AVOIDANCE OF SCOURING BY LARVAE OF *SIMULIUM VITTATUM* (DIPTERA: SIMULIIDAE) DURING A SPRING FLOOD

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The larva of the blackfly *Simulium vittatum* Zett (Diptera: Simuliidae) is an abundant and readily collected benthic invertebrate in many parts of North America (Wood et al. 1962). It has been collected from the solid submerged substrates in the Nanticoke River at Waterford, Ontario during all seasons of the year over several years by the authors and other blackfly workers (R. Faraday, personal communication). During spring floods, however, no larvae can be found in their usual microhabitat, although late instar larvae reappear as soon as the water level returns to normal. A similar observation was reported by Lewis and Bennett (1975), who studied a mixed population of 9 species from the genera *Prosimulium, Cnephia* and *Simulium.*

In late February 1985, when the Nanticoke River was flooded due to melting snow, the larvae were concentrated on the underwater portions of thin branches of shrubs growing out of the river bank. In these areas, there was virtually no current, as indicated by the movements of small pieces of green twigs (which have almost neutral buoyancy) which were moved by waves more than by currents. There is no doubt, however, that some currents were present. The branches were covered in silk and silk streamers produced by the larvae. The larvae formed dense irregular clumps and were inactive, even though this species normally remains active throughout the winter. When the branch to which the larvae were attached was tapped, some of them released and drifted downstream while attached to a silk strand. The larvae, attached to the branches by their single posterior proleg, held themselves almost perpendicular to the branch. Their feeding fans were retracted and their bodies were not twisted as during feeding. There were no signs of interactions between larvae as is normally seen when they are dispersed on rocks in the stream (Eymann and Friend, unpublished data).

Other larvae were found in the hyporheic zone (Williams 1984), in the gravel as much as 30 cm under the surface of the stream bed. One group was found under a flat rock about 30–40 cm across and 10–15 cm deep; and another on the upstream surface of the buried part of a submerged log, which was almost completely covered in coarse gravel. These larvae had formed a spaced dispersion pattern which suggests that they were actively feeding (Eymann and Friend, unpublished data). No larvae were found on any exposed surfaces or under rocks in faster water, and only a few individuals were found scattered under smaller rocks in slower water. Currie and Craig (in press) have suggested that *Gymnopais* Stone and *Prosimulium* Roubaud may also enter the hyporheic zone during a flood. Usual microhabitats were unsuitable, probably because the fast current made it impossible for the larvae to remain attached, or because of increased scouring (Hemphill and Cooper 1983).

It is not clear how the larvae managed to find such small, slow-current microhabitats, since it would require considerable lateral migration despite a strong current. The webs of silk and the silk streamers on the branches suggest that the larvae drifted to the branches while attached to silk strands. Use of large quantities of silk by larvae drifting to avoid a catastrophic situation has also been reported by Tarshis and Neil (1970), who observed larvae of a mixed population of *Cnephia dacetensis, S. decorum,* and *S. venustum/verecundum* during a sudden drop in the water level of a spillway. It is also not clear what proportion of the larvae that release their hold on the substrate eventually reach a calm refuge, what happens to those that do not, or how larvae on the branches return to the main stream when the discharge drops. Clearly, though, the larvae of *S. vittatum* have two potential refuges in which they can avoid scouring during a flood, the hyporheic zone, and areas adjacent to the stream bank where there is virtually no current. Removing shrubs from such areas in the late fall may bring about a significant decrease in the populations of species which overwinter as larvae.

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References Cited

Currie D. C. and D. A. Craig. In press. Feeding strategies of larval blackflies. *In:* K. C. Kim and R. W. Merritt, (eds.) Black flies: Ecology, population management and annotated world list. Penn. State University Press.

Hemphill, N. and S. D. Cooper. 1983. The effect of physical disturbance on the relative abundances of

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two filter-feeding insects in a small stream. Oecologia 58:378–382.

Lewis, D. J. and G. F. Bennett. 1975. The blackflies (Diptera: Simuliidae) of insular Newfoundland. III. Factors affecting the distribution and migration of larval simuliids in small streams on the Avalon Peninsula. Can. J. Zool. 53:114–123.

Tarshis, I. B. and W. Neil. 1970. Mass movement of blackfly larvae on silken threads (Diptera: Simuliidae). Ann. Entomol. Soc. Am. 63:607–610.

Williams, D. D. 1984. The hyporheic zone as a habitat for aquatic insects and associated arthropods. pp. 430–455. *In:* V. H. Resh and D. M. Rosenberg, (eds.) The ecology of aquatic insects. Praeger Publ., Toronto.

Wood, D. M., B. V. Peterson, B. V. Davies and H. Gyorkos. 1962. The black flies (Diptera: Simuliidae) of Ontario. Part II. Larval identification, with descriptions and illustrations. Proc. Entomol. Soc. Ont. 93:99–129.