TAXONOMIC AND ECOLOGICAL NOTES ON *LEUCOTRICHIA PICTIPES* (TRICHOPTERA: HYDROPTILIDAE), A MICROCADDISFLY NEWLY RECORDED FROM OHIO, U.S.A.[1]

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ABSTRACT: The microcaddisfly *Leucotrichia pictipes* (Banks) (Trichoptera: Hydroptilidae) was collected for the first time in Ohio at the Chagrin River in Cuyahoga County, and the mature larva is described. We give details on the larval habitat in an attempt to describe the ecological requirements for this species in Ohio.

KEY WORDS: *Leucotrichia,* Trichoptera, Hydroptilidae, Ohio (U.S.A.), new state record.

The caddisfly genus *Leucotrichia* (Trichoptera: Hydroptilidae) is a new world taxon (Flint 1970) with three species in the United States (Wiggins 1996). *Leucotrichia pictipes* (Banks) has a northern distribution (Flint 1970) where it builds fixed retreats on riffle rocks in streams and grazes periphyton (McAuliffe 1982). Although widespread in North America, this species has not been reported from Ohio. Light trapping for adults has been conducted intensively near Ohio streams, particularly in the northeast (Huryn and Foote 1983), but no adults have been taken. Adults are not readily attracted to lights, and survey work for larval Trichoptera throughout the state by the senior author has not previously produced immatures of this species. *Leucotrichia pictipes* occurs in states adjacent to Ohio, such as Michigan, Pennsylvania, and Kentucky (Blickle 1979). We recently collected *L. pictipes* for the first time in Ohio, and investigated the ecological conditions of the larval habitat. During our investigation, we found that although brief larval descriptions and illustrations have been given in the excellent works of Ross (1944), Flint (1970), McAuliffe (1982), and Wiggins (1996), no detailed morphological description of the mature larva is available. To supplement the data provided by previous investigators, we give a description of the fifth instar to provide details similar to those given for other Ohio Hydroptilidae (e.g., Keiper 1999, 2002; Keiper and Foote 1999).

METHODS

On September 14, 2001, six fifth instars were collected from the upper surfaces of riffle rocks of the Chagrin River 0.5 km south (upstream) from the Fairmount Road bridge in Hunting Valley, Cuyahoga County, Ohio (41.4846°N, 81.3949°W). On 14 September 2002 six additional larvae and numerous fixed

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retreats were taken. All larvae were placed in KAA solution (Wiggins 1996) and transferred to 70 percent ethanol after 24 hours. Specimens (n = 12) were examined with a Leica MZ-12.5 microscope, and measurements were taken with image analysis software; only undamaged specimens were used for length and width (n = 6). All specimens are currently housed in the Department of Invertebrate Zoology of the Cleveland Museum of Natural History.

Water chemistry and stream bed composition data were collected at the site 34 times since 1985, primarily in the months of June, July, September and October. Values are reported as mean ± 1 S.D. unless otherwise noted. These data have been generated in conjunction with stream water quality monitoring for the Ohio Department of Natural Resources (ODNR), Division of Natural Areas and Preserves, Scenic Rivers Program. This site is designated by ODNR as Chagrin River 21.0 (Ohio Department of Natural Resources 2001).

RESULTS AND DISCUSSION

Fifth Instar: Total length, $\bar{x}$ = 2.45 ± 0.45 mm.

Head capsule: width $\bar{x}$ = 0.27 ± 0.05 mm; dark brown, labrum blackish-brown, eyespot black with pale ring; long seta lacking near eye spot; mandibles asymmetrical, left broad and robustly cusped with one seta on posterolateral corner, pubescent setae on inner margin, darker posteriorly; right pointed apically, one seta on posterolateral corner, lacking setae on inner margin (Fig. 1).

Thorax: All notal sclerites brown with blackish periphery, dark margin thicker along posterior border; pronotal sclerite convex anteriorly, meso- and metanotal sclerites flat anteriorly; prosternal sclerites small, sub-circular, widely separated along posterior margin, positioned near posterior corner of trochantin; meso- and metathoracic sterna lacking sclerites; soft tissue of thoracic segments milky white with scattered green blotches (completely green in life); legs uniformly dark brown, foreleg $\bar{x}$ = 0.42 ± 0.05 mm, midleg $\bar{x}$ = 0.46 ± 0.05 mm, hindleg $\bar{x}$ = 0.45 ± 0.03 mm, leg ratio 0.91:1.00:0.98.

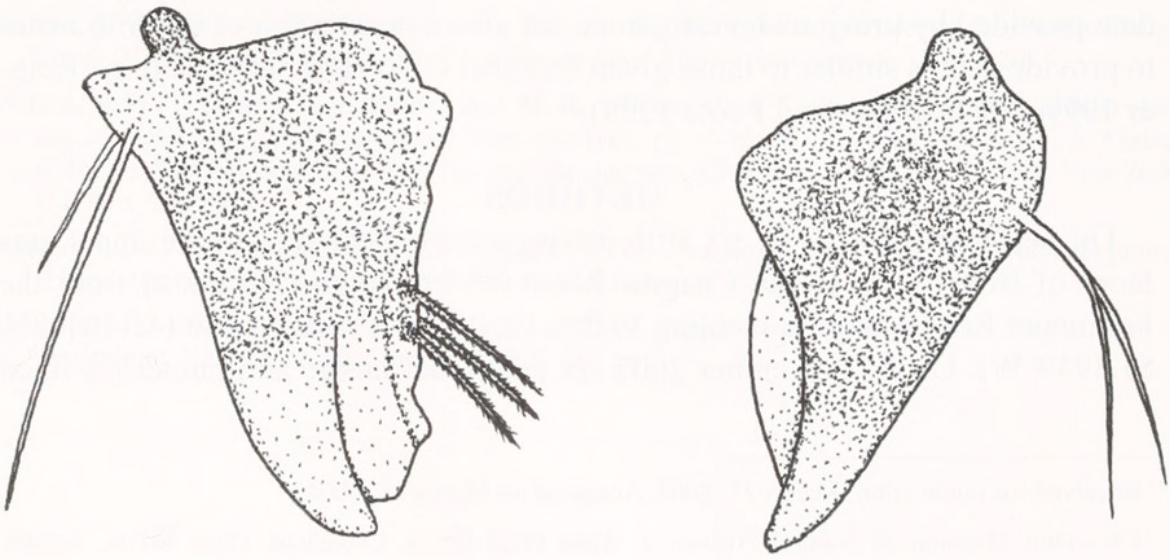

Fig. 1. Right and left mandibles of fifth instar *Leucotrichia pictipes,* ventral view.

Abdomen: Milky white, concolorous with thoracic soft tissue, completely green in life; widest at segments 5 and 6 ($\bar{x}$ = 0.59 ± 0.29 mm); first abdominal segment with posterodorsal sclerite 0.20-0.25x as long as metathoracic sclerite; segments 2-7 each with small sub-rectangular brown sclerite; segment 8 with rectangular sclerite approximately 0.25x length of metathoracic sclerite; segment 9 with rectangular dorsal brown sclerite; segment 10 with prolegs, each with sheath-like sclerite positioned laterad, prolegs with apical hook strongly curved to 900 angle; abdominal setal areas sa2 a small sclerotized dot with one seta, sa3 similar to sa2 but with 2 setae. Refer to figures given in Ross (1944, p. 120), McAuliffe (1982, p. 1559), and Wiggins (1996, p. 89) for further illustrations of larval and case morphology.

Average water depth was 39.8 (15.0) cm, pH was 7.2 (0.7), and water temperature was 21.5 (3.2) °C. Total suspended solids (TSS) were only measured four times (2000-2002) with a mean of 24.7 (5.5) mg/L. One TSS reading was 411 mg/L and treated as an outlier; this value was the result of heavy rains and subsequent siltation, and illustrates the variability of physical parameters that *L. pictipes* and other invertebrate taxa face in the Chagrin River. Bed composition of the riffle varied from 50-80 percent gravel and cobble with few boulders, with the remainder composed of sand and silt. Since 1985, the Cumulative Index Value has averaged 22.6 (5.8) which represents the low end of the excellent range (Ohio Department of Natural Resources 2001). Benthic macroinvertebrates co-occurring with *L. pictipes* often included water penny beetle larvae (Coleoptera: Psephenidae), riffle beetle adults (Elmidae), mayfly nymphs (Ephemeroptera), stonefly nymphs (Plecoptera: Perlidae), dobsonfly larvae (Megaloptera: Corydalidae), net-spinning caddisfly larvae (Trichoptera: Hydropsychidae), damselfly nymphs (Odonata: Coenagrionidae), crane fly larvae (Diptera: Tipulidae), midge larvae (Diptera: Chironomidae), crayfish (Decapoda), aquatic worms (Annelida), leeches (Hirudinea), clams (Bivalvia: Sphaeriidae), and pouch snails (Gastropoda: Physidae). Overall, the Chagrin River represents a clean water stream with a large proportion of gravel and cobble in the substrate that supports a diverse macroinvertebrate assemblage.

The cause for the narrow distribution of *L. pictipes* in Ohio remains unknown. The habitat parameters and macroinvertebrate assemblage of the Chagrin River, while in seemingly good condition for its proximity to a major metropolitan area (Cleveland), do not appear unusual. However, our information illustrates the benefits of repeated collections of immatures and adults even when an area has been well-studied. The fixed retreats of *L. pictipes* are firmly attached to rock substrates (McAuliffe 1982) making them difficult to obtain with standard sampling devices such as kick nets. The larvae were initially found in 2001 only after lifting a riffle rock from the water and examining the surface closely. However, studies of adult distribution and abundance have also failed to obtain this species. It is also possible that *L. pictipes* has only recently become established in Ohio and the Chagrin River.

The final instar of *L. pictipes* is easily distinguished from other co-occurring species of Hydroptilidae based on the enlarged abdomen. However, other characters are notably different from other microcaddisflies. The legs of *L. pictipes* are subequal, whereas other species for which the larvae are described exhibit a shortened foreleg compared to the middle and hind legs. The prosternal sclerites

of *L. pictipes* are quite small and widely separated, whereas other genera possess large sclerites that are approximated medially. Lastly, each dorsal abdominal sclerite is large, dark, conspicuous, and lacking central membranous areas.

The larval morphology is fairly unusual for Hydroptilidae and Trichoptera in general as is typical for the tribe Leucotrichiini, as the abdominal segments are greatly distended. Enlarged abdomens are also seen in *Zumatrichia* (Flint 1970, Wiggins 1996) and Wiggins' (1996, p. 75) key to hydroptilid genera gives characters that separate *Zumatrichia* and *Leucotrichia.* The mandibles of *L. pictipes* are asymmetrical, which is the norm for microcaddisflies (see Keiper and Foote 2000, Keiper 2002, and references therein). When compared to other species of Hydroptilidae, the mandibles exhibit similarity to species that specialize at piercing algal cells and draining their contents, such as *Hydroptila* (Nielsen 1948, Keiper and Foote 1999, 2000), *Oxyethira* (Nielsen 1948, Keiper and Walton 1999, Keiper 2002), and *Orthotrichia* (Nielsen 1948, Keiper 2002), or species that are more generalized trophically and scrape periphyton and pierce large algal cells, such as *Ochrotrichia* (Keiper and Foote 2000). In all those taxa, the right mandible is more pointed than the left, and indeed those species that pierce algal cells invariably maintain a grip on the algal cell with the strongly cusped or serrated left mandible while the acutely pointed right punctures the cell wall. The mandibles of *L. pictipes* are strongly cusped and seemingly appropriate for scraping algal substrates (McAuliffe 1982), but the outer cusp of the right mandible is pointed even though there is no evidence that this species attacks large algal cells. The setae on the inner edge of the left mandible are strongly textured with pubescence not seen on other microcaddisfly scrapers such as *Ochrotrichia.* The advantage to having the inner setae pubescent is unknown, but may aid the collection of scraped material (e.g. diatoms). This synthesis of mandibular morphology information among Hydroptilidae suggests that larvae were originally adapted to feed on algal filaments (such as the green alga *Cladophora*). *Leucotrichia* then radiated to the scraping guild, retaining some of the primitive morphological characters such as an acutely pointed right mandible that does not aid the scraping of periphyton. However, because the immatures of only a handful of the approximately 300 Nearctic species (Morse 1993) have been described, this hypothesis remains tentative.

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