydropsychidae.

Silk organization has been investigated in Trichoptera that either spin nets and retreats or build cases or have silk cocoons (Wallace & Malas 1976, Tachet *et al.* 1987; Townsend & Hildrew 1979, Cianficconi *et al.* 1992, Cianficconi & Moretti 2000, Bicchierai & Cianficconi 2007).