

THE CADDISFLIES (TRICHOPTERA) OF OTTER CREEK, WISCONSIN*

JEFFREY C. STEVEN and WILLIAM L. HILSENHOFF
Department of Entomology
University of Wisconsin, Madison

Abstract

By collecting and rearing larvae, sweeping bank vegetation, and using a black-light trap, 79 species or genera of caddisflies were identified or tentatively identified from collections made at Otter Creek. We believe that all except 9 may have developed in the stream. Six species, *Hydroptila valhalla*, *H. virgata*, *Oxyethira anabola*, *Lepidostoma libum*, *L. vernale*, and *Triaenodes dipsius* have not been recorded previously from Wisconsin. Most species are univoltine with relatively short emergence periods, but several have many cohorts and extended emergence periods.

INTRODUCTION

Caddisflies or Trichoptera are insects with aquatic larvae, aquatic pupae, and terrestrial adults. They comprise one of the largest orders of aquatic insects. Within the United States there are 18 families, 142 genera, and at least 1213 species (Merritt and Cummins, 1978). Wiggins (1977) estimated more than 10,000 species worldwide. Based mostly on studies by Longridge and Hilsenhoff (1972, 1973), Hilsenhoff (1981) reported 16 families, 71 genera, and 218 species from Wisconsin.

Trichoptera are holometabolous with five larval instars, and most species are univoltine. The larvae are known for their variety of cases, although some build nets and retreats instead. Through a small opening at the tip of the labium caddisfly larvae emit silk that is used either to cement together cases or to construct nets and retreats. Cases aid in respiration, protect against abrasion, and provide camouflage to protect from predation. Nets are used as retreats or to collect food from flowing water. Caddisfly larvae have evolved to exploit resources in a variety of running and still waters ranging from cool to warm streams, and

from lakes and permanent ponds to temporary ponds (Wiggins 1977). Because of this broad diversification, caddisfly larvae are important indicators of water quality, as well as an important source of food for fish.

Adults are cryptically colored and resemble moths, but their wings have hairs instead of scales, hence their name Trichoptera (trichos = hair, ptera = wings). They are relatively short-lived, with most species living less than a week or two. Some species may feed, but most only drink water. They are active at night, and most species are attracted to lights, but during the day they are inactive and stay in cool areas. Eggs are laid in masses in or above the water.

Previous collections indicated that Otter Creek has a diverse caddisfly fauna. The purpose of our study was to determine the species of caddisflies and their distribution in this small, spring-fed, woodland stream on the south slope of the Baraboo Range in south-central Wisconsin. Otter Creek has excellent water quality and is one of the cleanest streams in southern Wisconsin (Hilsenhoff 1977). Because of this and other considerations, The Nature Conservancy has purchased much of the land through which the headwaters flow to protect it for future generations.

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Within North America in recent years there have been several similar studies of caddisflies in streams or small watersheds. The objectives of these studies have varied as have techniques used to sample the caddisfly fauna. Larval collections have been frequently used (Mingo *et al.* 1977, McElravy and Foote 1978, Karl and Hilsenhoff 1979, Mingo and Gibbs 1980), but only about 39% of the larvae of North American caddisfly species are known (Wiggins 1977). Rearing larvae to the better known adults, supplemented by net collections of adults (Karl and Hilsenhoff 1979, Mingo and Gibbs 1980), or net collections of adults from along the stream (Ellis 1962, Mingo *et al.* 1977), are other techniques that have been used, but some species are difficult to capture by these methods. Light-traps, especially those using

black-light, were employed by Ellis (1962), Resh *et al.* (1975), McElravy and Foote (1978) and Morse *et al.* (1980) to capture adult caddisflies from streams being studied, but there are two serious problems with relying on this technique. Some species are not attracted to light and most are excellent fliers that disperse widely, so that individuals from nearby streams, ponds, lakes, and marshes may be captured along with those from the study stream.

Emergence traps placed over the stream provide a technique that assures capture of adult caddisflies from the study stream (Corbet 1966b, Anderson and Wold 1972, Flannigan 1977, Mingo and Gibbs 1980, Masteller and Flint 1980). The only problem with this technique is vandalism to the large and conspicuous traps, and this is often so serious that it precludes the use of traps on streams frequented by the public. In any study, however, it is advantageous to use as many collecting techniques as possible.

MATERIALS AND METHODS

Our study was conducted on the headwaters of Otter Creek in the northeast corner of Wisconsin's driftless area (T11N, R6E, S-28, 29, 32, 33). This stream descends rapidly, 107 m in 4 km (Narf and Hilsenhoff 1974), from the Baraboo Range onto a flat outwash plain and then flows south about 25 km into the Wisconsin River. The substrate of the creek varies from muck, sand, and accumulated vegetative debris in pools, to boulders, cobbles, pebbles, gravel, and sand in the riffles. Water depths and stream widths depend upon the season and rainfall. Otter Creek is a soft-water stream with low total alkalinity (16 ppm), low total nitrogen (0.30 ppm), low total phosphorous (0.03 ppm), low total solids (62 ppm), and a pH varying from 6.3-7.3 during the year (Hilsenhoff 1977).

Six sampling sites were chosen to represent various ecological habitats within the stream (Fig. 1). *Site 1* is a 6 m long spring seep that feeds into Otter Creek. It flows out between

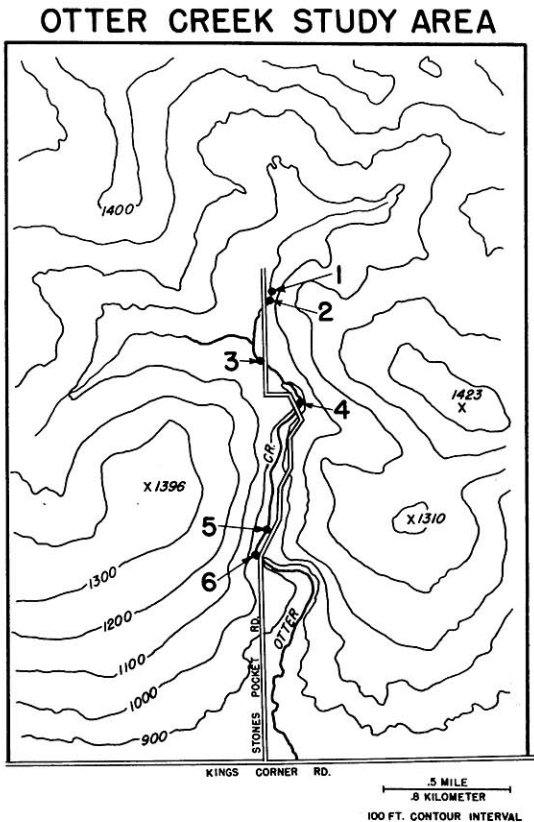


Fig. 1. Location of sampling sites.

two large sandstone boulders under a large oak tree, dropping 1 m over its 6 m length. The average width and depth are 0.4 m and 5 cm respectively. The substrate is predominantly fine sand and muck with scattered 5 to 12 cm cobbles. Leaf packs line the margins, with up to 20 cm of oak leaves covering the seep in the fall. *Site 2* is a 50 m portion of the creek above and below site 1. Its average width is 4 m and average depth 15 cm, with riffles predominating over pools. The substrate consists of scattered boulders, cobbles, pebbles, gravel, and sand, with leaf mats tending to wedge between larger rocks. *Site 3* is 20 m upstream from the third bridge north of Kings Corner Road. It is dominated by pools averaging 5.5 m wide and 0.5 m deep. The substrate is fine to coarse sand and muck with accumulations of tree branches and logs along the margins. *Site 4* is 10 m upstream from the second bridge north of Kings Corner Road. It is a 3 m wide rocky riffle composed mostly of 12 to 25 cm cobbles, with an underlying substrate of coarse gravel and sand. Leaf packs are common between the rocks. The average depth is about 15 cm. In the fall, filamentous green algae occurs at this site as well as at sites 2 and 3. *Site 5* is a 50 m long run with scattered riffles and is located at a wayside about 0.2 km north of the first bridge. The predominant substrate is large boulders with gravel and sand along the bottom. Leaf packs are numerous along the margins and the tree canopy is more open than at other sites. It is the widest (about 8 m) and deepest site (0.6 m average). *Site 6* is 6 m upstream from the first bridge north of Kings Corner Road. It has a moderate deciduous tree canopy. Most samples were taken from a riffle with large boulders, cobbles, leaf packs, and a sand and gravel base. Shallow pools are located just above and below the riffle. The average width is about 5 m and average depth about 0.4 m.

Using a D-frame aquatic net with 0.7 x 0.9 mm mesh openings, larvae were collected from each study site every two weeks from

19 March 1980 to 14 September 1980, and monthly from 17 October 1980 to 31 March 1981. Samples were collected from riffle, pool and bank areas at each site. Large rocks and logs were inspected, and caddisfly larvae were removed. Larvae from each site were preserved in a single jar of 70% ethanol and returned to the laboratory for identification and enumeration.

From 2 April 1980 to 14 September 1980, a second set of larval samples was collected at each site. This composite of riffle, pool, and bank samples was placed in a polyethylene bag half-full of water, leaves, and aquatic vegetation. In addition, one or two 2-gallon polyethylene pails were filled 3/4 full with typical substrate and aquatic vegetation from the site. Both pails and bags were returned to the laboratory in large coolers containing ice to keep the organisms cool. Approximately 120 liters of stream water were also returned to the laboratory.

Upon returning to the laboratory, substrates from each site were put into a 10-gallon glass aquarium along with enough stream water to fill the aquarium 3/4 full. Predators that were seen were removed. The substrate covered about the bottom 5 cm of each aquarium and was arranged to simulate the stream bottom, with additional vegetation or rocks piled above the water to aid emergence. The contents of the polyethylene bags were then gently poured into each aquarium. A high flow of compressed air through two air stones at one end of each aquarium provided water movement and oxygenation. A screen was placed over each aquarium to retain emerged adults.

The aquaria were maintained at a temperature and photoperiod similar to that of Otter Creek. Material from each sample date was usually reared for 2 months, after which the aquaria were cleaned and remaining caddisfly larvae were preserved in 70% ethanol.

During each visit to Otter Creek, about 10 minutes were spent at each site collecting adult caddisflies with a 30.5 cm diameter

sweep net. Tree bark, large rocks and under-sides of bridges were visually checked for adult caddisflies. All adults were preserved in 70% ethanol for later identification.

A black light was used every two weeks during the summer of 1980 to trap adult caddisflies, mostly at Site 4. A 6-watt black-light (G.E. F6T5/BL) was placed in the center of a 24 x 21 cm baffle attached above a 20 cm diameter funnel below which a pint mason jar containing 70% ethanol was attached. A 12 volt car battery, which was kept inside a 10-gallon trash can, provided electricity. The light-trap was set on top of the trash can at the midpoint of a white twin-sized bed sheet stretched between two poles. It was turned on about 1/2 hour before sunset and run about 4 hours. Caddisflies flying down the funnel were trapped in the alcohol, and aspirators were used to collect them from the sheet. They were also collected by sweeping vegetation around the sheet and along the creek.

Larvae and adults in the University of Wisconsin Insect Collection that were collected from Otter Creek between 1963 and 1979 were also examined. Most adults had been reared by Richard Narf during his

study of the stoneflies (Narf and Hilsenhoff 1974), and most larvae had been collected by students taking the aquatic insects course. Wayne K. Gall loaned to us additional larvae and adults from his personal collection.

RESULTS AND DISCUSSION

Seventy-nine species or genera were identified or tentatively identified from collections made at Otter Creek (Table 1). This represents more than one-third of the species known to occur in Wisconsin (Hilsenhoff 1981). Six of them, *Hydroptila valhalla*, *H. virgata*, *Oxyethira anabola*, *Lepidostoma libum*, *L. vernale*, and *Trianonodes dipsius* are new records for Wisconsin. In addition, a female *Pseudostenophylax* was reared and tentatively identified as *P. sparsus*, which would also be a new record for Wisconsin. It differed from two other females we tentatively identified as *P. uniformis*. Unfortunately larvae and female adults of many caddisfly species cannot be identified, and male adults frequently had to be relied upon for positive identification.

In addition to the 43 species positively identified from Otter Creek as larvae or reared adults, larvae of at least 6 more

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.

<i>Species</i>	<i>Collections</i>	<i>Number</i>	<i>Dates</i>	<i>Habitat</i>
HYDROPSYCHIDAE				
<u>Cheumatopsyche</u> spp.	larvae	464	year-around	throughout stream
Wallengren, 1891				
<u>Cheumatopsyche gracilis</u>	reared	22m 11f	18May-09Jul	boulder riffles
(Banks, 1899)	light-trap	41m 598f	05Jun-02Sep	at site 6
<u>Cheumatopsyche oxa</u>	reared	19m 13f	09May-29Aug	rock riffles
Ross, 1938	light-trap	22m 368f	25Jun-02Sep	at sites 2 & 4
<u>Cheumatopsyche pasella</u>	light-trap	1m 1f	09Jul, 14Aug	
Ross, 1941				

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

<i>Species</i>	<i>Collections</i>	<i>Number</i>	<i>Dates</i>	<i>Habitat</i>
<u>Cheumatopsyche pettiti</u> (Banks, 1908)	light-trap	9m 23f	05Jun-19Aug	
<u>Diplectrona modesta</u> Banks, 1908	larvae reared	90 1m	08Jul-24Apr 28May	rock riffles at site 2
<u>Hydropsyche betteni</u> Ross, 1938	larvae reared light-trap sweep	71 1m 1f 8m 98f 1m	27Aug-18Jun 25Jul 05Jun-02Sep 12Jun	rock, boulder riffles at sites 2 & 6
<u>Hydropsyche bidens</u> Ross, 1938	light-trap	1m 1f	05Aug, 05Jun	probably from Wisconsin River
<u>Potamyia flava</u> Banks, 1900	light-trap	1m	05Aug	probably from Wisconsin River
<u>Ceratopsyche bifida</u> (Banks, 1905)	light-trap*		2f 25Jun	
<u>Ceratopsyche bronta</u> (Ross, 1938)	light-trap		2f 09Jul	
<u>Ceratopsyche riola</u> (Denning, 1942)	larvae reared light-trap	185 1m 7m	12Jul-23May 27May 05Jun-22Jul	rock riffles at sites 4 & 6
<u>Ceratopsyche slossonae</u> (Banks, 1905)	larvae pupae reared light-trap	821 2m 34m 37f 55m 614f	year-around 04Jun, 02Jul 28May-22Aug 05Jun-02Sep	rock, boulder riffles at sites 2-6
<u>Ceratopsyche sparna</u> (Ross, 1938)	larvae reared light-trap sweep	20 1f 2m 54f 1f	24Jul-20Jan 24May 05Jun-19Aug 23May	rock riffles at sites 2 & 4-6

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

<i>Species</i>	<i>Collections</i>	<i>Number</i>		<i>Dates</i>	<i>Habitat</i>
PHILOPOTAMIDAE					
<u>Chimarra aterrima</u>	larvae	556		year-around	rock, boulder
Hagen, 1861	pupae	1m	1	31Jul-14Aug	riffles at
	reared	7m	9f	30May-18Aug	sites 2 & 4-6
	light-trap	2m	3f	05Jun-19Aug	
	sweep	56m	60f	25May-08Sep	
<u>Dolophilodes distinctus</u>	larvae	22		03June-14Jun**	
(Walker, 1852)	light-trap	1m		19Aug	
	sweep	1m		19Apr	
POLYCENTROPODIDAE					
<u>Nyctiophylax moestus</u>	larvae	5		24Apr-02Aug	pools, reduced
Banks, 1911	reared	3f		30Jun-13Jul	current at site 2
	light-trap	250m	936f	05Jun-19Aug	
<u>Phylocentropus placidus</u>	light-trap	9m	7f	05Jun-19Aug	sites 1 & 3
(Banks, 1905)	sweep	1m	2f	04Jun-18Jun	
<u>Polycentropus aureolus</u>	light-trap	1m		09Jul	
(Banks, 1930)					
<u>Polycentropus centralis</u>	larvae*	13		02Jul-02Apr	riffles at
Banks, 1914	light-trap	82m	84f	05Jun-02Sep	sites 2-4
	sweep	1m	1f	02Jun, 18Jun	
<u>Polycentropus flavus</u>	larvae*	9		05Nov-19May**	
(Banks, 1908)					
<u>Polycentropus pentus</u>	reared	1m		08Sep	pools at site 3
Ross, 1941	light-trap	5m	7f	05Jun-05Aug	
<u>Polycentropus remotus</u>	larvae*	5		31Aug-20Apr	pools at
Banks, 1911					sites 2 & 3

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

<i>Species</i>	<i>Collections</i>	<i>Number</i>		<i>Dates</i>	<i>Habitat</i>
PSYCHOMYIIDAE					
<u><i>Lyte diversa</i></u>	larvae	18		27Aug-18Jun	decaying wood at
(Banks, 1914)	reared	4m		11Jun-01Jul	site 3
	reared (6-Mo.)	49m	20f	17Dec-23Apr	
	light-trap	13m	22f	05Jun-09Jul	
	sweep	16m	15f	04Jun-18Jun	
<u><i>Psychomyia flavida</i></u>	larvae	1		19Mar	boulder riffles
Hagen, 1861	light-trap	197f		05Jun-02Sep	at site 6
	sweep	3f		12Jun-18Jun	
GLOSSOSOMATIDAE					
<u><i>Glossosoma intermedium</i></u>	light-trap	1m	3f	04May-05Jun	
(Kapalek, 1892)					
<u><i>Glossosoma nigrrior</i></u>	larvae	1031		year-around	rock riffles in
Banks, 1911	reared	116m	112f	30Apr-19Sep	moderate current
	light-trap	7m	28f	05Jun-19Aug	at sites 2-6
	sweep	4m	12f	23May-14Aug	
HYDROPTILIDAE					
<u><i>Agraylea multipunctata</i></u>	light-trap	3f		05Jun	probably from
Curtis, 1834					lakes or ponds
<u><i>Hydroptila consimilis</i></u>	light-trap	12m	166f	05Jun-05Aug	
Morton, 1905					
<u><i>Hydroptila grandiosa</i></u>	light-trap*	13f		05Jun-09Jul	
Ross, 1938					
<u><i>Hydroptila hamata</i></u>	light-trap*	4f		09Jul	
Morton, 1905					

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

<i>Species</i>	<i>Collections</i>	<i>Number</i>	<i>Dates</i>	<i>Habitat</i>
<u>Hydroptila jackmanni</u> Blickle, 1963	light-trap	2m	25Jul	
<u>Hydroptila valhalla</u> Denning, 1947	light-trap	5m	09Jul-22Jul	
<u>Hydroptila virgata</u> Ross, 1938	reared	2m	01Jul	rock riffles, and pools
<u>Hydroptila waubesiana</u> Betten, 1934	light-trap*	23f	05Jun-19Aug	
<u>Hydroptila wyomia</u> Denning, 1947	light-trap*	393f	25Jun-05Aug	
<u>Ochrotrichia spinosa</u> (Ross, 1938)	light-trap	3m 4f	09Jul-22Sep	
<u>Orthotrichia aegerfasciella</u> (Chambers, 1873)	light-trap*	2f	09Jul	probably from lakes or ponds
<u>Oxyethira anabola</u> Blickle, 1966	larvae* light-trap	2 5f	04Apr** 05Jun-25Jun	rock riffles
<u>Stactiobiella palmata</u> (Ross, 1938)	light-trap	1m 11f	05Jun-25Jun	

BRACHYCENTRIDAE

<u>Micrasema kluane</u> Ross and Morse, 1973	larvae reared reared (5 Mo.) reared (8 Mo.) light-trap sweep	83 4lm 38f 10m 5f 3m 1f 1m 1f 29m 17f	27Aug-05May 27Apr-08Jun 10Dec-18Dec 03Apr-23May 05Jun 23May-12Jun	large moss- covered rocks at site 2
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TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

<i>Species</i>	<i>Collections</i>	<i>Number</i>	<i>Dates</i>	<i>Habitat</i>
<u>Micrasema rusticum</u>	larvae	70	14Sep-09May	rock riffles at
(Hagen, 1868)	reared	36m 50f	14May-15Jul	site 4
	light-trap	45m 230f	05Jun-22Jul	
	sweep	39m 12f	04Jun-12Jun	
<u>Micrasema wataga</u>	larvae	17	23May-05Jun	boulder riffles
Ross, 1938	light-trap	3m	25Jun	at site 5
HELICOPSYCHIDAE				
<u>Helicopsyche borealis</u>	larvae	170	year-around	rock riffles
(Hagen, 1861)	reared	1m 4f	01Jul-09Jul	at site 4
	reared (5 Mo.)	1m	29Dec	
	light-trap	10m 8f	25Jun-05Aug	
	sweep	2m 1f	12Jun-18Jun	
LEPIDOSTOMATIDAE				
<u>Lepidostoma bryanti</u>	larvae	39	18Jan-09May	leaf packs in
(Banks, 1908)	reared	4m 2f	11May-25Jul	pools at
	reared (8 Mo.)	3m	23Mar-07Apr	sites 2, 3,
	light-trap	29m 245f	05Jun-25Jun	5 & 6
	sweep	3m	25May-12Jun	
<u>Lepidostoma costalis</u>	larvae	12	12Dec-28Jan	stones in
(Banks, 1914)	reared	3m 2f	28Jul-05Aug	moderate current
				at sites 2 & 6
<u>Lepidostoma griseum</u>	larvae	20	28Jan-08Jul	pools at
(Banks, 1911)	pupa	1	24Jul	sites 2, 4 & 6
	reared	1m	20Aug	
<u>Lepidostoma libum</u>	larvae	656	year-around	leaf packs in
Ross, 1941	pupae	111	17Jun-26Aug	spring seep at
	reared	402m 403f	30Apr-08Sep	site 1
	sweep	2m 4f	14Aug-02Sep	

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

<i>Species</i>	<i>Collections</i>	<i>Number</i>	<i>Dates</i>	<i>Habitat</i>
<u>Lepidostoma sackeni</u>	larvae*	10	20Jan-29Jul	leaf packs in
(Banks, 1936)	reared	2m 10f	30Jul-26Aug	spring seep at
	sweep	2m 1f	14Aug-08Sep	site 1
<u>Lepidostoma vernale</u>	larvae*	18	07Nov-31Mar	leaf packs in
(Banks, 1897)	reared	4m	07Apr-13Apr	seep at site 1
LEPTOCERIDAE				
<u>Ceraclea tarsipunctata</u>	light-trap	29m 42f	25Jun-09Jul	
(Vorhies, 1909)				
<u>Ceraclea transversa</u>	light-trap	21m 21f	09Jul-19Aug	
(Hagen, 1861)				
<u>Leptocerus americanus</u>	light-trap	3f	09Jul	probably not
(Banks, 1899)				from Otter Cr.
<u>Mystacides sepulchralis</u>	larvae	17	14Aug-05Jun	reduced current
(Walker, 1852)	reared	10m 9f	23Jun-27Aug	at sites 2,
	reared (6 Mo.)	1f	06Apr	3 & 5
	light-trap	1f	19Aug	
	sweep	6m 1f	12Jun-16Jul	
<u>Nectopsyche sp.</u>	light-trap	1f	09Jul	probably not
				from Otter Cr.
<u>Nectopsyche pavida</u>	light-trap*	1f	05Aug	probably not
(Hagen, 1861)				from Otter Cr.
<u>Oecetis avara</u>	larvae	123	02Jul-23May	sandy, swift
(Banks, 1895)	reared	3m 2f	09Jun-23Jun	water at
	light-trap	186m 75f	05Jun-22Jul	sites 2 & 4
	sweep	9m 16f	04Jun-13Jul	

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

<i>Species</i>	<i>Collections</i>	<i>Number</i>		<i>Dates</i>	<i>Habitat</i>
<u>Oecetis cinerascens</u> (Hagen, 1861)	reared	1m		11Sep	pools at site 3
<u>Oecetis inconspicua</u> (Walker, 1852)	light-trap	28m	25f	05Jun-19Aug	probably from nearby ponds
<u>Triaenodes dipsius</u> Ross, 1938	light-trap		1f	02Sep	
<u>Triaenodes tardus</u> Milne, 1934	light-trap		5f	25Jun-19Aug	
LIMNEPHILIDAE					
<u>Anabolia consocia</u> (Walker, 1852)	larvae	12		12Dec-18Jun	pools, margin
	reared	2m	2f	05Jun-07Aug	of creek at
	light-trap	1m	1f	08Sep, 25Jun	sites 2, 3 & 5
<u>Frenesia missa</u> (Milne, 1935)	larvae	8		15Jul-30Oct	spring seep at
	pupa	1		03Oct	site 1
	sweep	2m		05Nov, 20Jan	
<u>Hesperophylax designatus</u> (Walker, 1852)	larvae	9		24Jan-28Jan	intermittent
	light-trap	1m	2f	05Jun	feeder
<u>Hydatophylax argus</u> (Harris, 1869)	larvae	46		31Aug-02Apr	pools, in leaf
	light-trap		8f	05Jun-25Jun	packs at
	sweep		1f	12Jun	sites 2, 3 & 5
<u>Ironoquia lyrata</u> (Ross, 1938)	larvae	27		23Apr-11Jul	muck areas near banks at
	reared	1m	1f	11Aug	sites 2, 4 + 6
	light-trap	1m		19Aug	
<u>Limnephilus</u> sp.	larvae	3		09Mar-23Apr	pools at site 3

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

<i>Species</i>	<i>Collections</i>	<i>Number</i>	<i>Dates</i>	<i>Habitat</i>
<u>Neophylax concinnus</u> McLachlan, 1871	larvae	281	09Mar-28Jan	rock riffles at
	pre-pupae	29	02Jul-31Jul	sites 2, 4 & 6
	pupae	26	12Aug-03Oct	
	reared	2m 4f	10Sep-22Sep	
	sweep	4m 3f	10Sep-03Oct	
<u>Neophylax oligius</u> Ross, 1938	larvae	262	20Jan-11Sep	rock riffles at
	pupae	20	14Aug-27Aug	sites 2, 4 & 6
	reared	30m 22f	08Aug-22Sep	
	light-trap	3m 3f	02Sep	
	sweep	5m 2f	08Sep	
<u>Platycentropus radiatus</u> (Say, 1824)	larvae	80	17Oct-04Jun	pools at site 3
	reared	1m 1f	29Jul, 21Jul	
	light-trap	1m 1f	09Jul, 05Aug	
<u>Pseudostenophylax</u> spp. Martynov, 1909	larvae	125	07Nov-26Aug	spring seep at site 1
<u>Pseudostenophylax sparsus</u> (Banks, 1908)	reared*	1f	09Jun	spring seep at site 1
<u>Pseudostenophylax uniformis</u> (Betten, 1934)	pupa	1m	01Jul	spring seep at site 1
	reared*	2f	25Jun, 16Jul	
<u>Pycnopsyche guttifer</u> (Walker, 1852)	larvae*	745	12Dec-17Oct	pools, reduced current at
	pupae	69	11Aug-27Aug	sites 2-6
	reared	330m 318f	22Aug-14Sep	
	light-trap	69m 38f	02Sep-11Oct	

TABLE 1. Occurrence of species of Trichoptera at Otter Creek.—(Continued)

<i>Species</i>	<i>Collections</i>	<i>Number</i>	<i>Dates</i>	<i>Habitat</i>
<u><i>Pycnopsyche lepida</i></u>	larvae*	94	09Dec-22Aug	pools, reduced
(Hagen, 1861)	reared	3m 10f	18Aug-03Sep	current at
	light-trap	27m 51f	19Aug-08Sep	sites 2-5
<u><i>Pycnopsyche scabripennis</i></u>	larvae*	411	12Dec-24Jul	pools, reduced
(Rambur, 1842)	pupae	2	31Jul, 14Aug	current at
	reared	3m 4f	17Aug-29Aug	sites 2-6
	reared (5 Mo.)	1m 6f	13Apr-27Apr	
	light-trap	21m 10f	05Aug-08Sep	
MOLANNIDAE				
<u><i>Molanna blenda</i></u>	larvae	16	14Sep-18May	sand in moderate
Sibley, 1926	reared	3m 6f	11Jun-01Aug	to slow current
	reared (4 Mo.)	1m	23Mar	at sites 2-4
	light-trap	3m	05Jun-09Jul	
	sweep	1m	05Jun	
ODONTOCERIDAE				
<u><i>Psilotreta indecisa</i></u>	larvae	144	12Jul-30Apr	sand in
(Walker, 1852)	pupa	1	15Jul	moderate current
	reared	13m 9f	30Mar-13Jun	at sites 2-6
	light-trap	6m 15f	05Jun	
	sweep	5f	12Jun-02Jul	
PHRYGANEIDAE				
<u><i>Banksiola crotchii</i></u>	light-trap	1m	09Jul	probably from
Banks, 1943				lakes or ponds
<u><i>Oligostomis ocelligera</i></u>	larvae	2	17Oct, 12Dec	pools at site 2
(Walker, 1852)				
<u><i>Ptilostomis ocellifera</i></u>	larvae*	54	14Sep-06May	pools at site 2
(Walker, 1852)				

*Identification tentative.

**Collected in previous years, but not during study.

species were collected from Otter Creek. Three *Limnephilus* larvae were collected, but could not be identified to species. The 54 *Ptilostomis* larvae were thought to be *P. ocellifera*, but no confirming adults were reared or collected, and the *Oxyethira* larvae were probably *O. anabola*, the only *Oxyethira* species collected as an adult. Larvae of 3 species of *Polycentropus* were collected and tentatively identified as *P. centralis*, *P. flavus*, and *P. remotus* using the key by Ross (1944), while adults of *P. centralis*, *P. aureolus*, and *P. pentus* were collected and positively identified. This indicates that *P. centralis* larvae were correctly identified, but suggests that since larvae of *P. aureolus* and *P. pentus* are unknown, they may have been collected and incorrectly identified as *P. flavus* or *P. remotus*. Similarly, *Hydroptila jackmanni* and *H. valhalla* were identified only from males; their females and those of some other species of *Hydroptila* have not been described. Females of *H. jackmanni* and *H. valhalla* may have been collected and incorrectly identified as *H. grandiosa*, *H. hamata*, *H. waubesiana*, or *H. wyomia*, four species that were tentatively identified only from collections of females. Several other species that are known to live in streams similar to Otter Creek were collected in significant numbers, but identified only as adults. These include *Cheumatopsyche pettiti*, *Hydroptila consimilis*, *Stactobiella palmata*, *Ceraclea tarsipunctata*, *C. transversa*, *Oecetis inconspicua*, and *Phylocentropus placidus*, all of which probably developed in Otter Creek. It therefore appears that a minimum of 56 species of caddisflies live in Otter Creek, and that 10 to 14 more species that were collected only as adults may also develop in the stream.

Although most species of caddisflies were attracted by the black-light, some obviously were not. *Chimarra aterrima*, *Glossosoma nigrrior*, *Micrasema kluane* and the species of *Lepidostoma* except *L. bryanti*, and both species of *Neophylax* did not appear to be

attracted to light. In addition, females of several species were much more attracted to light than males. These include *Cheumatopsyche gracilis*, *C. oxa*, *Hydropsyche betteni*, *Ceratopsyche slossonae*, *Nyctiophylax moesta*, *Hydroptila consimilis*, *H. wyomia*, *Micrasema rusticum*, and *Lepidostoma bryanti*. We must point out, however, that males of some species of caddisflies fly mostly just before dawn while females fly in the evening (personal communication: David S. White, University of Michigan). Special mention should also be made of the fact that only females of *Psychomyia flavida* were collected, supporting Corbet's contention (1966a) that populations of this species are frequently parthenogenic. In *Oecetis avara*, males were more attracted to light than females.

Most of the species in Otter Creek are apparently univoltine, some with short periods of emergence and others with several cohorts that emerge over a prolonged period. A few species may be bivoltine, and one, *Psilotreta indecisa*, is probably semi-voltine.

The fauna of the spring seep (Site 1) is of special interest. Larvae of *Frenesia missa*, *Pseudostenophylax uniformis* and/or *sparsus*, *Lepidostoma libum*, *L. sackeni*, and *L. vernale* were collected only from this seep. Larvae of the other 3 species of *Lepidostoma*, *L. bryanti*, *L. costale*, and *L. griseum* were never found in the seep and occurred only in the stream. Ours is only the second North American record for *L. libum*, which was abundant in the spring seep. Its absence from collections since its discovery in Illinois by Ross (1944) probably results from adults not being attracted to light-traps, which are widely used to collect caddisflies.

Two observations related to terrestrial pupae deserve special mention. *Hydatophylax argus* larvae constructed cases of circular leaf pieces in early autumn, and moved to cases they constructed of bulky

wood chunks as winter approached. Larvae with both types of cases were readily collected in the autumn, but were never found in the 2 months prior to their emergence in June. Is it possible that this species has a terrestrial pupa as reported by Flint (1958) for *Ironoquia parvula*? We collected larvae of another species of *Ironoquia*, *I. lyrata*, and reared them to adults on submerged substrate in an aquarium, showing for the first time that unlike *I. parvula* this species has an aquatic pupa.

Specimens collected in this study are deposited in the University of Wisconsin Insect Collection, except for *Cheumatopsyche pasella*, which is at Florida A & M University, Tallahassee, Florida, and *Ironoquia lyrata*, which is at the Royal Ontario Museum, Toronto, Ontario.

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