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BRIEF NOTE

A SCANNING ELECTRON MICROSCOPIC STUDY OF THE MOUTHPARTS OF *CHEUMATOPSYCHE ANALIS* (TRICHOPTERA; HYDROPSYCHIDAE) LARVAE[1]

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Net-spinning caddisflies function as collectors of fine particulate organic matter in lotic ecosystems. Food particles are strained from flowing water by a silken net produced by larval secretions from a pair of long, tubular silk glands. The mouthparts of these larvae exhibit adaptations and modifications which facilitate feeding and food transport from the net into the oral cavity. The objective of this study was to observe and describe the larval mouthparts of one species of net-spinning caddisfly, *Cheumatopsyche analis* (Banks), and to discuss their role in relation to feeding.

Larvae were collected from Harker's Run, a small, second-order stream located 2.3 km northeast of the city of Oxford in Butler County, Ohio. Larval mouthparts were observed with a scanning electron microscope (Model 106, Coates and Welter Instrument Corp., Sunnyvale, California) after fixation in 2% gluteraldehyde, dehydration in a graded ethanol series (10, 25, 50, 75, and 100%), and, finally, a transfer to 100% methanol. Specimens were then subjected to critical-point drying, with 100% methanol as the initial fluid and CO_2 as the transition medium. Larvae were mounted on aluminum stubs at various orientations and sputter-coated with a gold-palladium alloy before examination.

The mouthparts of Trichoptera closely resemble those of Lepidoptera (Snodgrass 1935). The labrum of *C. analis* surrounds the oral opening anteriorly; the mandibles (m) project inward along the lateral edges of the cavity (fig. 1). The maxillolabium, a large composite structure, forms a thick under-lip posterior to the mouth. This structure is comprised of two lateral lobes (l) representing the maxillae and a median lobe (ml) formed from the labium.

The larvae of *C. analis* exhibit several morphological adaptations which facilitate feeding. They glean food material from their nets with a sweeping action of the labrum. Two types of labral bristles are used in feeding. Bristles found in two large tufts on the lateral edges of the labrum (lb) clean debris from the net (fig. 2). These bristles are pectinate in structure (fig. 3) and thus offer a broad edge which can be used to sweep the strands of the net. The underside of the labrum has many setae which are oriented toward the oral opening and which are feather-like in appearance (fig. 4). This feather-like structure increases the surface area of the bristles that aid in the movement of food particles toward the mouth. The role of the massive mandibles during feeding is unclear. The mandibles are very large and seem to be structurally incapable of manipulating or grinding the small food particles obtained from the net; however, mandibles may be useful in obtaining animal prey items, in moving retreat construction materials, and in defending the larva from attack. The lateral lobes of the maxillolabium have five segments and are probably used to manipulate food materials. The central lobe of the structure is not critical to feeding, as it contains the spinneret from which silk-strands originate. Details of food trans-

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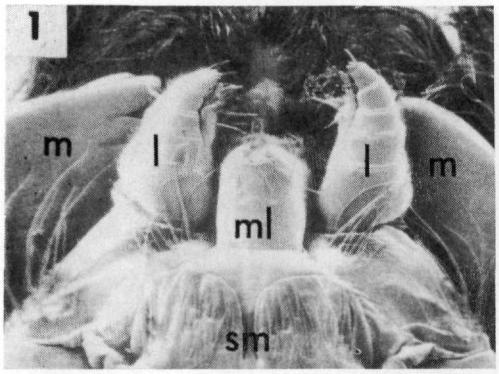

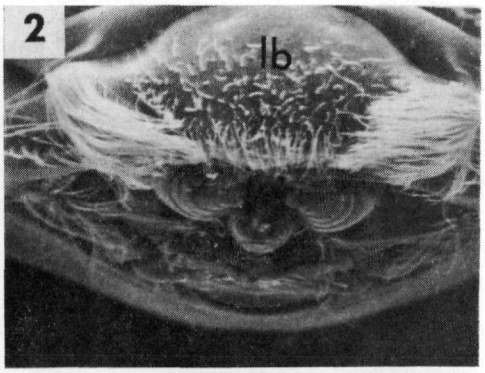

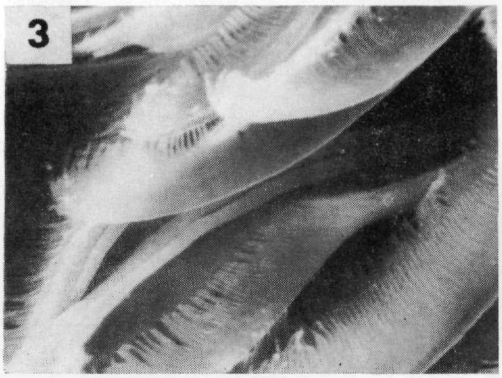

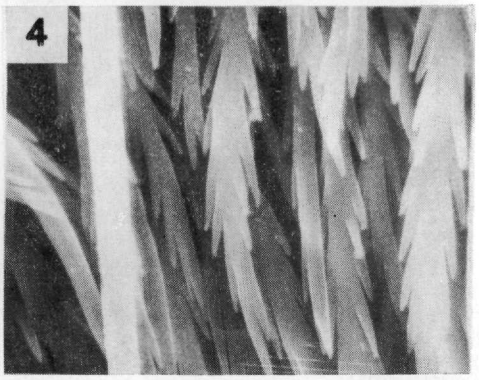

FIGURE 1. Ventral view of the mouthparts of a mature *C. analis* larva (139×) (mandible=m; later lobe=l; median lobe=ml; submentum=sm).
FIGURE 2. Anterior view of mouthparts of a mature *C. analis* larva (98×). Note the large lateral labral tufts (labrum=lb).
FIGURE 3. Pectinate bristles of the lateral labral tufts of *C. analis* (5242×).
FIGURE 4. Setae on the ventral surface of the labrum of *C. analis* (4645×).

fer from labral bristles to the oral cavity have not been worked out. Another configuration of mouthparts observed in several specimens is shown in figure 5. All mouthparts have been drawn inward, and the labrum (lb) and bilobed submentum (sm) are nearly touching. Such movements of these structures would aid in forcing food particles into the mouth.

The mouthparts of *C. analis* are very similar to those of *Hydropsyche,* as described by Lepneva (1964) and Schuhmacher (1970). The pectinate structure of the lateral, labral setae is identical in the two forms. Advanced hydropsychids, such as *Macronema,* display additional feeding adaptations (Sattler 1963). Members of this genus possess densely pilose brushes on the fore tibiae. Frontal and lateral lobes which are covered with rows of bristles project from the

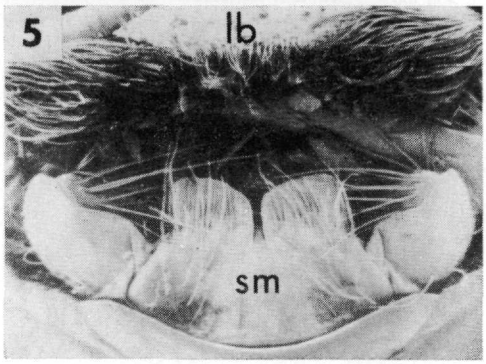

FIGURE 5. An alternate configuration of mouthparts exhibited by *C. analis* (103×) (labrum=lb; submentum=sm).

labrum. These structures also aid in sweeping food particles from the net into the oral opening. Members of another net-spinning caddisfly family, the Phili-

potamidae, are also equipped with several types of setae on the labrum and maxillary palps that aid in the capture of food particles (Wallace and Malas 1976). Thus, net-spinning trichopterans use setae almost exclusively in food transport from net to mouth. Furthermore, the setae have been modified and positioned in various ways to facilitate the feeding process in different larval forms.

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