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Net-spinning Caddisflies

Lakes and streams contain a variety of aquatic insects that have evolved remarkable adaptations for survival. One of these groups comprise the caddisflies in the order Trichoptera. The aquatic caddisfly larvae secrete silk through their mouths from modified salivary glands--silk similar to that spun by the caterpillars of butterflies and moths. And, certain caddisfly larvae construct silken nets to capture food from the water--structures similar to those used by commercial fishermen.

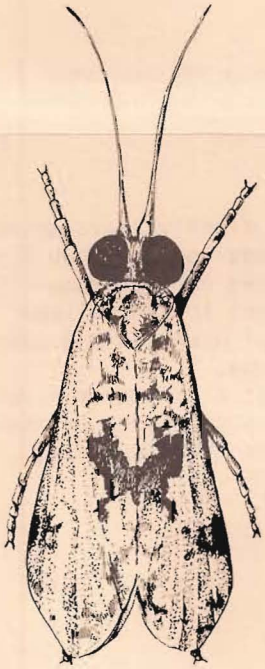

Figure 1. Adult (Hydropsychidae)

Figure 2. Larva (Hydropsychidae)

Three families of Trichoptera have larvae that are able to spin nets: Philopotamidae, Polycentropidae, and Hydropsychidae. Members of each family spin a characteristic type of net useful for family identification. All groups may be found in large numbers on the rocky substrates of rivers, streams, and waveswept shorelines.

The Trichoptera are holometabolous insects and thus go through four stages of development in their life cycle of about one year. The adults (figure 1), depending on species and location, emerge from early May to late September. These brown, gray, or black creatures are most active at night and large swarms may be found in the evening around bridges or other large objects near the water. During the day, however, the adults are secretive and usually sit quietly in the nearby vegetation. The adults generally live four to five weeks. After mating, the females crawl beneath the water surface and deposit their eggs in a tight cluster on the sides of large rocks. The larvae hatch approximately one month later, but before venturing out they aggregate in a cluster for a few days. Varying greatly in shades of white, green, brown or orange the young larvae (figure 2) feed and grow through five growth stages (instars). They construct their capture nets soon after hatching and as they get larger they build larger nets with larger webbing to catch their food. When the larvae are fully grown and they are ready for pupation, they construct a cocoonlike structure of small pebbles and silk. After transforming in the silken "cocoon" the pupal stage lasts two or

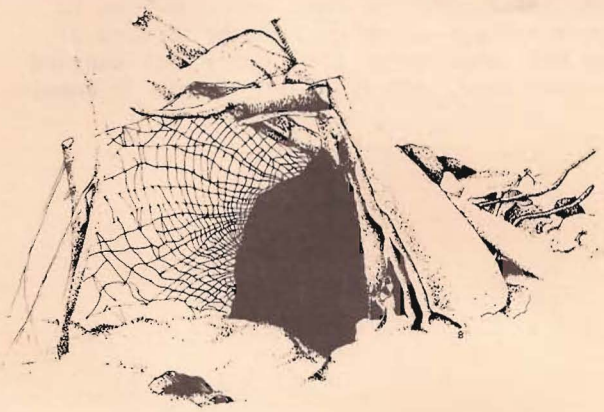

Figure 3. Capture net and retreat of a Hydropsychid larva.

three weeks, and then the adult breaks out and swims to the surface. The nets spun by the larvae are curious structures that catch food, and they also provide shelter. Thus, instead of searching for food, the larva waits for the flowing water to bring the food to its net. The nets are usually supported with small stones or pieces of vegetation (figure 3). When hungry the larvae graze on the net contents, eating small plant, animal, and fragments of detritus trapped by the threads.

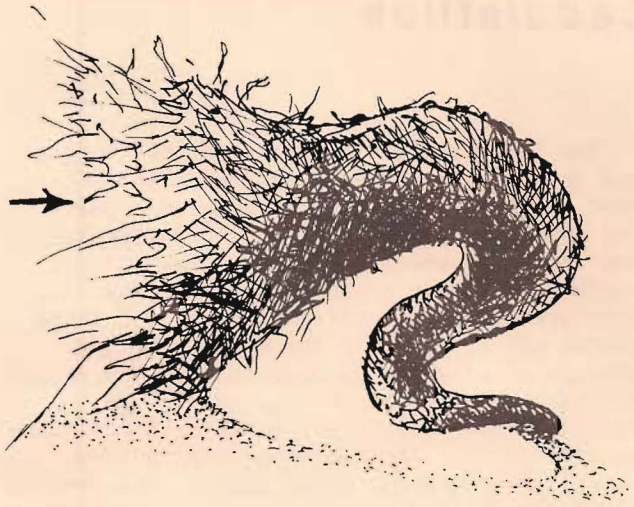

Figure 4. Capture net of a Polycentropid larva. (Arrow indicates water flow.)

Pebbles or sand grains that become trapped are discarded. Should a predator approach the net, the larva, using its two large anal claws, quickly pulls itself into the depths of the net structure.

You can identify the different families by the location and form of the capture net. Hydropsychid larvae, for example, construct their nets in fast flowing water and generally on the upper surface or rocks. They use sand, plant material, and small pebbles to form a retreat on which to hide (figure 3). Some are complicated structures that capture abundant food, yet allow the larvae to remain concealed from their enemies.

Polycentropid larvae, on the otherhand, build their nets in gently flowing areas of streams and rivers. Their nets are usually larger than those of the Hydropsychids and are shaped like trumpets (figure 4). Some larvae construct long tube-nets in the bottom sediments to filter out food material from water forced down the tube by the current.

Philopotamid larvae build their nets on the underside of rocks in areas protected from the current. Their nets are lightly fastened to the rocks by the front-ends so that they distend when the current flows through them (figure 5). The net of a final instar philopotamid contain millions of openings and over a kilometer of silk strands.

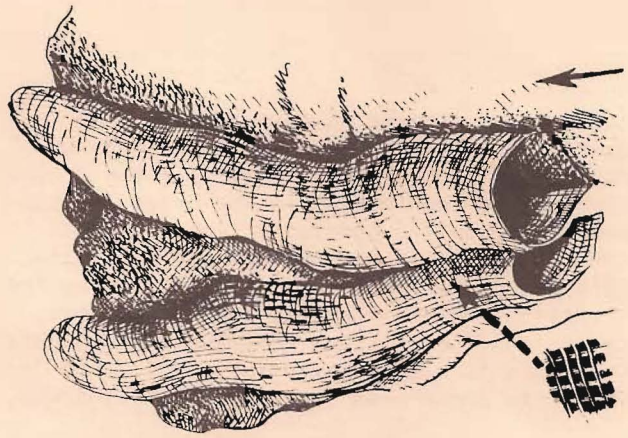

Figure 5. Capture net of a Philopotamid larva. (Upper arrow indicates water flow.)

The next time you're at a stream or river, look for these fascinating creatures or their capture nets. You'll find it a rewarding experience.

David C. Fowler

Drawings, prepared by Sharon Carlin, are modified from figures in Aquatic Insects of North America by R. W. Meritt and K. W. Cummins.

Michigan Entomological Society, c/o Department of Entomology, Michigan State University, East Lansing, Michigan 48824--(15-XI-80).