THE CADDISFLIES (TRICHOPTERA) OF STILLFORK SWAMP NATURE PRESERVE, CARROLL COUNTY, OHIO

by

John Daily Usis

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ABSTRACT

THE CADDISFLIES (TRICHOPTERA) OF STILLFORK SWAMP NATURE PRESERVE, CARROLL COUNTY, OHIO

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A survey of Trichoptera (caddisflies) was conducted in 1984 and 1985 at Stillfork Swamp Nature Preserve, Carroll County, Ohio. The purpose of the study was to collect and identify the caddisfly species and to evaluate their community structure, diversity and seasonal distribution. Specific interest was placed on the distributional ranges of species to evaluate post-glacial and zoogeographical relationships of the Trichoptera inhabiting northeastern Ohio. Comparisons between this unglaciated study site and Watercress Marsh, a glaciated wetlands, 18 kilometers north of Stillfork Swamp are addressed.

A total of 7,974 adult Trichoptera was collected representing nine families, 37 genera, and 104 species. *Polycentropus clinei* (L)., *Hydropsyche incommoda* Hagen, *Pycnopsyche aglona* Ross, and *Frenesia difficilis* (Walker) were new state records. The family Leptoceridae was the largest assemblage represented by 25 species and constituted 22.5 percent of the collection. The genus *Limnephilus* was the most abundant genus comprising 17.6 percent of the season total. Shredders, the largest trophic category, constituted 31.7

percent of the species and represented 37.8 percent of the total collection.

Conclusions reached from this study indicated that a large assemblage of still-water Trichoptera inhabit the unpolluted swamp. Most of the species are northern in range and confirm the probability that Stillfork Swamp may have or is serving as a refugium for these boreal species.

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LIST OF SYMBOLS

SYMBOL	DEFINITION
r	Pearson's Correlation Coefficient.
H	Brillouin's Diversity Index.
J	Evenness Value.
S	Species.
N	Collection Size.

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INTRODUCTION.

In ponds and streams, insects are usually the most conspicuous form of life and occur with great abundance and diversity. Aquatic insects occupy a wide variety of habitats and within each major taxon (order, family, and genus:) show remarkable adaptability to many aquatic environments. It is thought that aquatic insects were derived from terrestrial ancestors which invaded the waters on different occasions during the course of their evolution. The exact sequence is not known but probably the earliest was a mayfly-like insect (250 million B.P.) of the now extinct order Paleodictyoptera (Usinger, 1956). Subsequent invasions of aquatic environments included stoneflies (Plecoptera), dobsonflies (Neuroptera), beetles (Coleoptera), and true bugs (Hemiptera) during the Permian (220 million B.P.). Caddisflies (Trichoptera), true flies (Diptera), and parasitic Hymenoptera first appeared in the fossil record during the Jurassic (160 million B.P.). Moths and butterflies (Lepidoptera) did not appear until early Tertiary 160 million B.P.) (Brues et al., 1954). Miocene fossils indicate that the modern trichopteran fauna was well differentiated by the Cenozoic Era and many of its lineages were well represented more than 20 million years ago (Ross, 1965).

The order Trichoptera, one of the larger groups of aquatic insects, includes an estimated 1,200 North American species (Wiggins, 1978) and a world-wide total exceeding 10,000 species (Wiggins, 19773. The Trichoptera exhibit remarkable diversity of form, behavior, and habitat adaptations. In all probability, Lepidoptera and Trichoptera evolved from a common ancestor, a neuropteroid insect with net-veined wings that resembled present day Megaloptera, e.g. alderflies (Sialidae). Unlike the Lepidoptera, larval Trichoptera lost their spiracles and became wholly dependent upon an aquatic or semi-aquatic environment. Although caddisflies are holometabolous and aquatic as immatures, the adults transform to a winged terrestrial form. These secretive, highly excitable adults are normally active after dusk. The adults are readily attracted to lights and are found in abundance near suitable habitats. Caddisfly larvae occupy most types of freshwater habitats from cold springs to rivers, marshes, lakes, and temporary pools (Wiggins, 1977).

MacKay and Wiggins (1979) proposed that trichopteran diversity is an expression of the "ecological opportunities made possible by the secretion of silk, a proteinaceous secretion of all caddisflies. BY using silk to fashion a variety of shelters and other devices, larval Trichoptera have evolved adaptative systems to exploit a wide range of resources".

The recognition of Trichoptera as an insect group important in many aquatic ecosystems (Resh, 1974; Resh and Unzicker, 1975) has resulted in increased research in the areas of caddisfly behavior, biology, ecology, and energetics. The narrow ecological requirements of some caddisfly taxa and the more general requirements of other members of the order have proven to be viable indicators of water quality (Hilsenhoff, 1977).

The first published study of Ohio Trichoptera (Marshall, 1939) listed 47 species from Western Lake Erie with their relative abundance and seasonal distribution. Ross (1944) reported additional records for Ohio Trichoptera. During the past decade Ohio caddisflies have been under increased investigation. Studies by McElravy et al. (1977), McElravy and Foote (1978), Masteller and Flint (1979), MacLean and MacLean (1980, 1984), Peterson and Foote (1980), Huryn and Foote (1981, 1983) have added to the total number of caddisfly species known for Ohio. Huryn and Foote (1983) reported 15 families, 55 genera, and 200 species of Trichoptera known to occur in Ohio. This represents over 83 percent of the families and 39 percent of the genera known to occur in North America. Currently, 205 caddisfly species have been reported for Ohio by the above authors.

The greatest number of records of Ohio caddisflies is from the Glaciated Appalachian Plateau Province (Figure 1). No doubt many additional species will be recorded from the Unqiaciated Appalachian Plateau and other little studied physiographic regions of Ohio. Huryn (1982) conservatively estimates that a total of nearly 250 caddisfly species will eventually be recorded from Ohio.

Most studies of Ohio Trichoptera have focused on exclusively lotic habitats. The 69 species and 10 families of Trichoptera reported for Watercress Marsh by MacLean and MacLean (1984) demonstrated the diverse caddisfly fauna of lentic environments. Watercress Marsh, a small isolated wetlands located near the southern extent of glaciation in Columbiana County (Figure 2), supports a large and diverse caddisfly fauna including a number of glacial relict species.

FIGURE 1. Map showing location of the study area in northeastern Ohio, the glacial boundary, Flushing Escarpment, and other documented Trichoptera collection sites within Ohio, (o).


LAKE ERIE
WILLIAMS
FULTON
LUCAS
OTTAWA
DEFIANCE
HENRY
WOOD
SANDUSKY
ERIE
LORAIN
CUYAHOGA
LAKE
GEAUGA
ASHTABULA
TRUMBULL
PAULDING
PUTNAM
HANCOCK
SENECA
HURON
MEDINA
SUMMIT
PORTAGE
MAHONING
VAN WERT
ALLEN
WYANDOT
CRAWFORD
RICHLAND
ASHLAND
WAYNE
STARK
COLUMBIANA
Stillfork Swamp
MERCER
AUGLAIZE
HARDIN
MARION
MORROW
HOLMES
CARROLL
KNOX
TUSCARAWAS
LOGAN
SHELBY
UNION
DELAWARE
COSHOCTON
HARRISON
JEFFERSON
DARKE
MIAMI
CHAMPAIGN
LICKING
MUSKINGUM
GUERNSEY
BELMONT
CLARK
FRANKLIN
MADISON
PREBLE
MONTGOMERY
FAIRFIELD
PERRY
NOBLE
MONROE
GREENE
FAYETTE
PICKAWAY
MORGAN
HOCKING
WASHINGTON
BUTLER
WARREN
CLINTON
ROSS
ATHENS
VINTON
HAMILTON
CLERMONT
HIGHLAND
PIKE
JACKSON
MEIGS
BROWN
ADAMS
SCIOTO
GALLIA
LAWRENCE
OHIO RIVER
N
Study Area
Flushing Escarpment
Glacial Boundary

The purpose of the present study was to evaluate the trichopteran fauna of an unglaciated wetland area situated in close proximity to the Wisconsin glacial boundary in eastern Ohio. Ross (1965) and Howden (1969) discussed the importance of refugia to the insect fauna during the Pleistocene. Such areas have been known for a long time (Adams, 1902, 1905) and include the Appalachian region, considered by Ross (1965) to be an important refugium for Trichoptera. Howden (1969) stated that between the southern edge of the glacial ice and the unglaciated Beringian area no region with any appreciable number of insects existed during the Wisconsinan. Resh et al. (1975) reported that the predominantly northern caddisfly family Limnephilidae is poorly represented in Kentucky. Since this family constitues a dominant group in higher latitudes through much of North America (Wiggins, 1977), species of Limnephilidae no doubt survived the Pleistocene in refugia south of the glacial ice. Limnephilus larvae are predominantly lentic and inhabit environments such as temporary ponds, lake margins, and marshes (Wiggins, 1973b). Stillfork Swamp, Carroll County, Ohio has provided an ideal unglaciated habitat for an extensive period of time (Buchanan, 1980). MacLean (1983) reported the possible origins of the Trichoptera fauna near the Wisconsinan glacial boundary in Mahoning and Columbiana Counties, Ohio.

An intensive survey of the caddisflies inhabiting Stillfork Swamp Nature Preserve was conducted during spring, summer, fall of 1984 and the winter of 1985. The objectives of the study were:

1. To compile a species list of the caddisflies inhabiting Stillfork Swamp Nature Preserve.

2. To quantitatively measure the community structure, diversity, and seasonal distribution of adult Trichoptera occurring within the study area.

3. To address and evaluate post-glacial dispersal and zoogeography of Trichoptera within northeastern Ohio.

4. To compare and contrast the caddisfly fauna of Stillfork Swamp, an unglaciated site, with that of Watercress Marsh (MacLean and MacLean, 1984).

DESCRIPTION OF STUDY AREA.

General Description.

Stillfork Swamp lies nine kilometers northeast of Carrollton and five kilometers south of Augusta on County Road 10, Carroll County, Ohio. The swamp borders Still Fork Creek (Figure 35 in Sections 34 and 35, T 15 N, R 5 W Augusta Township, and Sections 12 and 18, T 14 N, R 5 W Washington Township, Carroll Countr, Ohio (Stein, 1974). Most of the swamp area is owned by the Kent State University Foundation and The Nature Conservancy and constitutes approximately 125 acres. The study area is also known as Specht Marsh (Buchanan, 1980) because of an early railroad station located at the junction of Countr Road 10 and the railroad track which traverses the entire length of the swamp. The land owned by The Nature Conservancy and Kent State University Foundation, 61.48 acres and 29.25 acres respectively, is used as a nature preserve and is managed by the KSU Department of Biological Sciences (Stein, 1974). The remaining wetland areas are privately owned and used for livestock grazing.

Geologic and Physiographic Description.

Stillfork Swamp is located a few kilometers west of the Flushing Escarpment, a dissecting Lexington Peneplain ridge of the Unglaciated Appalachian Plateau physiographic province (Stout and Lamb, 1938). Most of the valleys of northern Carroll and Jefferson Counties are underlain by paleozoic shale, sandstones, limestone, and

FIGURE 2. County map indicating location of Stillfork Swamp, Flushing Escarpment, and the southern limits of glaciation.

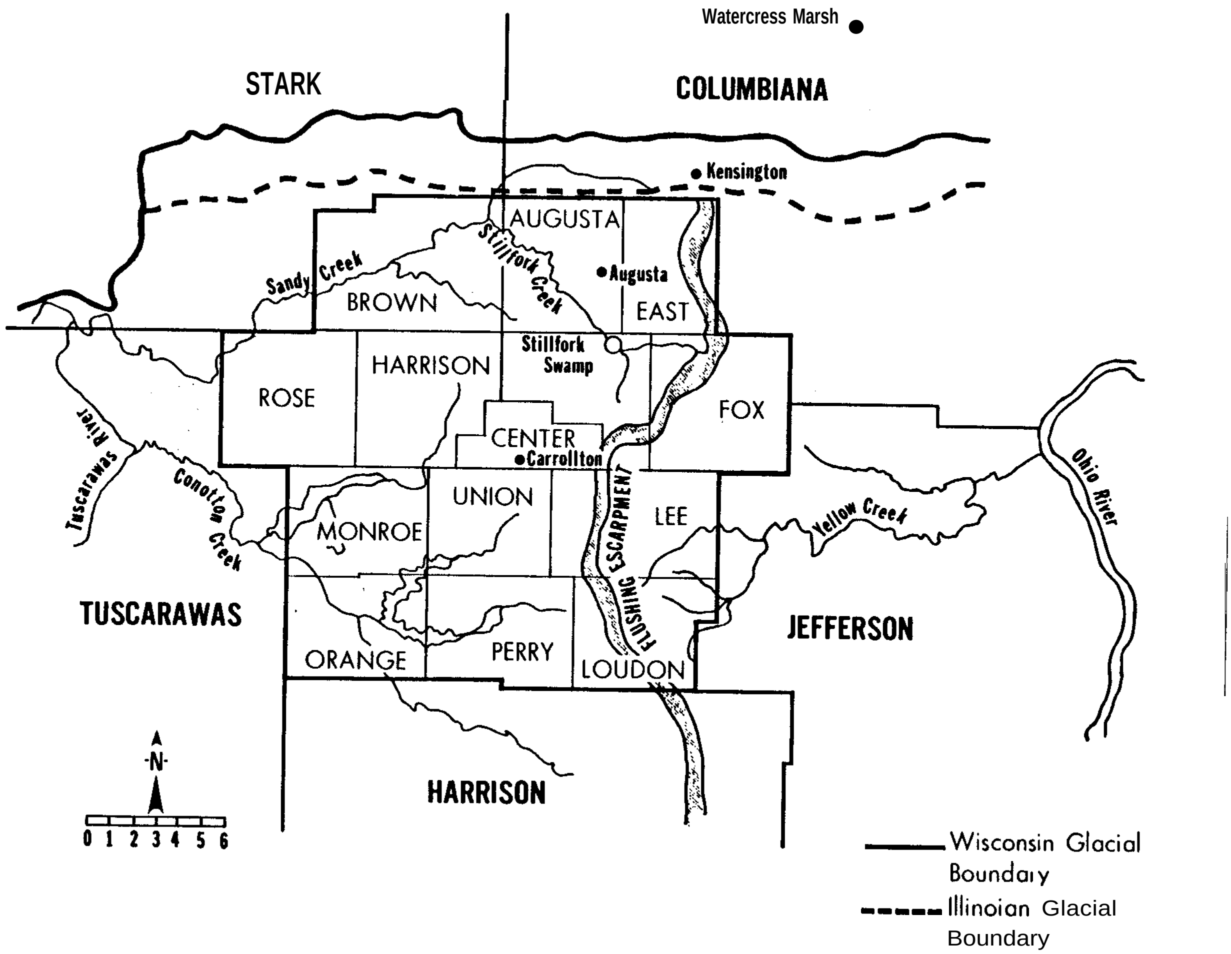

Watercress Marsh
STARK
COLUMBIANA
Kensington
AUGUSTA
Augusta
Sandy Creek
Stillfork Creek
BROWN
EAST
Stillfork Swamp
ROSE
HARRISON
FOX
CENTER
Carrollton
Tuscarawas River
Conotton Creek
UNION
LEE
MONROE
FLUSHING ESCARPMENT
Yellow Creek
Ohio River
TUSCARAWAS
JEFFERSON
ORANGE
PERRY
LOUDON
HARRISON
N
0 1 2 3 4 5 6
Wisconsin Glacial Boundaiy
Illinoian Glacial Boundary

FIGURE 3. Still Fork Creek flowing through Stillfork Swamp Nature Preserve, Carroll County, Ohio. Photograph taken November 23, 1984.

sedimentary rocks of the Pottsville and Allegheny Groups of the Pennsylvanian Age (Wright, 1951).

The Flushing Escarpment? extending north and south through eastern Carroll County (Figure 2), is a major drainage divide of preglacial origin (Stout and Lamb, 1938). The surface immediateir west of the Flushing Escarpment in northern Carroll County has low, narrow ridges and relatively broad! shallow, and poorly drained valleys. During the pre-glacial Teay's Stage, the area now occupied by Stillfork Swamp was a deep, V-shaped valley drained br tributaries of the Dover River which flowed north eventually joining the pre-glacial St. Lawrence River in the Lake Erie basin (Stout and Lamb, 1938).

As the great Pleistocene glaciers advanced from the north, they dammed this north-flowing river system causing the formation of glacial-edged finger lakes. Eventually, entirely new drainage patterns were created forming the large Muskingum River system of southeastern Ohio. Stillfork Swamp is located in one of the valleys which became a finger lake during glacial time (Stein, 1974). The ice sheet advanced to within nine kilometers of the site before climatic changes caused the glaciers to retreat.

The base level of the headwaters flowing westward off the Flushing Escarpment essentially became elevated due to the deposition of sediments eroded from the nearby hills. When the last glacier retreated, the lake waters drained out of the Still Fork Valley and joined Sandy Creek, a tributary of the Tuscarawas River. The former V-shaped valley became a flat lake bed filled with Pleistocene sediments across which Still Fork Creek slowly meanders (Figure 3).

Marshes and swamps developed along the poorly drained stream bed and valley floor. Many of the cold-climate wetland plants and animals became established in this and similar areas along the glacial border and persisted until disturbed by recent agricultural practices (Stein, 1974).

Stein (1974) reported that Stillfork Swamp is "still one of a few remaining areas which serves as a refuge +or many northern species. Despite extensive farming operations in the valley, the construction of a railroad and a road through the center of the swamp, and grazing by livestock, much of the character of a northern swamp remains".

Vegetation of Study Area.

A critical factor for hydrophytes is adequate moisture. Large numbers of such plants are wide-ranging because aquatic habitats occur irrespective of the moisture climate. The occurrence of disjunct northern populations of high-moisture requiring species is the result of their survival in relict swamp and bog habitats dating back to post-glacial times (Braun, 1967).

Cusick and Silberhorn (1977) reported that wetiands are of very limited occurrence in unglaciated Ohio and only small areas of swamp and marshland occur close to the glacial border, principally in Carroll County. Braun (1955) discussed the vascular floral history of this area and reported that during the end of the Tertiary period many different communities of deciduous forest evolved in the Appalachian and adjacent regions.

During the Pleistocene Epoch, specialized habitats within the broad expanse of unglaciated landscape provided refugia for northern plants and animals. A few boreal relicts survive in the floristic region of ungiaciated Ohio (Braun, 1967). These plants presumably are remnants of the boreal community that migrated southward in advance of the Pleistocene. Cusick and Silberhorn (1977) attributed the disjunct populations of boreal plants, restricted to portions of Belmont, Carroll, Columbiana, and Jefferson Counties, to the effects of glaciation and the Flushing Escarpment. Braun (1967) proposed that distributional patterns observed for many species are test explained br consideration of their glacial and post-glacial migration during and after the Wisconsinan Ice Age.

Stillfork Swamp is dominated by species of plants that inhabit meadow, marsh, pond, and littoral zone environments. Small open water areas are scattered throughout the swamp and provide permanent aquatic habitats throughout the rear. Much of the swamp is covered with water from fall to late spring. It undergoes a relatively dry period from mid-July to early November. In general, temporary bodies of water exhibit much greater amplitudes in both physical and chemical conditions than do most permanent aquatic habitats. Animals and plants that inhabit temporary bodies of water have to be extremely tolerant of these conditions if they are to survive (Williams, 1978).

The dominant tree species of Stillfork Swamp are swamp white oak, Quercus bicolor Willd.; pin oak, Quercus palustris Muenchh.; white elm, Ulmus americana L.; red maple, Acer rubrum L.; and common alder, Ainus serrulata (Ait.) Willd. They are found in the swamp communities bordering the open marshes, Among the shrubs and bushes that have invaded the dense swamp and swamp forest are swamp rose, Rosa palustris Marsh.; buttonbush, Cephalanthus occidentalis L.; heart-leaved willow, Salix rigida Muhl.; black willow, Salix nigra L.; silky dogwood, Cornus Amomum Mill.; and meadow-sweet, Spiraea alba DuRoi. The open marsh vegetation contains a variety of sedges, rushes, grasses, and aquatic plants. Heed-canary grass, Phalaris arundinacea L.; swamp-milkweed, Asclepias incarnata L.; marsh fern, Thelypteris palustris Schott,; Halberd-leaved tearthumb, Polygo[illegible]. arifolium L. var pubecens; nannyberry, Viburnum lentago L.; giant bur-reed, Sparganium eurycapum Engelm.: common arrowhead, Sagittaria latifolia Willd.; and wool grass, Scirpus cyperinus (L.) Kunth. are among the herbaceous plants which occur at Stillfork Swamp. Water smartweed, Polygonum natans Eat., and pickerel weed, Pontederia cordata L., line the edges of Still Fork Creek as it slowly winds through the swamp. Water pennywort, Hydroctyle ranunculoides L.f., and star duckweed, Lemna trisulca L., occur in the open ponds. Cat-tails, Typha latifolia L., are present, but not dominant. Swamp rose, giant bur-reed, and smartweed dominate the open marshy areas. By iate July and early August, Stillfork becomes choked with spatterdock, Nuphar advena (Ait.) Ait.f., and Halberd-leaved tearthumb, while the standing water ponds become overgrown with water pennywort and pickerel weed.

Stein (1974) reported the following rare plants for Stillfork Swamp: winterberry, Iiex verticilata (L.) Gray; toothed arrow-wood, Viburnum dentatum L.; shining willow, Salix lucida Muhl.; marsh skullcap, *Scuteliaria epilobiifolia* L.; and vernal water-starwort, *Callitriche verna* L. Stillfork Swamp and Watercress Marsh in Columbiana County are the only two habitats in Ohio from which the swamp jack-in-the-pulpit, *Arisaema stewardsonii* (Britt.) Stevens, is known.

Cusick and Silberhorn (1977) reported an additional rarity for unglaciated Ohio, *Carex comosa* Boott., a sedge species scarce south of the glacial border. Buchanan (1980) reported that the water pennywort of Stillfork Swamp is probably at its northern limits and not indigenous to Ohio.

Faunal Elements.

In addition to the aquatic flora, certain other components of Stillfork Swamp biota illustrate the diversity and uniqueness of this habitat. Buchanan (1947, 1980) reported that long-billed wrens? *Telmatodytes palustris dissaeptus* (Bangs); short-billed wrens, *Cistothorus platensis stellaris* (Naumann); least bitterns, *Ixobrychus e. exilis* (Gmelin); willow flycatcher, *Empidonax t. traillii* (Audubon); marsh hawk, *Circus cyaneus hudsonius* (L.); and warbling vireo, *Vireo g. gilvus* (Vieillot), nest at Stillfork Swamp. Buchanan (1980) reported six state records for the area west of the Flushing Escarpment which includes Stillfork Swamp. The eastern ribbon snake, *Thamnophis sauritus sauritus* (L.); and brown snake, *Storeria dekayi* (Holbrook); was collected in Still Fork Valley, October 1972, but not found elsewhere in the county, The only known spotted turtle, *Clemmys guttata* (Schneider), from unglaciated Ohio was collected in Stillfork Swamp by Buchanan (Conant, 1951). The stinkpot musk turtle, Sternotherus odoratus (Latreille), was collected in 1958 extending the known range for this species in unglaciated eastern Ohio. Stillfork Swamp is also the type locality of the melodius ground cricket, Nemobius melodius Thomas and Alexander, collected in 1957. In Ohio, this species is only known to occur at Stillfork Swamp and Cranberry Island, Fairfield County, and is considered a relict species of northern wetlands.

It is evident that Stillfork Swamp includes habitats characteristic of northern wetlands that have supported many species of plants and animals as disjunct populations since glacial time.

Collection Stations.

Two permanent collection sites were established within the study area. Their locations are shown on Figure 4.

Site No. 1.

This collecting site (Fig. 5) was located approximately 250 m east-northeast of County Road 10 and Still Fork Creek bridge. Site location was primarily based upon the proximity of several acres of swamp forest adjacent to a large expanse of open swamp (Fig. 6). Collections disclosed large numbers of Limnephilus larvae feeding on the submerged, decaying vegetation. This site area was dominated by smartweed and bur-reed. Vegetation bordering the swamp forest at the site was comprised of wool grass, blue-jointed grass, Calamagrostis canadensis (Michx.); swamp milkweed and blue-purple vervain,

FIGURE 4. Map of Stillfork Swamp Nature Preserve, Carroll County, Ohio showing locations of collecting sites 1 and 2.

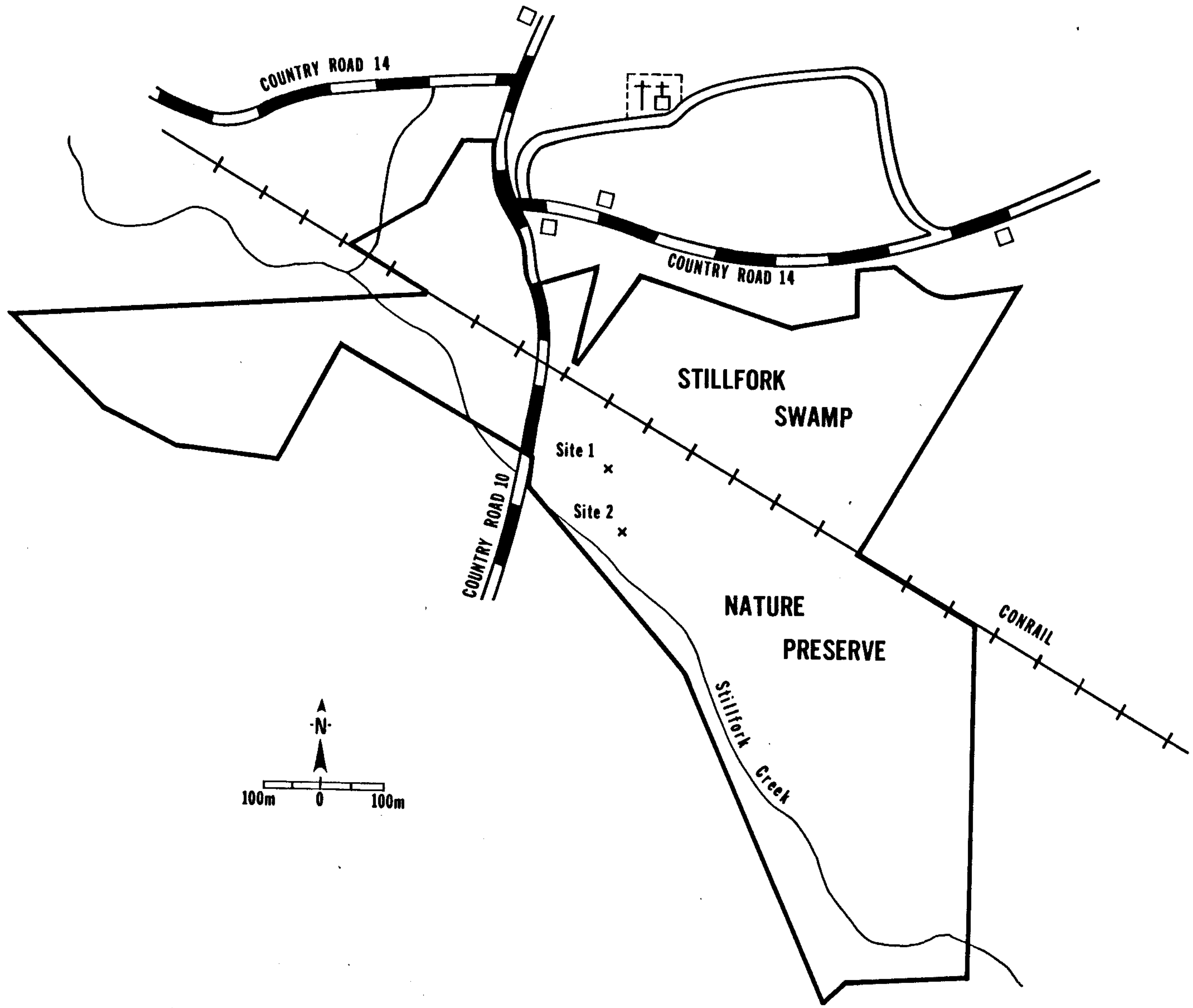
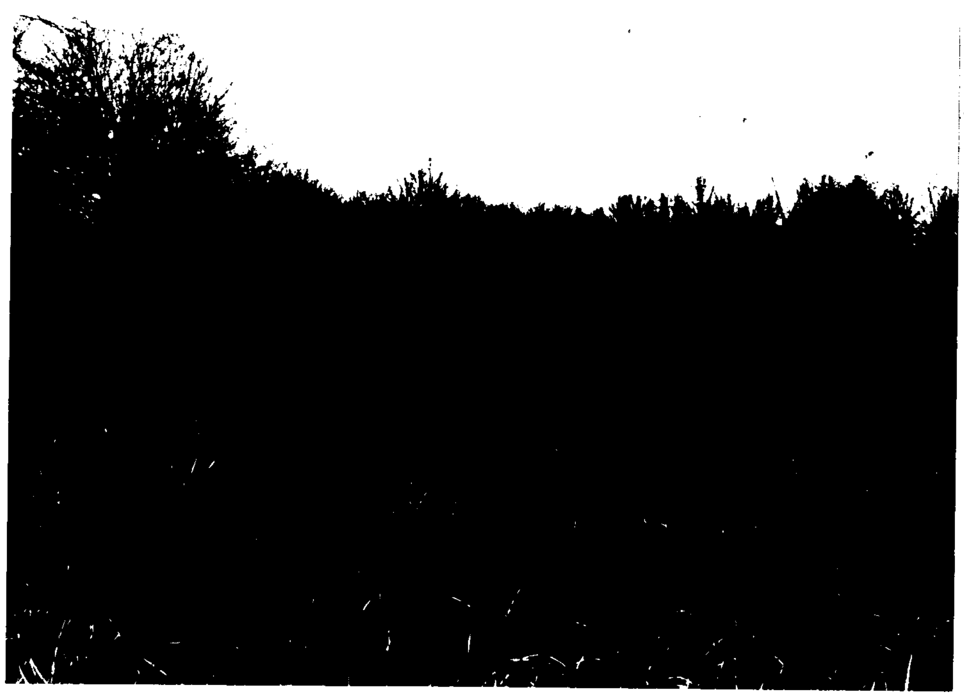

COUNTRY ROAD 14
COUNTRY ROAD 14
STILLFORK
SWAMP
Site 1
Site 2
COUNTRY ROAD 10
NATURE
PRESERVE
CONRAIL
Stillfork Creek
N
100m
0
100m

FIGURE 5. Collection Site 1 dominated by smartweed and bur-reed vegetation. Photograph taken November 23, 1984.

FIGURE 6. Swamp forest adjacent to Collection Site 1. Photograph taken November 23, 1984.



Verbena hastata L.

Physio-chemical analysis of the soil in October, 1984 revealed a pH of 5.2 and 82 percent moisture content: other soil pH measurements showed that the swamp soil ranged from 4.5 to 6.0.

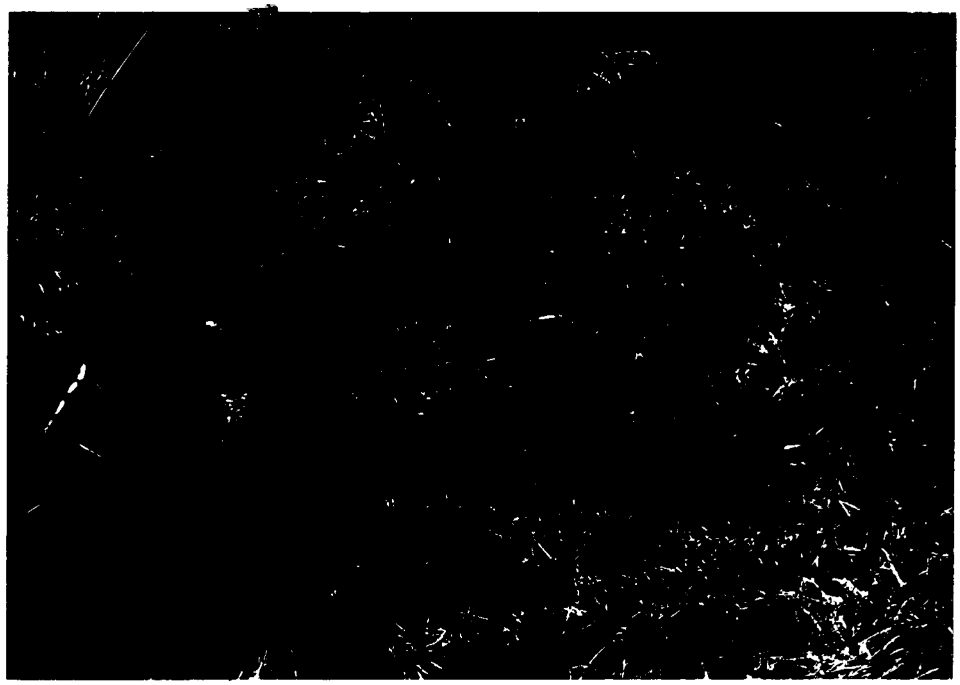
Site No. 2.

This site (Fig. 7) was located several hundred meters south-southeast from No. 1 and was situated much cioser to Still Fork Creek. A 20-30 cm wide intermittent stream that originated from a large bur-reed and arrowhead swamp area (Fig. 8) flowed south past the site and into Still Fork Creek. In spring, large numbers of *Ironoquia* larvae were observed feeding upon submerged, decaying grasses in the slow currents of this stream. Clumps of wool grass and reed-canary grass lined the banks of this temporary stream. In June and July the water level in the stream dropped and was covered by an orange oxidized iron film. Hynes (1970) and Williams (1978) reported that streams in marshy areas are often covered by flocculent brown films (ferric hydroxide) characteristic of high organic matter and low pH. By early August only a muddy bottom was visible as Halberd tearthumb had completely overgrown the swamp rose thickets and buttonbushes which surrounded this site. Passage through the area became very difficult.

Phrsio-chemical data on the intermittent stream taken in November 1934, when it was again flowing showed: (1) pH, 6.5; (2) dissolved oxygen saturation, 45-50 percent; (3) temperature, 2 C; (4) current velocity, 5-10 cm/sec. Grazing first instar caddisfly larvae were observed and collected from the stream on November 23, 1384.

FIGURE 7. Collection Site 2 with intermittent stream and clumps of reed-canary grass and wool grass lining banks. Photograph taken November 23, 1984.

FIGURE 8. Open swamp located near Collection Site 2; origin of intermittent stream. Photograph taken November 23, 1984.



MATERIALS AND METHODS.

Collections of adult caddisflies were made at sites one and two by light traps operated at weekly intervals during the months of May through November 1984. A total of 31 collections were made. Collections o+ larvae and pupae were made irregularly during April, Mar, November, December 1984 and February 1985. Methods used to obtain adult specimens differed from those used for immatures and are treated separately. Collections were made at weekly intervals according to the schedule of Lewis and Taylor (1967).

Adult Collections.

Because most nocturnal insects are photopositive, light traps were employed in sampling adult caddisflies (Ross, 1944). Two 'light traps were purchased from Bio-Quip Products, Santa Monica, California (Universal Light trap No. 2851A) and consisted of a 3 1/2 galion polypropylene bucket, light weight funnel, aluminum top, clear plastic vanes and an eight watt black light tube. Power was supplied by a portable 12 volt DC battery (capable of eight hours use without recharging:). The light traps were operated from approximatelr one-half hour before dusk until sunrise or approximately eight hours. Weekly collections were made throughout the emergence season irrespective of weather conditions. Light trapping began May 2, 1984 and ended November 9, 1984. Specimens were sorted from the light trap material and preserved in 80 percent ethanol. Although light traps collect large numbers of insect species, they are unable to discriminate between endemic and migrant species: therefore, low wattage bulbs to restrict the area sampled were used. Sampling sites were specifically selected to provide samples ot both permanent and temporary lentic and lotic habitats.

<u>immature Collections</u>.

Collections of larvae were primarily carried out prior to and subsequent to the adult emergence period. Habitats in the temporary pools and permanent water areas **as** well as Still Fork Creek were sampled on April 12, 24, November 23, December 17, 1984 and February 10, 1985. The collection method consisted of handpicking specimens from submerged vegetation, mud and silt substrates, and stream rocks and lugs. All collections were made by the authsr, Specimens were placed in 80 percent ethanol and transported to the laboratory for sorting and identification.

<u>Temperature and Physical Data Recordinos</u>.

A Bendix Hygrothermograph, model 594, was used to continuously record the relative humidity and temperature of the air from June 1 through November 9, 1984. The hygrothermograph was located within the Nature Preserve approximately 25 meters west of permanent sampling site No. 2. The hygorthermograph was housed in a louvered instrument shelter, approximately 20cm above the ground surface. The location, selected underneath a swamp rose thicket, was free from direct sunlight and precipitation. Recording charts were changed every collection date, Relative humidity and temperature values were accurate to ± 2.0 percent and ± .5 C, respectively. Measurements of soil and water pH, soil moisture, soil and water temperature, dissolved oxygen, and current velocity were made for each permanent sampling station as well as Still Fork Creek for descriptive purposes.

Identification of Trichuptera.

Caddisfly specimens, Loth adults and immatures, were identified with the use of keys and descriptions by Betten (1934, 1950); Ross (1938a, 1938b, 1941, 1944, 1947, 1956, 1966); Ross and Merkley (1950); Schmid (1951, 1952, 1855, 1970); Flint (1953, 1960, 1962, 1964); Denning (1956); Blickle (1963, 1964, 1979); Denning and Blickle (1972); Morse (1972, 1975); Wiggins (1973a, 1975, 1977); Gordon (1974); Schuster and Etnier (1978); Sykora and Weaver (1978); and Kelly and Morse (1982). In most cases adults were identified to species. Specimens that could not be positively identified and new state records were sent to authorities for contirmation (Dr. J. B. Wallace, Professor, University of Georgia - Leptoceridae, Hydropsychidae, Polycentropodidae; Dr. O. S. Flint, Jr., Curator, National Museaum, Smithsonian Institute - Hydroptilidae, Limnephilidae). Adult genitalia were cleared in saturated potassium hydroxide solution (Ross, 1944) and preserved in genitalia vials filled with 80 percent ETOH. Adult specimens and accompanying genitalia were placed in 2 dram shell vials of 80 percent ETOH. Larval specimens were identified at least to genus and preserved the same as adults. Permanent storage of the collection was achieved br plugging shell vials with cotton and immersing them upside down in larger jars filled with 80 percent ETOH (Wiggins, 1977).

Analytical Methods and Data Analysis.

A quantitative description and summary of the characteristics of the trichopteran community inhabiting Stillfork Swamp was one of the objectives of this studr. Because there are almost unlimited mathematical generalities for describing species diversity and taxonomic differences, Hill (1973) proposed that indices used to describe anr species assemblage be simple and well understood. Community structure, as defined by Wilhm and Dorris (1968), is the complex of individuals belonging to the different species in an ecosystem. Most measures of species diversity express the degree of uncertainity in correctly predicting the species identity of an individual selected at random from the community. Various measures of diuersitr have been developed that express species richness (number of species) and evenness (distribution of individuals among the species). The more species in the community and the more equal their abundance, the greater the uncertainity of predicting the species and hence the resultant diversity.

Pielou (1966) recommended that the formula given br Brillouin (1962) be used to assess the diversity of light trap collections of insects due to the non-randomness of the sampling method. For this study, each collection was treated as a discrete population and a diversity index was calculated using Brillouin's formula,

$$H = (\log N! - \sum \log n_i !)/N$$

where N is the sum of individuals of all the species in the collection and n_i is the number of individuals in the i'th species (i = 1,2,...,S).

Lloyd, Zar, and Karr (1968) provide a table of logarithms of factoriats, up to N = 1050. Far N greater than 1050, log n_i! (or log N!) was approximated by Stirling's formula,

$$\log n_i! = (n_i + 0.5)\log n_i - 0.4343\, n_i + 0.3991$$

(Brower and Zarr, 1977).

Theoretical masimum diversity and evenness were calculated according to the derivations of Brower and Zar (1977),

$$H_{max} = [\log N! - (S - r)\log c! - r \log (c + 1)!] / N,$$

where c is the interger portion of N/S and r is the remainder. The concept of evenness may be considered as a mathematical means of describing the distribution of N individuals among the S species. in any particular set of proportional abundances expressed as the nearness of the observed diversity index to its theoretical maximum. Pielou (1969) defined evenness as,

$$J = H / H_{max}$$

and referred to this value as relative diversity.

Diversity indices are of theoretical interest because they can be related to stability, maturity, productivity, evolutionary time, predation pressure, and spatial heterogeneity (Hill, 1973). There are many statistical properties relating to species composition and species number relations and each one mar give a different ordering of the community. Direct biological interpretation of species diversity indices are not necessarily meaningful in their own right, but these measurements may be used as parameters for a given assemblage of species that enable quantitative comparison of different communities or subcommunities.

RESULTS.

A total of 7,374 adult caddisflies was collected at the permanent stations established within Stillfork Swamp Nature Preserve. This total represented nine families, 37 genera, and 104 species. Larval caddisflies were also collected representing four families and nine genera. Of the 104 species collected, four were new distributional records for Ohio. All species of Trichoptera were represented by an adult individual collected by light traps.

Annotated List of Species.

The following list presents data on dates and abundance of caddisflies collected at Stillfork Swamp Nature Preserve during the adult emergence period of 1984. Nomenclature and classification of the Trichoptera essentially follows Wiggins (1977), except for the subfamilies Hydropsychinae and Macronematinae (Ross and Unzicker, 1377; Flint and Bueno, 1982). Species are listed in alphabeticai order within genera. New state records are indicated by an asterisk before a species name.

Philopotamidae

Dolophilodes distinctus (Walker). VI-18-84 (1 male).

Wormaldia shawnee (Ross). VII-8-84 (1 female).

Chimarra aterrima Hagen. VIII-6-84 (1 female); IX-25-84 (1 female).

Chimarra obscura (Walker). VI-18-84 (3 females:): VII-8-84 (1 male); IX-22-84 (2 males>.

Psychomyiidae

Lype diversa (Banks). VI-6-84 (1 male, 5 females.'!; 3-84 (1 male, 1 female); VII-14-34 (1 female).

Psychomyia flavida Haqen. VII-14-84 (1 female).

Polycentropodidae

Nyctiophrlax affinis (Banks). VI-6-84 (1 male); VI-18-84 (1 male); VII-23-84 (1 male).

Nyctiophylax moestus Banks. VI-18-84 i3 males, 7 females).

Polycentropus aureolus (Banks). VI-18-84 (1 male:); VI-25-84 (2 males); VII-1-84 (1 male, 1 female); VII-3-34 (9 males>; VII-31-84 (1 male:).

Polrcentropus centralis Banks. VIII-13-84 (1 male).

Polycentropus cinereus Hagen. VI-6-84 (1 male); VI-11-84 (3 males, 1 female); VI-13-84 (6 males, 41 females); VII-8-84 (1 male, 2 females); VII-14-84 (1 female); VIII-28-84 (1 male); IX-13-34 (5 females).

*Polycentropus clinei (Milne). VI-18-84 (1 male).

Polycentropus confusus Haqen. VI-18-84 (2 females); VII-8-84 (1 male); VII-20-84 (1 male); IX-22-84 (1 female).

Polrcentropus crassicornis Walker. VI-4-84 (1 female); VI-11-84 (1 male>; VI-18-84 (13 males, 29 females); VI-25-84 (1 male): VI1-1-84 (2 males).

Polycentropus interruptus (banks:). VI-18-34 (1 female:).

Polycentropus nr. nascotius Ross. IX-25-84 (2 females).

Polycentropus pentus Ross. VI-18-84 (1 female).

Polycentropus remotus Banks. VI-18-84 12 females); IX-13-84 (1 female).

Polycentropus sp. VII-8-84 (1 female); VII-20-84 (1 female): VIII-23-84 (1 female:).

Phylocentropus lucidus (Hagen). IX-13-84 (1 female)

Phylocentropus placidus (Banks). V-11-84 (1 female); VI-6-84 (2 females); VII-23-84 (1 female).

Hydropsychidae

Cheumatopsyche aphanta Ross. VI-6-84 (1 female); VI-11-34 (1 female); VI-18-84 (1 male, 10 females); VI-25-84 (1 female); VII-9-84 (1 male); VII-14-84 (3 females); VIII-13-84 (1 female).

Cheumatopsyche campyla Ross. VI-6-84 (1 male, 28 females); VI-11-84 (2 males, 5 females); VI-18-84 (30 males, 59 females); VII-8-84 (1 male, 2 females); VII-14-84 (2 males, 9 females:); VII-20-34 (1 male, 11 females); VII-23-84 (3 males, 13 females): VIII-6-84 (3 females); VIII-13-84 (1 male, 2 females:); VIII-28-84 (1 male, 2 females); IX-22-84 11 female).

Cheumatopsyche gracilis (Banks). VI-18-84 (2 males, 4 females); VIII-6-84 (1 male, 4 females).

Cheumatopsyche halima Denning. VI-18-84 (7 females).

Cheumatopsrche oxa Ross. VI-6-84 (1 female); VI-11-84 (3 females:); VI-18-84 (3 males, 14 females:); VII-14-84 (1 female);

VII-23-84 (4 males, 2 females:); VII-31-84 (1 male); VIII-6-84 (1 female).

Cheumatopsyche pettiti (Banks). V-11-84 (10 females); V-25-84 (2 females); VI-6-84 (4 males, 23 females); VI-11-84 (3 males, 51 females); VI-18-84 (45 males, 155 females); VI-25-84 (4 females); VII-1-84 (1 male, 1 female); VII-8-84 (7 males, 40 females); VII-14-84 (3 males, 28 females); VII-20-84 (23 females:); VII-31-84 (9 females); VIII-6-84 (3 males, 14 females); VIII-13-84 (7 males, 18 females); UIII-28-84 (5 males, 5 females); 15-13-84 (8 males, 27 females); IX-22-84 (6 males, 3 females); IX-25-84 (34 males, 18 females>; X-7-84 (1 female).

Cheumatopsyche nr. smithi Gordon. UI-18-84 (I male).

Hydropsyche betteni Ross. VI-6-84 (1 male, 5 females>; VI-11-84 (3 females); UI-18-84 (1 male, 15 females); VII-8-84 (7 females): VI1-14-84 (1 male, 3 females); VII-23-84 (4 females); VI11-6-84 (2 females): VIII-13-84 (2 females); UIII-28-84 (3 females).

Hydropsyche dicantha Ross. UI-11-84 (1 male, 2 females>; VI-18-84 (11 males, 25 females); VII-8-84 (4 females); UII-14-84 (1 female); VII-20-84 (1 female); VII-23-84 (1 female); VII-31-84 (1 female).

*Hydropsyche incommoda Hagen. VI-6-84 (2 females!.

Hydropsyche orris Ross. V-25-84 (3 females:): VI-6-84 (2 males, 13 females); VI-18-84 (12 males, 56 females); VII-8-84 (5 males, 9 females:); VII-14-84 (2 males, 11 females); VII-20-84 (3 males, 1 female); VII-23-84 (1 male, 1 female); VIII-6-84 (2 females).

Hydropsyche phalerata Hagen. VI-18-84 (1 female); VIII-28-84 (1 female).

Hydropsyche simulans Ross. VIII-13-84 (1 mate).

Hydropsyche valanis Ross. VII-20-84 (2 females); VII-23-84 (1 female); IX-8-84 (1 female).

Symphitopsyche bronta (Ross.). VI-6-84 i15 females); VI-11-84 (6 females); VI-18-84 (1 male, 13 females); VII-1-84 (2 males); VII-8-84 (2 females); VII-14-84 (11 females); VII-20-84 (4 males, 8 females): VII-23-84 (3 males, 7 females); VIE-31-84 (1 female); VIII-6-84 (1 female); VIII-13-84 (1 male, 4 females); IX-8-84 (3 females): IX-13-84 (1 female); IX-22-84 (1 female); IX-25-84 (I male, 2 females).

Symphitopsyche cheilonis (Ross). VI-18-84 (1 male, 1 female); VIII-13-84 (1 male).

Symphitopsyche morosa (Hagen). VI-18-84 (1 female).

Symphitopsyche slossonae (Banks). VI-11-84 (3 females); VI-18-84 (2 males, 8 females); VII-20-84 (1 male); VII-23-84 (1 male, 1 female); VIII-6-84 (1 female:); VIII-13-84 (3 females); VIII-28-84 (9 females); IX-13-84 (1 male, 3 females); IX-22-84 (10 females).

Symphitopsyche nr. sparna Ross. 01-18-84 (1 female).

Symphitopsyche walkeri (Betten and Mosely). VI-18-84 (1 male).

Potamyia flava (Hagen). VI-11-84 (1 female); VI-18-84 (15 males, 232 females:); VII-1-84 (1 female); VII-8-84 (40 females); VII-14-84 (7 males, 42 females); VII-20-84 (11 females); VII-23-84 (3 males, 63 females); VIII-6-84

(162 females); VIII-13-84 (16 females); VIII-28-84 (4 males, 271 females); IX-8-84 (1 male); IX-13-84 (2 males, 11 females); IX-22-84 (1 male, 32 females); IX-25-84 (50 females).

Macrostemum zebratum (Hagen). VI-18-84 (1 male).

Rhracophilidae

Rhyacophila Iedra Ross. VI-18-84 (3 males).

Rhyacophila lobifera Betten. V-19-84 (2 mates:); V-25-84 (32 males, 5 females>; VI-5-84 (1 male, 2 females>.

Hydroptilidae

Agraylea multipunctata Curtis. VI-6-84 (1 female); VI-18-84 (1 male); VII-8-84 (10 females:); VII-14-84 (1 female); VII-20-84 (6 females); VII-23-84 (1 female); VIII-6-84 (1 female); IX-13-84 (1 female); IX-25-84 (1 male, 5 females:).

Hydroptila ajax Ross. VI-18-84 (4 males, 5 females); VII-20-84 (15 females); VII-23-84 (3 males, 4 females); VIII-6-84 (1 male, 5 females).

Hydroptila amoena Ross. VII-23-84 (1 female); IX-13-84 (1 female).

Hydroptila angusta Ross. VI-5-84 (1 male); VI-11-84 (1 male); VI-18-84 (1 male, 1 female); UII-8-84 (2 femalesl; VII-20-84 (1 male); VII-23-84 (1 male, 1 female); VIII-6-84 (2 females); IX-22-84 (1 female:); IX-25-84 (5 males, 24 females); X-13-84 (1 female).

Hydroptila consimilis Morton. VI-18-84 (26 males, 19 females);

VII-8-84 (1 male); VII-14-84 (1 female); VII-23-84 (1 female); VIII-6-84 (1 male).

Hydroptila grandiosa Ross. VI-6-84 (2 females); VII-23-84 (1 female); VIII-13-84 (3 females): IX-13-84 (1 female).

Hrdroptila hamata Morton. IX-13-34 (1 female).

Hrdroptila jackmanni Blickle. VI-18-84 (22 males, 20 females).

Hrdroptila perdita Morton. VII-8-84 (1 male): VII-23-84 (1 female); VIII-13-84 (1 female).

Hrdroptila waubesiana Betten. VI-6-84 (7 females); VI-11-84 (2 females); VI-18-84 (5 females); VII-8-84 (33 males, 61 females); VII-14-84 (43 males, 296 females); VII-20-84 i37 males, 110 females); VII-23-84 (12 males, 34 females); VII-31-84 (2 females>; VIII-6-84 (4 females); VIII-13-84 (2 males, 17 females); VIII-28-84 (2 males, 4 females); IX-13-84 (9 males, 22 females).

Hrdroptila sp. VIII-6-84 (1 female).

Ochrotrichia spinosa (Ross). VI-18-84 (11 males, 3 females).

Ochrotrichia sp. VI-18-84 (1 female); VII-8-84 (1 female).

Oxrethira nr. dualis Morton. VI-18-84 (1 female); VII-8-84 (3 females!; VIII-6-84 (1 male, 3 females); IX-22-84 (3 females); IX-25-84 (1 female).

Oxrethira forcipata Mosely. VII-8-84 (2 males); VII-23-84 12 males); VIII-6-84 (2 males); VIII-13-84 (1 male); VIII-28-84 (1 male).

Oxyethira pallida (Banks). VI-18-84 (1 male, 1 female!; VII-8-84 (8 females:); VII-14-84 11 male, 4 females:); VII-20-84 (2 males, 8 females); VII-23-84 (9 males, 26 females); VII-31-84 (1 female); VIII-6-84 (2 males, 28 females); VIII-13-84 (1 male, 9 females); VIII-28-84 (2 males, 2 females); IX-12-84 (2 males, 16 females:); IX-22-84 (7 males, 39 females); IX-25-34 (1 male, 33 females); X-7-84 (1 male, 6 females); X-13-84 (3 females); X-20-84 (1 male, 67 females): X-26-84 (2 males, 67 females); XI-2-84 (6 females).

Oxyethira sp. VII-1-84 (1 female); VII-14-84 (1 female:); VIII-6-84 (1 female).

Stactobiella palmata (Ross). VI-18-84 (1 male).

Orthotrichia aegerfasciella (Chambers). VI-6-84 (1 male); VI-18-84 (19 males, 30 females); VI-25-84 (1 male, 1 female); VII-8-84 (5 males, 11 females); VII-14-84 (2 males, 1 female); VII-20-84 (17 males, 6 females); VII-23-84 (20 males, 10 females); VII-31-84 (3 males, 2 females); VIII-6-84 (25 males, 12 females:): VIII-13-34 (45 males, 13 females); VIII-20-84 (1 male); VIII-28-84 (1 male, 1 female); IX-13-84 11 male); IX-25-84 (1 female).

Orthotrichia cristata Morton. Vf-18-84 i5 males, 1 female); VII-1-84 (1 female); VII-8-84 (4 males, 1 female); VII-14-84 (2 males, 2 females); VII-23-84 (1 female); VII-31-84 (1 male>.

Neotrichia sp. UII-23-84 (1 female).

Phryganeidae

Agrypnia straminea Hagen. IX-22-84 (1 female): IX-25-84 (7 females); X-7-34 (1 male, 1 female).

Agrypnia vestita (Walker). VIII-28-84 (4 males, 3 females); IX-8-84 (4 males, 5 females); IX-13-84 (6 males, 9 females);

IX-22-84 (6 males); IX-25-84 (1 male).

Banksiola crotchi Banks. VI-18-84 (1 female); VII-23-84 (1 male); VIII-6-84 (1 male).

Banksiola dossuaria (Say). VI-18-84 (1 male, 1 female).

Phryganea sayi Milne. VII-23-84 (1 male); VIII-6-84 (6 males, 6 females]; VIII-13-84 (4 males, 7 females); VIII-28-84 (9 males, 3 females); IX-8-84 (1 female:); IX-13-84 (10 males, 16 females); IX-22-84 (1 female); IX-25-84 (1 male).

Ptilostomis ocellifera (Walker). VI-6-84 (3 females]; VI-18-84 (6 males, 9 females); VII-1-84 (1 female); VII-8-54 (2 females); VII-14-84 (1 male, 6 females); VII-20-84 (11 females); VI1-23-84 (5 females); VII-31-84 (4 males, 1 female); VIII-6-84 (3 females); IX-22-84 (1 female).

Ptilostomis postica (Walker). VI-6-84 (1 female); VIII-13-84 (1 female); VIII-20-84 (1 male); VIII-28-84 (2 females); IX-22-84 (1 male); IX-25-84 (1 male).

Limnephilidae

Ironoquia parvula (Banks). IX-25-84 (2 males); X-5-84 (1 female); X-7-84 (19 males, 2 females); X-13-84 (1 male).

Ironoquia punctatissima (Walker). VIII-28-84 (42 males, 25 females>; IX-8-84 (5 males, 6 females); IX-13-84 (114 males, 40 females); IX-22-84 (12 males, 12 females); IX-25-34 (19 mates, 16 females:); X-7-84 (1 male, 2 females:); X-13-84 (1 male, 1 female).

Hydatophylax argus (Harris). VI-6-84 (1 female).

*<u>Pycnopsyche aglona</u> Ross. IX-22-84 (1 male); IX-25-84 15 males:); X-7-84 (39 males, 1 female); X-13-84 (10 males, 6 females).

<u>Prcnopsyche divergens</u> (Walker). VIII-28-84 (1 male).

<u>Pycnopsyche guttifer</u> (Walker). IX-13-84 (1 male); X-20-84 (1 male).

<u>Pycnopsyche indiana</u> (Ross). X-7-84 (11 males, 2 females).

<u>Pycnopsyche lepida</u> Hagen. IX-13-84 (1 male); IX-22-84 (2 males); IX-25-84 (3 males, 3 females); X-13-84 (2 males, 2 females).

<u>Anabolia consocius</u> (Walker). VII-1-84 (1 male); VIII-28-84 (1 male); IX-13-84 (3 males, 2 females); IX-22-84 (5 males); IX-25-84 (2 males); X-13-84 (1 male).

<u>Limnephilus indivisus</u> Walker. V-25-84 11 female); VI-18-84 (1 male, 3 females); VIII-13-84 11 male, 1 female); VIII-28-84 (10 males, 9 females) IX-8-84 (9 males, 5 females); IX-13-84 (157 males, 176 females); IX-22-84 185 males, 102 females); IX-25-84 (129 males, 114 females); X-5-84 (2 males, 4 females); X-7-84 (11 males, 21 females); X-13-84 (6 males, 3 females); X-20-84 (1 male, 1 female); X-24-84 (1 male).

<u>Limnephilus submonilifer</u> Walker. V-11-84 (7 males, 12 females:); V-17-84 11 male, 6 females); U-25-84 (11 males, 6 females); VI-2-84 (2 females); IX-8-84 (4 males); IX-13-84 (30 males, 18 females); IX-22-84 131 males, 41 females); IX-25-84 (95 males, 28 females); X-5-84 (1 female); X-7-84 (54 males, 41 females); X-13-84 (32 males, 6 females); X-20-84 (45 males, 9 females); X-26-84 (39 males, 2 females); XI-2-84 (12 males, 1 female).

<u>Platycentropus radiatus</u> (Say). VII-14-84 (1 female); VII-20-84

(1 female).

*Frenesia difficilis (Walker). XI-2-34 (1 male); XI-9-84 (2 males).

Frenesia missa (Milne). XI-2-84 (3 males); XI-7-84 (16 males).

Neophylax concinnus McLachlan. X-7-84 (1 female); X-13-84 (4 females); X-20-84 (1 male).

Leptoceridae

Ceraclea alaqma (Ross). VI-18-84 (4 males); VI-24-84 (1 male); VII-8-84 (1 male).

Ceraclea cancellata (Betten). VI-13-84 (1 male, 1 female).

~~Ceraclea~~ nr. diluta (Hagen). VI-18-84 (5 females).

Ceraclea flava (Banks). VII-14-84 (1 male).

Ceraclea maculata (Banks). VII-1-84 (1 male); VII-8-84 (1 male): VIII-6-84 (2 females).

Ceraclea tarsi-punctata (Vorhies). VI-18-84 (11 males, 14 females); VI-25-84 (1 male); VII-1-84 (3 males); VII-8-84 (1 male, 2 females); VII-14-84 (1 female:); VII-23-84 (1 female).

Ceraclea transversa (Hagen). VI-18-34 (18 males, 37 females); VII-8-84 (5 males, 1 female); VII-20-84 (2 females); VII-23-84 (2 males, 1 female); VIII-5-84 (2 males, 2 females).

Leptocerus americanus (Banks). VI-18-84 (2 males, 2 females); VII-1-84 (3 males); VII-8-84 (2 females); VII-14-34 (1 female); VII-23-84 (1 female).

Nectopsyche nr. albida (Walker). VI-6-84 (1 female).

Nectopsyche candida (Hagen). VI-18-84 (6 females); VII-14-84

(3 males, 10 females); VIII-13-84 (1 female); VIII-28-84 (2 females).

Nectopsyche diarina (Ross). VI-6-84 (4 females); VI-11-84 122 females:); VI-18-84 (69 females); VI-25-84 (1 female); VIII-6-84 (5 females); VIII-13-84 (3 females); VIII-28-84 (3 females:).

Nectopsyche sp. VII-1-84 (1 female); VII-8-84 (14 females); VII-20-84 (3 females); VII-23-84 (2 females).

Triaenodes abus Milne. VI-18-84 (1 female).

Triaenodes dipsius Ross. VI-18-84 (1 male).

Triaenodes flavescens Banks. VII-8-84 (1 female); VII-14-84 (2 females); VII-23-84 (2 females); VIII-13-84 (2 females:).

Triaenodes injustus (Hagen). VI-18-84 (2 males, 1 female); VII-14-84 (1 male, 1 female).

Triaenodes marginatus Sibly. VI-6-84 (3 males, 6 females); VI-11-84 (3 males, 26 females); VII-1-84 (30 females); VII-8-84 (11 males, 85 females); VII-14-84 (1 male, 23 females); VII-20-84 117 females); VII-23-84 (2 males, 18 females); VII-31-84 13 females); UIII-6-84 (29 females); VIII-13-84 (5 males? 33 females); VIII-28-84 (2 males, 49 females:).

Triaenodes tardus Milne. VI-6-84 (1 male, 6 females); VI-11-84 (1 male, 1 female); VI-18-84 (1 male, 2 females); VI-25-84 (2 males); VII-8-84 (1 male, 2 females>; VII-20-84 (1 female); VII-23-84 (1 male, 2 females!; VII-31-84 (1 female); VIII-6-84 (1 male, 26 females); VIII-28-84 (1 male, 3 females): IX-13-84 (1 male, dl females); IX-22-84 (2 males, 8 females! ; IX-25-84

(3 males, 8 females).

Oecetis cinerascens (Hagen). VI-6-84 (1 male); VI-11-84 (4 males); VI-18-84 (6 males, 3 females): VI-25-84 (2 males); VII-1-84 (1 male): VII-8-84 (1 male>; VII-14-84 (1 male, 1 female); VII-20-84 12 males); VII-23-84 (1 male); VIII-6-84 13 males:); VIII-13-84 (2 males, 1 female); VIII-28-84 (2 females>; IX-25-84 (2 females).

Oecetis ditissa Ross. VI-11-84 (2 females); VI-18-84 (1 male, 16 females); VI-25-84 (3 males); VI1-8-84 (1 male, 2 females); VII-14-84 (1 male, 1 female); VII-23-84 (2 males); VIII-6-84 (1 male, 1 female); UIII-13-84 (1 male, 2 females); VIII-28-84 (1 female); IX-13-84 (2 females); IX-22-84 (1 male).

Oecetis immobilis (Hagen). VIII-13-84 (4 females); VIII-28-84 (1 male).

Oecetis inconspicua (Walker). VI-6-84 (14 males, 7 females); VI-11-84 I50 males, 28 females); VI-18-84 I151 males, 172 females); VI-25-84 123 females); VII-1-84 (15 males, 7 females); VII-8-84 (32 males, 33 females:); VII-14 84 (8 males, 11 females); VII-20-84 (32 males, 16 females); VII-23-84 (54 males, 57 females); VII-31-84 (6 males, 1 female); VIII-6-84 (15 males, 12 females); VIII-13-84 (16 males, 17 females); VIII-28-84 (5 males, 3 females); IX-13-84 (7 females:); IX-22-84 (6 females); IX-25-84 (1 male, 5 females).

Oecetis nocturna Ross. VII-18-84 (1 male, 1 female); VII-8-84 (1 male); VIII-6-84 (2 males, 4 females); VIII-13-84 (1 female); VIII-28-84 (1 male, 2 females).

Oecetis nr. ochracea (Curtis). VIII-6-84 (1 male, 1 female), VIII-13-84 (3 females)

Oecetis sp. VI-18-84 (1 female).

Caddisfly Fauna.

Species belonging to three families made up 75 percent of all the Trichoptera collected (Table 1). The Leptoceridae were the largest assemblage represented by 25 species that constituted 22.5 percent of the total number of species and 24.8 percent of the entire catch. Triaenodes marginatus and Oecetis inconspicua accounted for 8.1 and 10.1 percent of the season's total, and occurred in 40.7 and 55.5 percent of the collections, respectively. Although Triaenodes tardus made up less than 2 percent of the total catch, it occurred in 51.9 percent of the collections.

While Hydropsychidae were present in greater numbers than Leptoceridae, this family had fewer species and made up 19.8 percent of the species present and 27.5 percent of the total collection. Cheumatopsyche campyla and C. pettiti contributed 2.2 percent and 7.8 percent of the total collection respectively and occurred in 40.7 and 66.7 percent of all light trap collections. Potamyia flava, the most abundant species (12.1 percent of the total), was collected in 48.1 percent of the collections. Hydropsyche orris, the most abundant of the species of Hydropsyche, comprised 1.5 percent of the total catch and was present in 29.6 percent of the collections.

The 20 species of Hydroptilidae were the third largest

TABLE 1. Numerical abundance of caddisfly families collected by light traps operated at Stillfork Swamp Nature Preserve, Carroll County, Ohio 2 May through 9 November, 1984.

Family	Number of individuals	Percent of season total	Number of Species	Percent of Species
Philopotamidae	10	0.1	4	3.6
Psychomyiidae	10	0.1	2	1.8
Polycentropodidae	168	2.1	13	12.6
Hydropsychidae	2190	27.5	22	19.8
Rhracophilidae	45	0.6	2	1.8
HYdroptilidae	1563	19.6	20	18.0
Phryganeidae	168	2.1	7	6.3
Limnephilidae	1845	23.1	15	13.5
Leptoceridae	1975	24.8	25	22.5

assemblage and comprised 18.0 percent of the species and 19.6 percent of the seasonal total. *Hydroptila waubesiana* was the most abundant hydroptilid and occurred in 44.4 percent of the samples and represented 8.8 percent of the total collection. *Oxyethira pallida* constituted only 4.5 percent of the total catch, but was found in 62.9 percent of the samples. Although *Orthotrichia aegerfasciella* made up 2.9 percent of the total catch, it occurred in 51.9 percent of the collections.

The family Limnephilidae was represented by 15 species and comprised 23.1 percent of the seasonal total, and was more abundant than the Hydroptilidae. *Limnephilus indivisus* was the second most abundant species in the total collection (10.7 percent) and appeared in 44.4 percent of the collections. *Limnephilus submonilifer* and *Ironoquia punctatissima* accounted for 6.7 and 3.7 percent of the collection total and were present in 48.1 and 25.9 percent of all the light trap collections. Although represented by only two species, the genus *Limnephilus*, was the most abundant genus present at Stillfork Swamp, and comprised 17.4 percent of the seasonal total. This dramatically illustrates the difference between the caddisfly fauna of southern Ohio and Kentucky with that of northern Ohio (Resh et al., 1975; Huryn, 1982; Huryn and Foote, 1983; MacLean and MacLean, 1984).

Adult Sex Ratios.

Sex ratios were determined for species that were present in 25 percent or more of the collections and represented by 100 or more individuals (Table 2). The percentage of females was calculated by determining the arithmetic mean for numbers of males and females in each collection and then averaging for the seasonal totai. The percentage of females varied from 32.4 to 100 percent. In most species, females predominated. These findings are similar to those of Anderson and Wold (1972) and Hesh et al. (1975). It has been suggested that sexes of certain Trichoptera species exhibit preferential attraction to light. Harris (1971) reported that flight activity patterns showed higher proportions of males arriving earlier at light than females. Resh et al. (1975) reported that the closely related species, Cheumatopsyche pettiti and C. campyla, segregated their nightly flight activities on nights when both species were collected. MacLean and MacLean (1984) observed that male Potamyia flava displayed very limited attraction to light, based upon sex ratios in their collections. This observation was also noted at Stillfork Swamp (Table 2). Whether or nut these data represent the true sex ratio of the species is uncertain. Since caddisfly pupae were not collected, it was not known whether adult sex ratios reflected preferential attraction to light or actual population sex differences. Downes (1964) reported that males are rarely encountered in a circumpolar Limnephilid, Apatania zonella Zett., but there is little reason to believe that a 1:25 male to female sex ratio implies a parthenogenetic adaptation for P. flava. While 100 percent of Nectopsyche diarina collected were female, 67.6 percent of Limnephilus submonilifer were male. It was commonly observed that in mast species of Limnephilidae, male emergence preceeded female emergence as indicated by weekly light trap collections. Here again,

TABLE 2. Sex ratios of selected species of adult caddisflies based on light trap collections from Stillfork Swamp, Carroll County, Ohio, 2 Mar through 9 November, 1984.

Taxon	Total Nu. individuals in collection	% Females in light trap collection	% Samples in which species occurred	% of season's total
Hydropsychidae				
Cheumatopsyche campyla	177	76.2	40.7	2.2
C. pettiti	618	78.5	66.7	7.8
Hydropsyche orris	121	79.5	29.6	1.5
Potamyia flava	965	96.5	48.1	12.1
Hydroptilidae				
Hydroptila waubesiana	702	79.7	44.4	8.8
Oxyethira pallida	356	91.0	62.9	4.5
Orthotrichia aegerfasciella	229	38.4	51.9	2.9
Limnephilidae				
Ironoquia punctatissima	296	34.5	25.9	3.7
Limnephilus indivisus	853	51.6	44.4	10.7
L. submonilifer	534	32.4	48.1	6.7
Leptoceridae				
Nectopsyche diarina	107	100.0	25.9	1.3
Triaenodes marginatus	642	92.2	40.7	8.1
T. tardus	138	89.1	51.9	1.7
Oecetis inconspicua	804	47.5	55.6	10.1

whether the emergence pattern demonstrates different emergence times or reflects different female flight behavior is unsubstantiated.

Seasonal Distribution.

Corbet and Tjonneland (1955) stated that evaluation of emergence patterns of short-lived aquatic insects should be based on all night catches. Resh et al. (1975) reported that Ceraclea ancylus (Vorhies) adults have a survivorship of 50 percent beyond a 24 hour period and only 2 percent beyond 48 hours. For several Ceraclea species, attraction to light occurs almost immediately after eclosion for newly emerged adults. Peak flight activity for most caddisflies occurs within the first three hours after sunset (Resh et al. 1975). Although weekly light trapping can miss the rare short-lived species that emerge with temporal uniformity? it allows for a continuous comparison of collections throughout the adult emergence period. During this study, light traps were operated from dusk until sunrise and no measurement of flight activity during successive time periods throughout the night as Nimmo (1966) carried out was attempted.

The seasonal occurrence of adults was examined for 60 of the more abundant caddisfly species collected at Stillfork Swamp (Figure 9). Species were chosen according to the following criteria:

a. If the species occurred in two collections,

b. If the species occurred in only one collection, and its abundance was greater than four.

The remaining species were considered to be too rare to be included in Figure 9.

FIGURE 9. Seasonal occurrence of selected species of Trichoptera adults collected at Stillfork Swamp Nature Preserve, Carroll County, Ohio, May 2 through November 9, 1984. Bars represent species occurrence in week collection.

Lewis and Talyor (1967) Collection Week Periods.

WEEK NO.	DATES	WEEK NO.	DATE
Spring		Summer	
18	Apr. 30 - May 6	32	Aug. 6 - Aug. 12
19	May 7 - May 13	33	Aug. 13 - Aug. 19
20	May 14 - May 20	34	Aug. 20 - Aug. 26
21	May 21 - May 27	35	Aug. 27 - Sep. 2
22	May 28 - Jun. 3		
Summer		Autumn	
23	Jun. 4 - Jun. 10	36	Sep. 3 - Sep. 9
24	Jun. 11 - Jun. 17	37	Sep. 10 - Sep. 16
25	Jun. 18 - Jun. 24	38	Sep. 17 - Sep. 23
26	Jun. 25 - Jul. 1	39	Sep. 24 - Sep. 30
27	Jul. 2 - Jul. 8	40	Oct. 1 - Oct. 7
28	Jul. 9 - Jul. 15	41	Oct. 8 - Oct. 14
29	Jul. 16 - Jul. 22	42	Oct. 15 - Oct. 21
30	Jul. 23 - Jul. 29	43	Oct. 22 - Act, 28
31	Jul. 30 - Aug. 5	44	Oct. 29 - Nov. 4
		45	Nov. 5 - Nov. 11

FIGURE 9

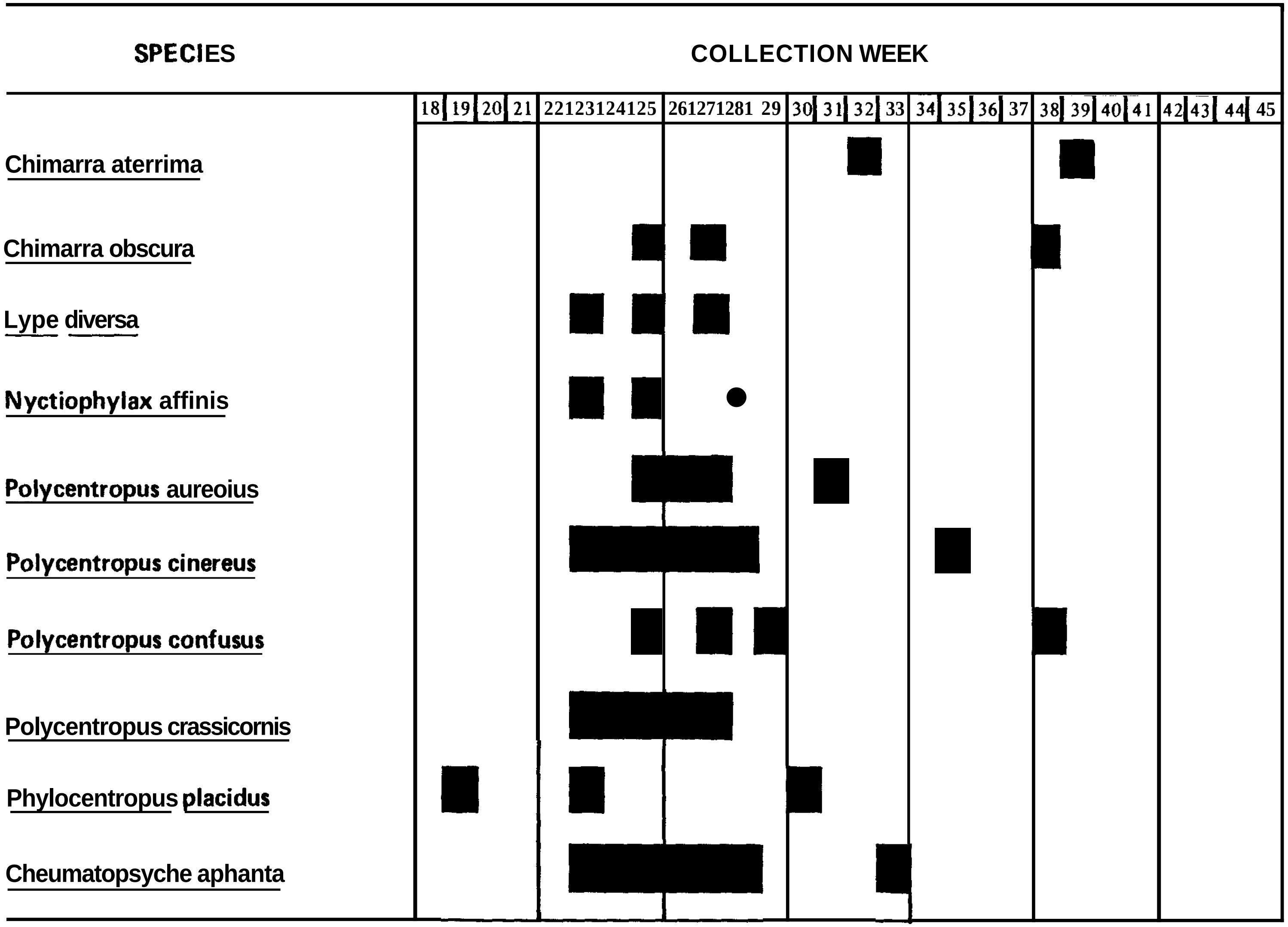

SPECIES
COLLECTION WEEK
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45
Chimarra aterrima
Chimarra obscura
Lype diversa
Nyctiophylax affinis
Polycentropus aureoius
Polycentropus cinereus
Polycentropus confusus
Polycentropus crassicornis
Phylocentropus placidus
Cheumatopsyche aphanta

FIGURE 9 (Continued)

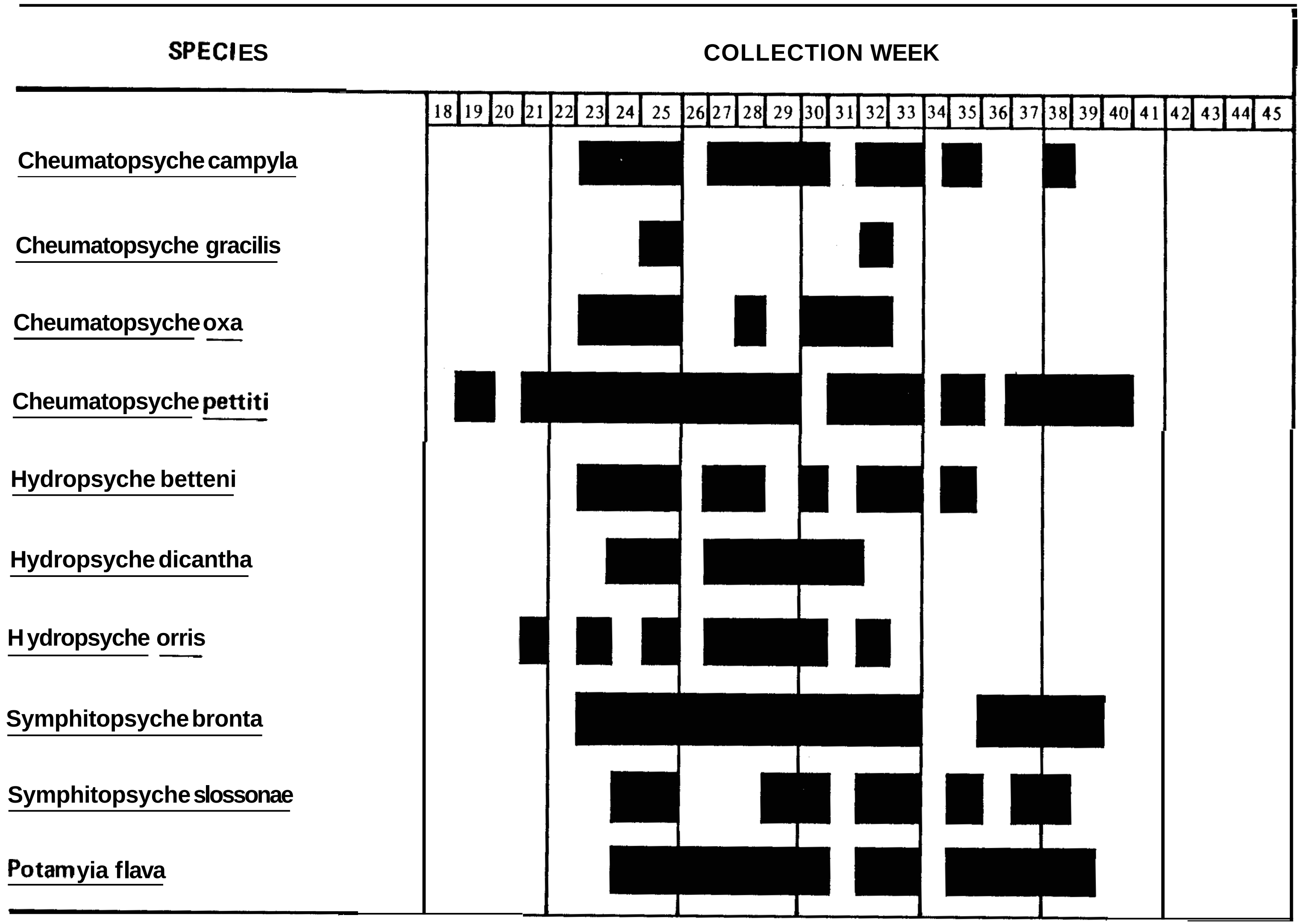


FIGURE 9 (Continued)

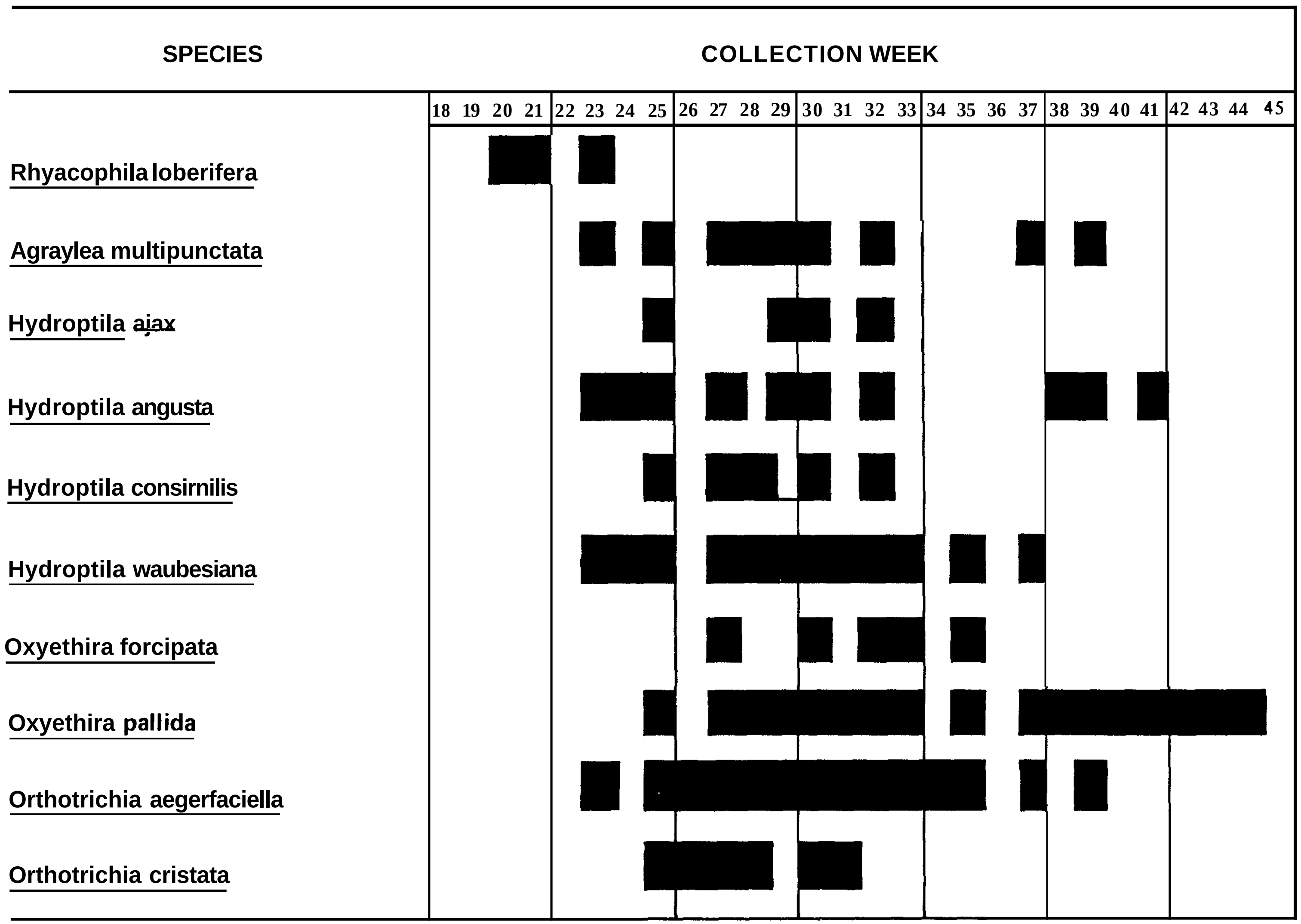


FIGURE 9 (Continued)

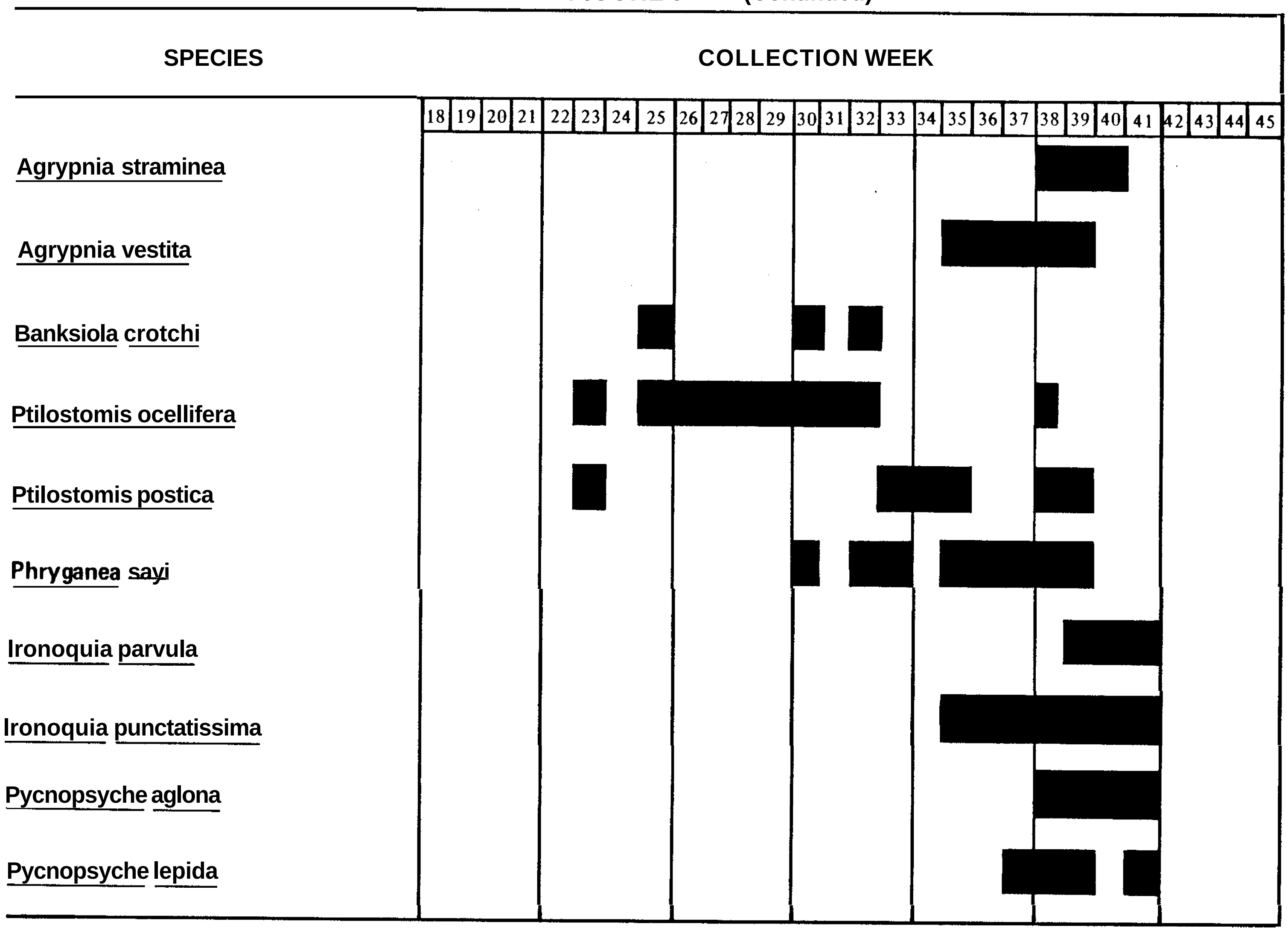


FIGURE 9 (Continued)

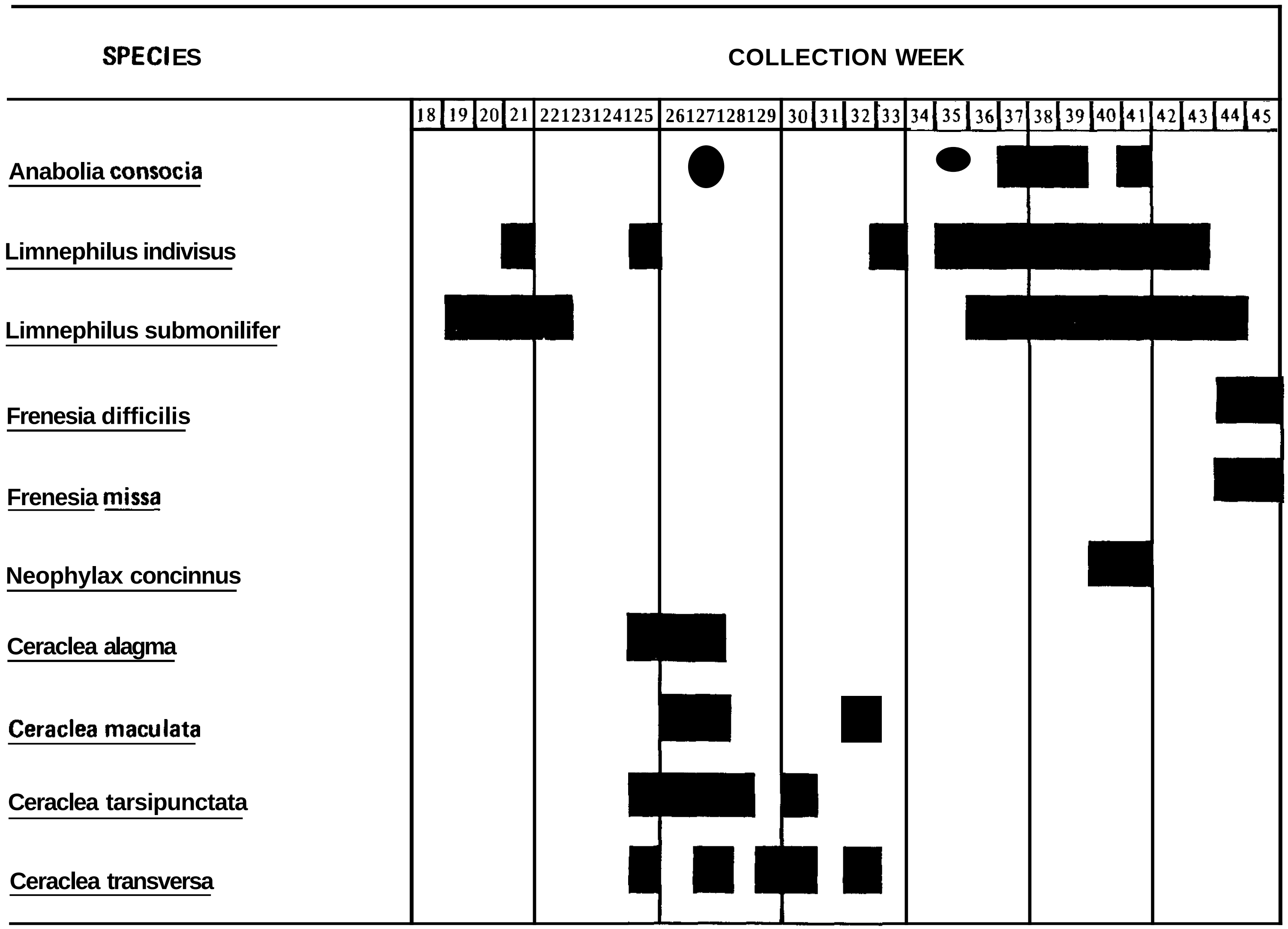
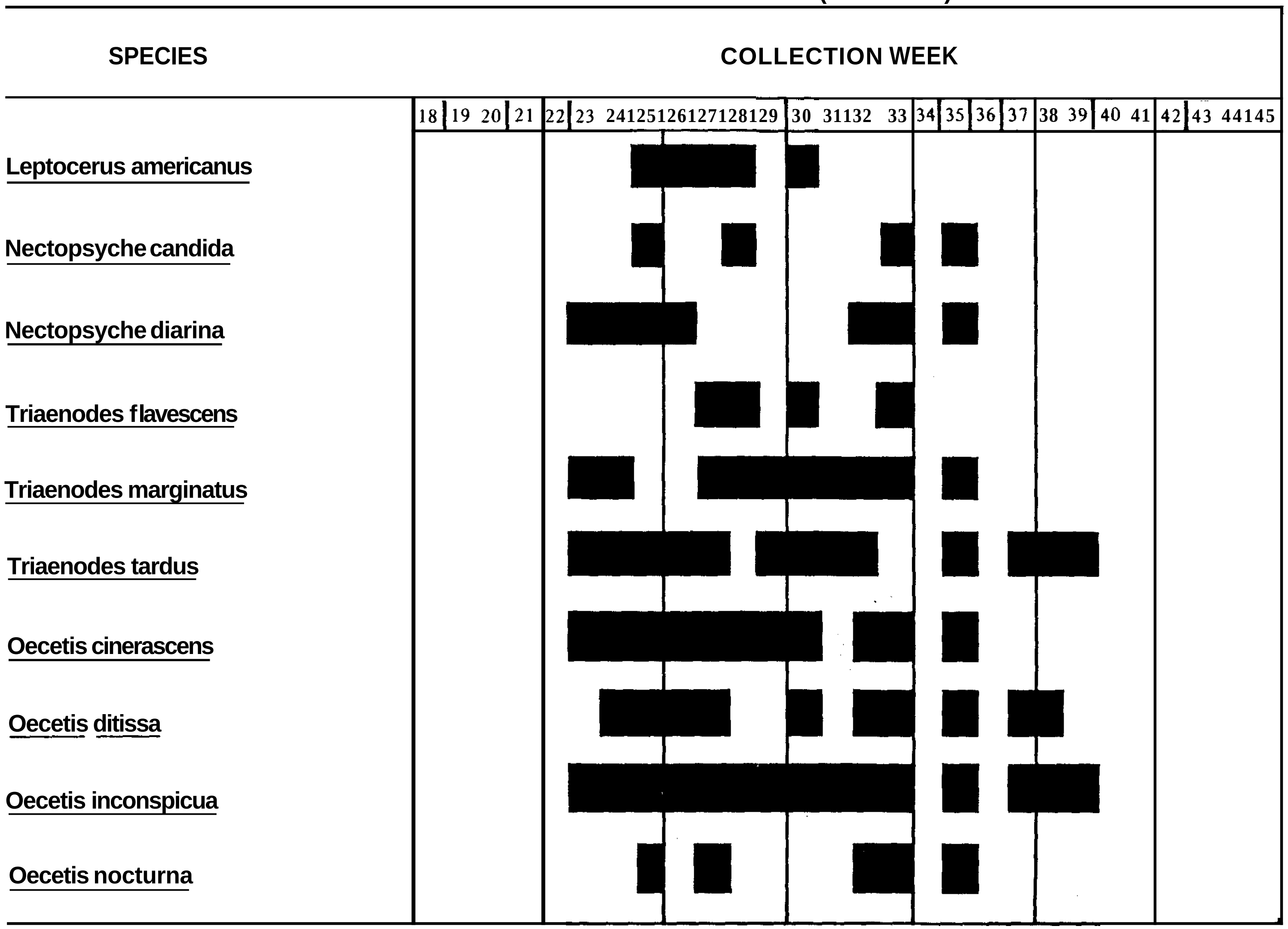


FIGURE 9 (Continued)



Many species exhibited flight periods that extended over several months. Fourteen species were collected continuously, or nearly so, from late Mar through mid-September. Manr species showed a peak abundance in !ate spring, followed by a second, smaller peak in early fall. Adults of thirty-two species were taken for only short periods lone or two consecutive collection periods),

For this study most of the caddisfly fauna could not be placed into two distinct emergence categories, summer or autumn groups as reported by Crichton (1960) for Trichoptera. The emergence pattern observed at Stillfork Swamp corresponded with Marshall's (1939) observed seasonal occurrence of Trichoptera for western Lake Erie with succession of species proceeded from early summer to fall.

Seasonal distribution showed that most adult Limnephilidae are "autumn" forms. Adults of Ironoquia, Pycnopsyche, Frenesia, and Neophylax appeared during the months of September, October, and November. Adults of Limnephilus indivisus and L. submoniiifer displayed the much reported (Wiggins, 1973; McElravy, 1976; MacLean and MacLean, 1984) dual flight pattern appearing first in spring and again in late summer and earlr fall. Many of the remaining species consisted of "summer" forms having emergence patterns from Mar to August, with maximum abundance occurring in June.

Some species were numerous for a few days or weeks and displayed two flight periods throughout the season. Species observed with two peaks of abundance were Potamyia flava, Cheumatopsyche pettiti, and Oxyethira pallida. Potamyia flaua had an extended flight period (June to October) and displayed peaks in mid-June and late-August. Cheumatopryche pettiti peaked in mid-July and again in late-October. While Oxyethira pallida was present in 63 percent of the samples, its annual cycle mar be either univoltine with sequential cohorts or bivoltine. A bivoltine species of Oxyethira has been recorded for Denmark (Nielsen, 1948).

Many species were not collected in large numbers, and a few from the "summer" group, Nyctiophylax moestus, Rhyacophila ledra, Hydroptila jackmanni, and Oecetis uchracea were abundant in only one collectton. Most of the summer species collected during the study were of two types: 1) abundant species that occurred over a long part of the spring and summer, and 2) rare species that were collected infrequently or only once.

Appendix A summarizes the species collected for each collection period +or sites 1 and 2.

Species Diversity.

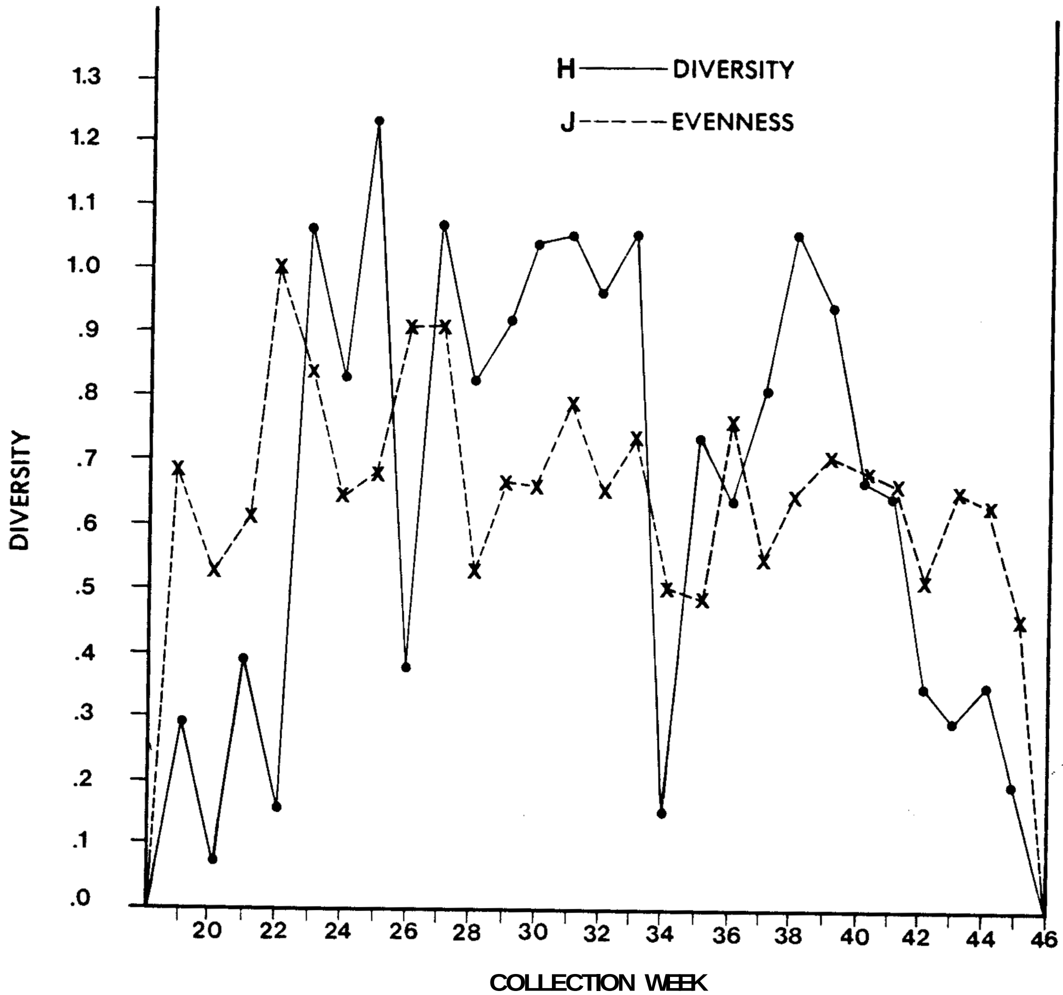
The analysis of community characteristics of the caddisfly fauna of Stillfork Swamp is presented in Table 3. Values of species diversity (H), and evenness (J) were plotted for each collection week to illustrate seasonal trends (Figure 10). The fluctuations in Brillouin's Index (H) were basically similar to those reported by MacLean and MacLean (1984) for Watercress Marsh. Diversity values gradually increased during the month of May and by mid-June surged to their highest level due to the greatest abundance of species and individuals for the entire season. Diversity declined during the month of August, increased to a second peak by mid-September, and then

TABLE 3. Number of species (S), size (N), Brillouin's diversity Index (H), evenness (J) fur 27 week period on dates specified.

Week[a]	Date	S	N	H	J
19	V-11-84	3	30	0.293	0.689
20	V-19-84	2	9	0.067	0.525
21	V-25-84	5	60	0.386	0.601
22	VI-2-84	1	2	0.151	1.000
23	V1-6-84	28	170	1.067	0.803
24	VI-11-84	19	226	0.826	0.644
25	VI-18-84	66	1868	1.230	0.683
26	VI-25-84	12	43	0.369	0.910
27	VII-8-84	39	475	1.065	0.918
28	VII-14-54	31	560	0.722	0.502
29	VII-20-84	25	360	0.916	0.672
30	VII-23-84	39	453	1.041	0.664
31	VI1-31-83	13	38	1.051	0.798
32	VIII-6-84	33	407	0.964	0.654
33	VIII-13-84	30	257	1.048	0.727
34	VIII-20-84	2	2	0.151	0.500
35	VIII-28-84	27	499	0.723	0.484
36	IX-8-84	8	44	0.640	0.761
37	IX-13-84	24	765	0.801	0.543
38	IX-22-84	24	429	1.056	0.649
39	IX-25-84	24	624	0.950	0.710
40	S-7-84	10	223	0.673	0.693
41	X-13-84	11	80	0.643	0.666
42	X-20-84	5	126	0.344	0.516
43	X-26-84	3	111	0.293	0.660
44	XI-2-84	4	22	0.346	0.637
45	XI-9-84	2	19	0.182	0.452

a) Lewis and Taylor (1967)

FIGURE 10. Seasonal distribution of Brillouin's diversity index (H) and evenness (J) for the Trichoptera fauna of Stillfork Swamp Nature Preserve, Carroll County, Ohio, May 2 through November 9, 1984.


H——— DIVERSITY
J - - - - - EVENNESS
DIVERSITY
1.3
1.2
1.1
1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
.0
20
22
24
26
28
30
32
34
36
38
40
42
44
46
COLLECTION WEEK

slowly declined as the number of species and individuals decreased. The major difference between small and large collections was an apparent increase in the probability of collecting rs species. A total of 66 species was collected on 18 June, 1984 the largest number collected in a single collection.

Temperature.

Mean air temperature for weeks of 2 June to 2 November, 1984 in which light traps were in operation are given in Table 4. Temperatures during the month of May 1384 were cooler (9.8 C) than the average annual temperature (11.7 C) normally recorded by the Carrotlton Police Department, Carrotlton, Carroll County, nine kilometers southwest of Stillfork Swamp. These lower than normal temperatures appeared to have slowed the emergence of adult caddisflies. Huryn and Foote (1983) reported adult collections by mid-April for many counties in Ohio. The first light trap collection on 2 Mar, 1984 had an overnight low of 7.2 C (45 F) and resulted in only a few specimens of Diptera.

Significant correlations ($P<0.001$) of collection size (N) (Figure 11) and species diversity (H) (Figure 12) with temperature readings suggests that a minimum threshold temperature mar be necessary for flight activity. Temperature also influences both the size and the number of species in the collection. This observation agrees with previous studies on the relationship of temperature and abundance and indicates that temperature is a significant factor in determining size of the nightly catches (Nimmo, 1966; Resh et al., 1975).

TABLE 4. Mean air temperature C during collection periods of 2 June through 2 November, 1984 at Stillfork Swamp Nature Preserve.

Week[a)]	Date	Mean air temperature during light trap operation	Range	Mean nightly air temperature fur collection period	Range
22	VI-2-84	13.1	(16.7 - 9.4)	16.6	(26.7 - 6.7)
23	VI-6-84	19.7	(22.2 - 17.2)	20.6	(22.2 - 17.2)
24	VI-11-84	16.1	(19.4 - 12.8)	18.1	(28.1 - 8.9)
25	VI-18-84	21.7	(23.3 - 20.0)	19.8	(25.0 - 10.6)
26	VI-25-84	15.3	(17.8 - 12.8)	16.3	(22.8 - 7.2)
27	VII-8-84	16.9	(18.1 - 15.8)	18.7	(25.6 - 13.6)
28	VII-14-84	19.2	(21.7 - 16.7)	17.1	(25.8 - 8.3)
29	VII-20-84	17.5	(18.9 - 16.1)	17.4	(23.3 - 12.2)
30	VII-23-84	19.2	(21.7 - 16.7)	15.9	(21.7 - 8.9)
31	VII-31-84	16.7	(20.0 - 13.3)	19.0	(23.3 - 11.1)
32	VIII-6-84	20.0	(21.7 - 18.3)	20.5	(24.7 - 16.1)
33	VIII-13-84	19.7	(21.7 - 18.3)	17.6	(22.8 - 11.7)
34	VIII-20-84	10.8	(13.9 - 7.8)	12.8	(21.1 - 3.9)
35	VIII-28-84	20.0	(22.8 - 17.2)	16.3	(22.8 - 5.6)
36	IX-8-84	12.8	(16.1 - 9.4)	13.6	(23.3 - 2.5)
37	IX-13-84	19.4	(20.6 - 18.3)	12.4	(20.6 - 1.1)
38	IX-22-84	16.9	(19.4 - 14.4)	19.2	(22.2 - 14.4)
39	IX-25-84	20.3	(21.1 - 19.4)	9.9	(21.1 - 0.6)
40	X-7-84	14.7	(15.5 - 13.9)	13.2	(20.6 - 2.2)
41	X-13-84	13.3	(13.3 - 13.3)	13.8	(22.5 - 5.6)
42	X-20-84	16.4	(18.9 - 13.9)	11.6	(20.6 - 3.3)
43	X-26-84	14.4	(15.5 - 13.9)	12.2	(23.9 - 2.2)
44	XI-2-84	12.2	(15.5 - 8.9)	10.9	(23.1 - 1.1)

a) Lewis and Taylor (1967)

FIGURE 11. Correlation of collection size (N) and mean ambient air temperature for collections of Trichoptera adults, Stillfork Swamp, 1984.

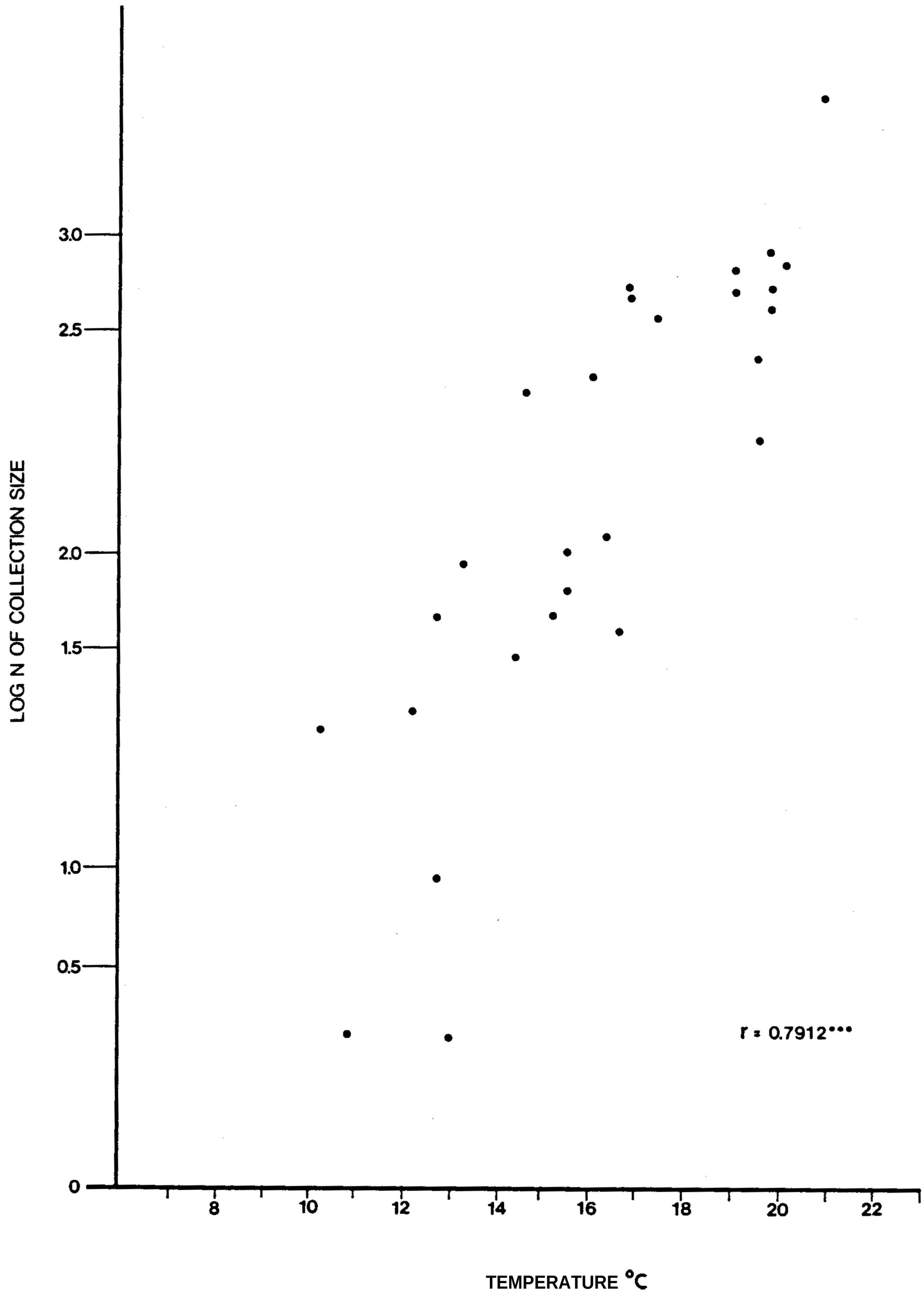
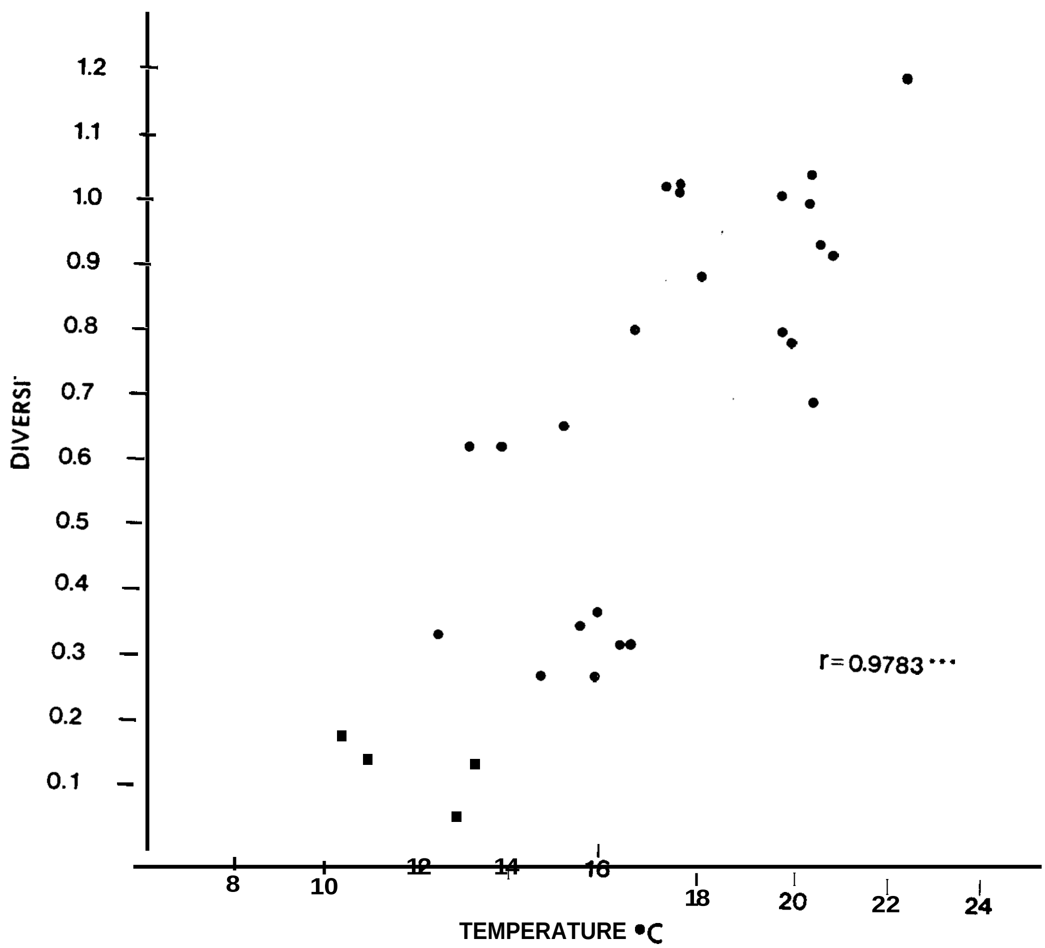

LOG N OF COLLECTION SIZE
3.0
2.5
2.0
1.5
1.0
0.5
0
8
10
12
14
16
18
20
22
TEMPERATURE °C
r = 0.7912***

FIGURE 12. Correlation of Brillouin's diversity index (H) and mean ambient air temperature for collections of Trichoptera adults, Stillfork Swamp, 1984.


1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
DIVERSI
r = 0.9783 •••
8
10
12
14
16
18
20
22
24
TEMPERATURE •C

DISCUSSION.

Before discussing the results of the caddisfly survey of Stillfork Swamp! a statement an the nature of the data is appropriate. Although most analrses are Lased upon adult collections with the use of light traps, it is important to understand the limitation of this method. First, light traps will attract only individuals that are photopositive and have entered the catchment area. Those taxa that are active during the day or apterous mar be excluded from the collection. Sex ratios mar be artifacts of this trapping method due to differential attraction of the sexes. Second, any interpretation of population density from light trap data may be biased. Sampling variability can result from manr factors, i.e. the choice and operation of the trap, physical features of the environment, and weather conditions during operation (Nimmo, 19665. Estimates of the area sampled can not be determined and relative density calculations with reference to area are invalid. Density estimates are also variable due to the degree of population aggregation as well as variability of the sampling technique.

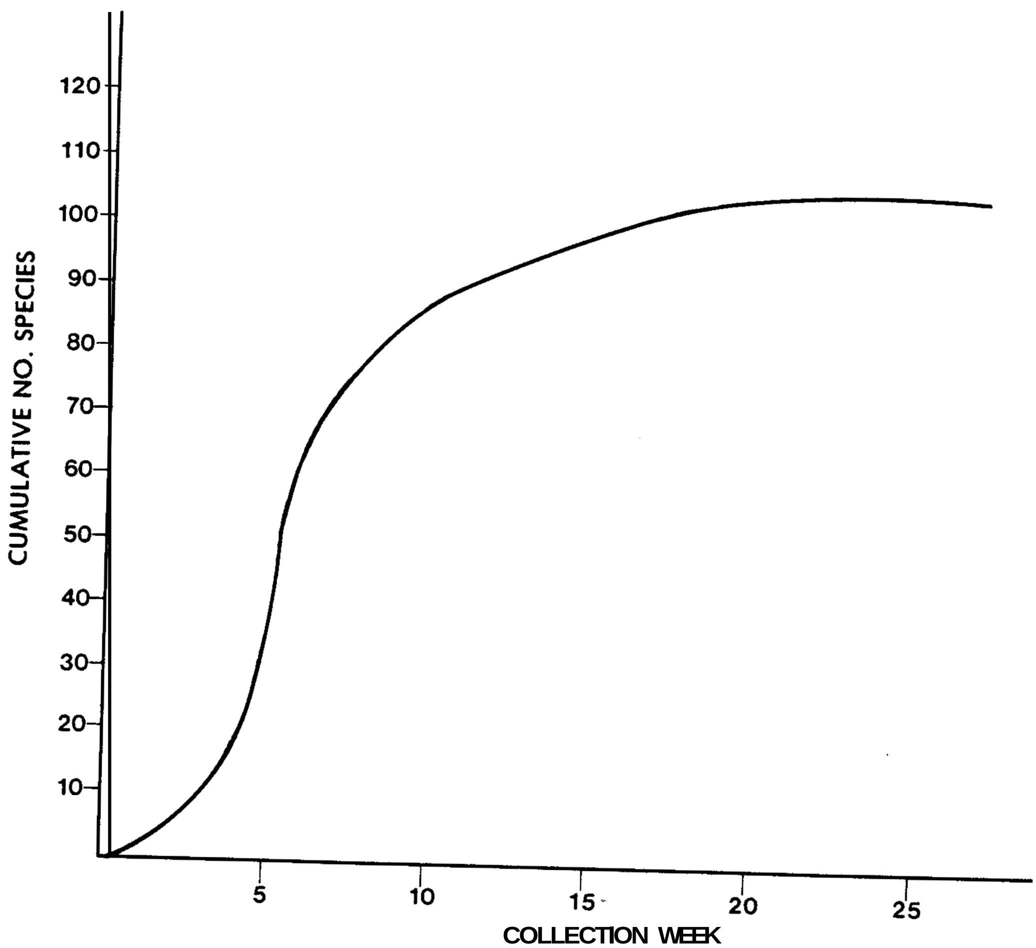
Resh (1979) discussed the influence of sampling frequency on the interpretation of light trap data. Species distributional studies have indicated that important fluctuations in population abundance can be missed by sampling monthly in contrast to every 10 days (Kajak, 1963). Many authors (Mundie, 1956; Lindeberg, 1358; Morgan et al., 1963; Corbet, 1965; McCauley, 1976; and Lammers, 1977) have discussed the advantages and disadvantages of emergence traps as an alternative to light trap collecting. Corbet (1965) reported that samples collected by emergence traps become progressively less representative of the emerging population and the design of many traps render them unsuitable for quantitative studies (Mundie, 1956).

McElravy (1976) compared light trap collections of caddisflies with both larval and emergence trap data and concluded that light traps provided a good representative sample of the fauna. Huryn (1982) reported that a11 families and most genera, represented in benthic collections were also present in light trap collections. Weekly collections made throughout the season at permanent sites helped to maximize the reliability of the data presented in this study. A species-collection curve (Figure 13) suggests that the majority of caddisfly species occurring at Stillfork Swamp have been recorded. Additional collections would undoubtedly increase the annotated list by a few rare species; however, it is felt unjustified.

Zoogeographical Considerations of Eastern Caddisfly Fauna.

The present day distribution of a species cannot be understood purely in terms of current environmental conditions that govern its existence. Historical factors which include past changes in environment and associated habitat alterations must be considered. Because the present distribution of temperate insect faunas is in large part related to events of the late-Cenozoic Era, a brief discussion of the influence of the Pleistocene Epoch on the dispersal of caddisflies in eastern North America is included,

FIGURE 13. Cumulative number of Trichoptera species collected at Stillfork Swamp Nature Preserve, Carroll County, Ohio, May 2 through November 9, 1984.


120
110
100
90
80
70
60
50
40
30
20
10
CUMULATIVE NO. SPECIES
5
10
15
20
25
COLLECTION WEEK

The caddisflr fauna of Stillfork Swamp cannot be understood without a knowledge of certain topographical conditions that prevailed prior to the Pleistocene 12 million B. P.). Late Cenozoic physiographic and sedimentary history aid in understanding the ecological mechanisms influencing insect evolution and present distribution. Cenozoic activity of eastern and central tectonic plates resulted in a series of uplifts in the low plateaus and Appalachian Highlands of eastern North America. Of particular importance to aquatic insects were the deep erosions that followed these uplifts. The steep-sided valleys that formed in many of the uplifted areas resulted in increased diversity of local ecological habitats (Ross, 1958).

In discussing aquatic freshwater insects, e.g. Trichoptera, one is dealing with insects restricted to particular habitats that would seem to set distinct limits to their dispersal patterns. Ross (1951, 1953, 1955, 1958, 1965, 1967) dealt with effects of the Pleistocene on insect distributions for a variety of Nearctic groups. Nimmo (1971, 1974) specifically addressed the post-glacial origins of the trichopteran families Rhyacophilidae, Limnephilidae, Glossosomatidae, and Philopotamidae in Alberta and eastern British Columbia. Coope (1970) reported that large scale changes in the distribution of insect species occurred during successive glacial and interglacial periods and that faunal history has been largely a matter of the geographical rearrangement of existing species in response to extreme fluctuation of the environment.

In the Miocene and Pliocene, renewed uplifts of the Rocky Mountains altered the circulation of westerly winds and shifted biomes eastward during the late Pliocene (Coope, 1970). During the advances of the Pleistocene glaciers air and ground temperatures were reduced, but to what extent and how far south is uncertain, Bryson and Wendland (1967) proposed a sequence of climatic pattern shifts form the peak of the Wisconsinan glaciation (1 million B. P.) to the present. They describe the effects of the retreating Laurentian Ice on air masses and subsequent weather conditions, Bryson and Wendland (1967) indicated that there was essentially no tundra belt between the receding ice front and the encroaching boreal forest. Exactly where tundra mar have survived is uncertain. Berti (1975) indicated that the movement of the late Wisconsinan glacier into the Great Lakes region supported a tundra-1ike vegetation environment in the Erie lowlands. Maxwell and Davis (1972) stated that tundra bordering the Wisconsin ice sheet was predominantly in the East and extended southwards into the Appalachians at higher elevations. The habitat preference of each insect species is important in elucidating past dispersal patterns. Suitable climatic conditions are inconsequential to individuals of a species if the habitat which they require is missing. This is especially true for Trichoptera whose larvae have very resticted freshwater habitat requirements.

Flint (1957) reported that all of northern Canada was under ice during the height of Wisconsinan glaciation, and only three areas are thought to have been unglaciated acting as refugia. Northern refugia haue been postulated for the Mackenzie delta, Bering straights, central Alaska, western arctic islands, and Perryland in northern Greenland. Ball (1963) stated that the current distribution of the northern biota is explainable by the dispersal from two major unglaciated areas ill central Alaska, and (2) the area south of the main ice sheet. For the Canadian insect fauna, the most important glacial refugium was undoubtedly the large area of North America that lay south of the continental glaciers (Matthews, 1978). Areas which were unglaciated during the Wisconsinan, or any other glaciation are of prime interest to biogeographers because they mar have served as refugia for the redistribution of plants and animals (Lindroth, 1970).

The distribution of Trichoptera in North America is of yet incompletely understood. Nimmo (1971) proposed twelve range patterns for Rhracophilidae and Limnephilidae inhabiting Alberta and eastern British Columbia. These distributional relationships were used to deduce the source and routes whereby reinvasion of the completely glaciated provinces occurred. Nine post-glacial dispersal routes were proposed. Several of the indicated routes are of consequence to this study. Nimmo (1971) proposed the existence of a corridor of deglaciated territory between the western and eastern half of North America following the retreat of the Laurentian ice sheet and the Cordilieran ice sheet in the Rocky Mountains. This corridor acted as a dispersal route for much of the Canadian biota.

Post-glacial lakes and drainage patterns have been altered greatly since the early Pleistocene. Many watershed areas were completely rearranged due to glaciation. Nevertheless, a network of freshwater lakes and streams was present after the glacial retreat that offered a variety of habitats from fast-flowing to slow standing waters of permanent and intermittent natures. The distribution of freshwater habitats has undoubtedly changed since the beginning of the Wisconsinan glaciation. Nimmo (1971) felt it reasonable to assume that the area just south of the Wisconsinan glacier was occupied by lakes, creeks, and rivers that were sustained by glacial meltwater and provided abundant habitats for Trichoptera. It is evident from the abundant trirhopteran fauna now present in formerly glaciated areas that an extremely varied fauna representing diverse ecological types persisted in ungiaciated areas and moved into previously glaciated areas after the ice retreated.

Coope (1968) reported that conditions near Cleveland, Ohio were similar to the northern fringes of the boreal forest rather than tundra-like. Evidence from Titusville, Pennsylvania and the Wisconsin Tills in Ohio (Goldthwait, 1958) suggests that open forest and not tundra conditions preceded the advance of the Wisconsinan ice. However, narrow bands of tundra may have existed south of the glacial ice (Frye and Willman, 1958), thus tundra species were not eliminated from eastern North America.

Distributions of several boreal Trichoptera species coincide fairly well with the northern coniferous forest and extend southward through the Appalachian Mountains and along the Cumberland Plateau. Ross (1965, 1967) reported that during deglaciation, these boreal species presumably spread northward, repopulating the streams and lakes to the north. A large number of caddisflies, e.g. Diplectrona modesta Banks, Pycnopsyche subfasciata (Say), and Glossosoma intermedium (Klapalek), have distributions that support such a conclusion. Ross (1967) suggested that ancestral boreal Trichoptera were broken into three isolated populations during the Wisconsinan, one in the extreme East, another in the Rocky Mountain area, and another in Alaska. Sykora et al. (1981) indicated that during glaciation of the Great Lakes, populations of Hydropsychidae became isolated south sf the ice and current distributions of _H. separata_ Banks and _Symphitopsyche recurvata_ (Banks) are a result of Pleistocene glaciation. Present records would indicate that after deglaciation eastern boreal populations of Trichoptera have spread chiefly northward, whereas isolated western populations spread westward and northeastward at a relatively rapid rate (Ross, 1958). However, Nimmo (1971) proposed that many eastern species dispersed to the West and recolonized much of the central and western Canada. Ross (1958) indicated that species of _Ceraclea, Triaenodes_, and _Banksiola_ spread from eastern North America into the Western mountain region. Of significant interest, caddisflies that did make the journey westward were mostly marsh, wetland, or alpine species. Many species of _Ceraclea, Triaenodes_, and _Banksiola_ are present at Stillfork Swamp. Ross (1965) stated that distributions of Holarctic and Trans-continental species make it difficult to elucidate their past dispersal. For some cool-adapted forms the ice sheets created conditions along their southern edges which were suitable for both eastward and westward migration, resulting in transcontinental distributions (Ross, 1956). Ross (1965) mentioned that as the ice receded coot-adapted species became more anc . e restricted in their range as a result of intervening gaps of inhospitable terrain. For the Limnephilidae, Nimmo (1971) stated that Holarctic species dispersed east and south from Alaska, or other northern refugia. All other limnephilids appear to have dispersed northward (post-glacially) from south of the ice sheets. Of interest to this study are the range distributions of species recorded from Stillfork Swamp.

In order to determine the influence that the Wisconsinan Ice Age had on the distribution of the Trichoptera fauna of Ohio, the Tears-age drainage pattern should be considered. Stout, VerSteeg, and Lamb (1943) described the Teays River as the major preglacial drainage system of south central and western Ohio. The preglacial Marietta and Groveport Rivers drained southwestern and central Ohio respectively and were main tributaries of the Teays River. By the mid-Pleistocene (approx. 1 million B.P.), the Teays-age drainage pattern was affected by the advancing glaciers. Eventually the Kansan Glacier completely buried the Tears River Valley and established a new major drainage pattern, the Ohio River. Glacial damming of the Tears River, as indicated by the rhythmic layering of sediments, was due to the repeated advances and recessions of glacial ice up until the final retreat 13,000 B.P. (Matsch, 1976).

During the Tertiary, the Tears River system provided a corridor for the dispersal of aquatic fauna into western Ohio. Even by the early Pleistocene, conditions remained favorable for northward and westward dispersal of organisms (Hobbs, 1983). Selbey and Duvel (1899), Braun (1928), Gordon (1928), and Greulach (1933) have discussed the importance of the Teays River as an avenue of migration for many southern plant species into Ohio. Transeau (1941) discussed the rule of the Tears River and subsequent formation of the great proglacial

Lake Tight on the isolation of plant species in Ohio.

While a significantly large area of Ohio was drastically affected by glacial movements, the unglaciated Allegheny Plateau region offered an undisturbed geographical area with suitable habitats to support many of the indigenous and displaced organisms, As previously reported in the "Description of the Study Area", Stillfork Valley was affected by the Wisconsinan Glacier by damming of the north-flowing Dover River and Sandyville Creek and subsequent formation of a glacial finger lake. The presence of relict species of plants at Stillfork Swamp suggests that this habitat served a as suitable refugium for these species. In this thesis, the term refugium refers to Kavanaugh's (1979) definition of a climatic refugium. The term is a relative concept since species may be moving into or out of a refugia! area as climatic and environmental conditions change.

The provincial and state distributions of Trichoptera recorded for Stillfork Swamp are presented in Appendix 8. Ross (1944) listed seven types of geographical ranges for the caddisfly fauna of Illinois. However, since these ranges pertain to Illinois and surrounding states, the more appropriate distributional terms used by Merritt and Cummins (1984) have been modified to describe the ranges of Ohio Trichoptera. They are as follows:

(1) Species which are essentially widespread occurring throughout the United States and Canada are termed "Transcontinental".

(2) Species which are essentially northern occurring throughout much of southern Canada and northern U.S. are labeled "Northern".

(3) Northern species that occur mainly in northern Canada and

across the arctic are labeled "Holarctic".

(4) Species that occur primarily in the North and East of the continent but extend through the hills and mountains of the southern Appalachians are labeled "Northeastern".

(5) Southeastern species occurring mainly in the Southeast with states such as Ohio and Virginia at the northern limit of their range are termed "Southeastern".

(6) Species which are essentially widespread throughout the eastern U.S. and eastern Canada are called "Eastern".

(7) Species which occur primarily in the central United States are labeled "Central".

Historical reconstruction of Trichoptera distributions requires the acceptance of the principle that individuals of present day species possess the same range of environmental tolerances as previous members of the species (Kavanaugh, 1979). Scudder (1978) stated that the Pleistocene had pronounced effects on freshwater lentic environments and present distribution patterns of many lentic inhabitants are related to glaciation and the existence of various proglacial lakes.

Distributions of Trichoptera collected at Stillfork Swamp were evaluated with those of congeneric species to determine possible Pleistocene affects. The available distributional data indicated that the majority of Trichoptera belong to taxa exhibiting Northern and Northeastern affinities. Numerically, the limnephilid assemblage constituted a significant northern component of caddisflies and provided some insight into post-glacial movements and origins of the northeastern Trichoptera fauna.

Although species of Limnephilus, Anabolia, Pycnopsyche, Ironoquia, and Frenesia are reported only locally or in limited numbers south of the glacial boundary, they are common in Ohio's Glaciated Plateau. The genus Limnephilus Leach is Holarctic in distribution with many exclusively arctic species. Approximately 35 species are known for North America (Wiggins, 1977). Two northern species L. indivisus and L. submonilifer are present at Stillfork Swamp. Although L. indivisus is considered transcontinental and is usually restricted to the northern U.S. and Canada, L. submonilifer extends its range into the southern Appalachians (Etnier, 1973).

The genus Pycnopsyche Banks? comprised of 14 Nearctic species and arranged in five species groups (Schmid, 1955), was represented at Stillfork Swamp by five species. Pycnopsyche aglona, a new state record was previously reported only from Wisconsin, Massachusetts, and Maine. The addition of Ohio broadens the range of this disjunct species and suggests that Ohio's unglaciated region could have acted as a refugium for this species.

The genus Anabolia Stephens is widely distributed in the Holarctic region with four species Known for North America (Schmid, 1955). Anabolia consocia, the only member of this genus found at Stillfork, has a transcontinental distribution (Nimmo, 1971) and commonly inhabits marshes, slow streams, and temporary pools (Flint, 1960; Wiggins, 1973).

The genus Ironoquia Banks *is* also a Holarctic genus with four species known to occur only in the Eastern part of the continent.

Ironoquia punctatissima and I. parvula collected at Stillfork are known to live in temporary pools and streams (Ross, 1944; Flint, 1958; and Wiggins, 1973). Larvae avoid drought conditions by aestivating in leaf litter around the receding water margins. Pupation occurs in early autumn and adults fly during late September and October.

The genus Frenesia Setten and Mosely is a Nearctic genus confined to the Northeast. It contains only two species, F. difficilis and F. missa, both of which were collected at Stiltfork Swamp. This was the first time that F. difficilis has been reported for Ohio. Flint (1956) gives an extensive account of the unique biology of this genus, Larvae complete their development in late September and October, and adults emerge in November. The adult emergence of Frenesia is very unusual, as no other caddisfly in eastern North America flies so late in the rear. Flint (1956) indicated that larvae develop only in clear unpolluted waters of small streams anti spring-feed pools.

Ironoquia, Pycnopsyche, and Frenesia are strictly Eastern in their pre-glacial origins. This is based upon the presumption that a genus, or species-group, originated in the geographical area which harbors the greatest number of species in question. The longer the period of time during which representatives of a group occupy a given geographical area the greater the amount of speciation which may occur (Nimmo, 1971).

From the distributions presented in Appendix B, it would appear that the Northern species-assemblage inhabiting Stillfork Swamp could have emigrated to this lower latitude during the time of glaciation or could have already been present in this region. it should be pointed out that the Northern species which remain in Ohio are predominantly still-water forms. The large and diverse trichopteran fauna inhabiting the swamp confirms the fact that the swamp has remained relatively undisturbed by man's recent industrial and agricultural intrusions.

Trophic Structure of Stillfork Swamp Trichoptera.

Cummins (1973) categorized the feeding mechanisms of aquatic insects into "functional groups" based on trophic relations, e.g. shredders, grazers, collectors, pretiators, and piercers. These categories define the role of insect taxa in aquatic ecosystems with respect to processing nutritional resources. Wiggins and MacKay (1979) proposed that the Trichoptera "functional feeding groups" correspond with reasonable consistency at the generic level. The use of functional feeding groups is advantageous in that it enables a numerical assessment of the invertebrate biota of a given aquatic ecosystem to be evaluated and its relationship with a particular food resource to be more easily understood. It further defines the linkage that exists between resources and insect morpho-behavioral adaptations (Cummins, 1973).

The trophic category of the trichopteran species that occur within the study area are given in Appendix B and summarized in Table 5. Trophic functions were inferred from adult light trap collections and assigned according to Wiggins (1977), Wiggins and MacKay (1978), anti Merritt and Cummins (1984). The largest

TABLE 5. Classification by Trophic Categories for Stillfork Swamp Trichoptera inferred from adult light trap collection (Based on Merritt and Cummins, 1984).

Functional Group	No. Species	Percent of Species	No. of individ-uals	Percent of Total
Shredders	33	31.7	3000	37.8
Collectors	31	29.8	2221	27.9
Predators	24	23.1	1166	14.6
Piercers	14	13.5	1545	19.5
Scrapers	2	1.9	15	0.2

category was the "shredder" functional group (33 species, 4 families) comprising 31.7 percent of the species and representing 37.8 percent of the total collection. Due to the predominantly lentic nature of the swamp this trophic structure is consistent with results reported by MacLean and Maciean (1984) for Watercress Marsh. The "collector" category (31 species, 5 families) and "predator" category (24 species and 4 families) were the next largest trophic groups and represented 29.8 and 23.1 percent of the species, respectively. "Piercers" (14 species, 2 families), comprised almost exclusively of Hydroptilidae, were well represented by 13.5 percent of the species and 19.5 percent of the total collection. The "scraper" or grazing trophic category was very poorly represented by only 2 species totalling 0.2 percent of the season total. This very low scraper component contrasts greatly with studies of lotic habitats in southern Ohio (Huryn, 1982).

Analysis of the caddisfly trophic structure of Stillfork Swamp reveals an apparent balance between most functional groups. The compartmentalization of feeding habits and food utilization? particularly when partitioning ref!ects the food source, provides a useful description of this swamp's ecosystem. The observed trophic structure contrasts sharply with woodland stream ecosystems where emphasis is upon the "collector" category and processing of detritus (Hynes, 1970). Very little is known about the trophic relationships of wetland ecosystems and their trichopteran fauna. MacLean and MacLean (1984) inferred the larval trophic structure +or Watercress Marsh. Their observations correspond closely to those of this study and suggest simitarity in feeding habits for marsh and swamp Trichoptera.

Caddisfly Adaptations to Temporary Pools.

Stillfork Swamp has provided an ideal habitat for a large popuiation of Trichoptera that have adapted their life histories to temporary bodies of water. Wiggins (1973) recognized and defined two types of temporary pool habitats - temporary vernal pools that contain water for only a few months of the year (March - June), and temporary autumnal pools that contain water for nine months of the year (October - July). Stillfork Swamp can be classified as a temporary autumnal swamp or wetland. Caddisflies that inhabit such temporary waters belong primarily to the Limnephilidae, Phryganeidae, and Polycentropodidae. They are able to withstand harsh lentic conditions and seasonal dry periods by diapause, oviposition apatt from water, and gelatinous egg matrices that resist desiccation and freezing (Wiggins, 1973).

Limnephilus indivisus, whose life history has been well documented (Noval and Sehnal, 1963, 1965; and Wiggins, 1973b), was the dominant shredder. Observations on development of the larvae on 10 February, 1985 revealed that they survive the winter as first and second instars under thick ice which covers the shallow ponds. The dormant larvae were attached to decaying vegetation, most noteably water smartweed. Ail surface water in the temporary pond had been absorbed or evaporated, leaving a two inch insuiated air space between the ice cover and the moist soil. Ice crystals were seen covering the larval cases, but the larvae were not frozen. Temperature between the ice and soil was 1 C, while the air temperature at the time of observation was -4 C. Apparently, L. indivisus larvae can withstand separation from water in this dormant state and reduced metabolic activity allows them to survive until spring before renewing activity.

Similar behavior was observed for Ironoquia punctatissima, which inhabited the temporary stream passing through site two, First and second instars were found buried in the moist mud of the stream bottom while the stream was covered with ice and was free of water during the winter months.

Larval behavior of other temporary pool caddisflies was not observed. Survival of the many resident species of Trichoptera must depend upon similar adaptations to the fluctuating water levels. Oviposition apart from water appears to have led to the exploitation of temporary pools by many limnephilids (Wiggins, 1973b). Adaptations to temporary pools further aided the evolution of larval tolerances to seasonal fluctuations of temperature and oxygen. However, many of the adaptations displayed by temporary pond and intermittent stream species found at Stillfork Swamp has not restricted them from colonizing other habitats. Limnephilus indivisus and L. submonilifer have been reported from permanent ponds and Marshes (MacLean and MacLean, 1984).

Most shallow ponds represent a transitional series from a permanent aquatic habitat to a terrestrial one. Wetzel (1975) proposed a series of successional stages for wetland ecosystems based an the rate of accumulation of organic matter, Because organic matter accumulates faster than It *is* degraded, succession proceeds from ponds to reed swamp to marshes and fens to finally terrestriai vegetation or a bog ecosystem. During the Wisconsinan glaciation, Stillfork Valley was likely a glacial edge-finger lake (Stein, 1974). Undoubtedly, Stillfork Valley has been undergoing some ecological succession but at what rate and whether the final climax destination is the present swamp is uncertain. For Trichoptera, the ability to adapt and expoit these ecological successional stages is well represented by the present fauna of Stillfork Swamp.

Comparison of the Trichoptera Fauna of Stillfork Swamp and Watercress Marsh.

A primary objective of this study was to compare and contrast the caddisfly fauna of Stillfork Swamp with that of Watercress Marsh. Durrell and Durrell (1979) divided the Appalachian Plateau Province of Ohio into two sections, a giaciated section (site location of Watercress Marsh) and an unglaciated section (site location of Stillfork Swamp:). Lafferty (1979) contrasted the two sections describing the unglaciated as rugged hill country and the glaciated as rolling topographr dotted with numerous lakes, marshes, and occasional bogs and fens. Huryn (1982) stated that physiographic and historical contrasts are reflected in the Trichoptera faunas inhabiting the two regions. His comparison of the Little Muskingum watershed in southeastern Ohio and the West Branch of the Mahoning River in northeastern Ohio (McElravy, 1976) revealed an increased diversity of Trichoptera in the glaciated section. The increased diversity reported from the West Branch survey was due to a greater number of lentic species, Because the Stillfork Swamp and Watercress Marsh studies sampled lentic habit* and utilized similar collection techniques both in duration and intensity, comparison of the two faunas should reflect real differences and quantify Huryn's (1982) conclusions.

In absolute terms, the Stillfork Swamp caddisfly fauna was more diverse, with 104 species represented, while the Watercress Marsh fauna consisted of 69 species. Brillouin's diversity indices (H) were used to test the nu71 hypothesis that the diversity of the two sites were equal. The difference in diversity indices for each week served as the basis for a paired t-test. This difference between diversity indices was found to be significant ($t = 2.415$, $P<0.05$). However, differences between evenness values (J) showed no significant differences. Potaymia flava, a species characteristic of large, slow-flowing mid-western streams (Ross, 1944), was the most abundant species at both sites. Both sites possessed lotic habitats sufficient to harbor large populations of Hydropsychidae. Similarities between the sites were reflected in a "shared species" total of 51 (Sorensen's Coefficient of Similarity = 0.590). This "shared species" assemblage typically represented species that are widespread in Ohio and the Northeast. A large number of the "shared species" group were those exhibiting Transcontinental distributions. As discussed earlier, similarity of trophic structure was reflected in the dominance of the shredder and reduced scraper categories.

Perhaps the most revealing species assemblages are those that apparently were restricted to one site or the other. The Holarctic species Limnephilus moestus Banks, L. ornatus Banks, and L. rhombicus L. were present at Watercress Marsh but absent at

Stillfork Swamp. Limnephilus diversity apparently is greater at glaciated sites (Huryn and Foote, 1983; MacLean and MacLean, 1984).

Although many temporary pond species are present at both rites, their populations are larger at Stillfork; Swamp. MacLean and MacLean (1984) discussed the apparent variety of microhabitats suitable far the diverse assemblage of species observed at Watercress Marsh including springs that provide the major source of water far the ponds and streams. This contrasts substantially with Stillfork Swamp which has only two known springs. The majority of water that maintains the temporary pond+ and wetlands is provided by the occasional flooding of Still Fork Creek and rising watertable in the fail.

Despite the higher diversity at Stillfork Swamp, the families Glossosomatidae, Molannidae, and Lepidostomatidae were not collected at this site. Their presence at Watercress Marsh was apparently due to an abundance of spring and erosionai headwater areas. Rhyacophila ledra, R. lobifera, both members of the Rhyacophilidae, reported to inhabit small temporary, clear streams, were collected only at Stillfork Swamp, probably due to the close proximity of Still Fork Creek. Differences in species composition of the two faunas illustrate the physiographic differences and available microhabitats of the two sites.

Although Watercress Marsh was overrun by the Grand Hiver iobe of the Wisconsinan Glacier during its final advance about 13,000 B.P. (Matsch, 1976), both sites have taxa that represent relict species that have survived as isolated populations since the retreat of the ice sheets. Both sites are relatively remote from potential distributional effects of master drainage systems. Watercress Marsh is considered a headwater source of the Mahoning River, while Still Fork Creek and its headwaters are tributaries of the westward flowing Tuscarawas River. Historically, the St. Lawrence drainaye system probably had a greater effect on the composition of the caddisfly fauna of these sites than did the pre-Ohio Hiver drainage.

Differences between the Trichoptera fauna of these two sites are best understood by the dissimilarities in microhabitats caused by past geologic events (Table 6). The valley of Stillfork Swamp is a sediment-filled lake bottom through which meanders a slow-flowing stream. Watercress Marsh is fed by numerous underground springs and seeps which originate from the surrounding terminal moraines created by the Grand River Lobe of the Misconsinan Glacier. Differences in glacial history have greatly influenced the type and extent of aquatic habitats at these sites accounting for much of the dissimilarity in their caddisfly fauna. Huryn's (1982) conclusion that glaciated sites support greater diversity of Trichoptera appears only valid for the lotic environments that were studied. The study of Stillfork Swamp Trichoptera suggests that unglaciated lentic environments can support a more diverse caddisfly fauna than unglaciated habitats.

Recommendations.

In summarizing the foregoing results and discussion, the lentic habitat of Stillfork Swamp Nature Preserve can be seen to support a diverse and abundant Trichoptera fauna. Many of its elements appear to represent disjunct or relict forms, species which show significant

TABLE 6. Comparison of microhabitat utilization by the Trichoptera faunas of Stillfork Swamp and Watercress Marsh,

Habitat Type	Stillfork Swamp No. Species/ (No. Individuals)	Watercress Marsh No. Species/ (No. Individuals)
Lotic - Medium to large rivers	14 / (1065)	9 / (1437)
Lotic - erosional Small/Med. streams	24 / (1012)	8 / (482)
Lotic - depositional Small/Med. streams	11 / (95)	5 / (48)
Lotic - erosional Spring-fed streams	2 / (32)	11 / (63)
Lotic - erosional Temporary streams	6 / (373)	3 / (121)
Lentic - littoral Lakes and ponds	22 / (3309)	16 / (1358)
Lentic - depositional Lakes, ponds, and marshes	14 / (310)	13 / (288)
Lentic - Temporary ponds	5 / (1464)	4 / (177)

zoogeographical relationships with distant regions and with the geologic past. While Stillfork Swamp comprises only a small part of an ecological watershed controlled in large measure by Still Fork Creek, any disturbance to the watershed or watertable would have deleterious effects on the biota of the swamp.

This type of habitat is rapidly becoming unique in the United States. The Congressianal Office of Technological Assessment reported that 30 to 50 percent of all wetlands in the lower 48 states has been destroyed in the last 200 rears for agriculture, forestry, oil and gas development, and urbanization. Nearly all the iosses (97%) were freshwater wetlands, primarily swamps and bogs (Tangley, 1984). Pressure upon all freshwater wetlands has resulted in their wholesale destruction, Botanists have amassed large amounts of data concerning the flora of many swamp plants and their unique survival strategies, i. e. sweet gale (Myrica gale L.) with nitrogen fixing root nodules, sundew (Drosera rotundifolia L.), bladderwort (Utricu?aria sp.) are insectivorous heterotrophs. However, our knowledge of the wetland invertabrate fauna is depauperate. Before more wetland habitats are irreversibly polluted or destroyed, scientists must undertake studies that will aid in our understanding of these unique natural treasures. Because of their unique and distinctive character, the temporary lentic and lotic habitats within Stillfork Swamp should be given adequate protection to preserve this swamp ecosystem.

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Weekly Collection Summary

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TABLE A:, Week 19 Collectian Summary.

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
V-11-84	3/30	(18.3 - 11.7 C)
Polycentropodidae		
Phylocentropus placidus	(1 female)	
Hydropsychidae		
Cheumatopsyche pettiti	(10 females)	10
Limnephilidae		
Limnephilus submonilifer	(7 males; 12 females)	19

TABLE A2. Week 20 Collection Summary.

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
V-19-84	2/9	(17.1 - 10.0 C)
Rhyacophilidae		
Rhyacophila lobifera	(2 males)	2
Limnephilidae		
Limnephilus submonilifer	(1 male; 6 females)	

TABLE A3. Week 21 Collection Summary.

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
V-25-84	5/60	(20.3 - 10.5 C)
Hydropsychidae		
Cheumatopsyche pettiti	(2 females)	2
Hydropsyche orris	(3 females)	3
Rhyacophilidae		
Rhyacophila lobifera	(32 males; 5 females)	37
Limnephilidae		
Limnephilus indivisus	(1 female)	1
Limnephilus submonilifer	(11 males; 6 females)	17

TABLE A4. Week 22 Collection Summary.

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
V-2-84	1/2	(16.7 - 9.4 C)
Limnephilidae		
Limnephilus submonilifer	(2 females)	2

TABLE A5. Week 23 Collection Summary.

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
VI-6-84	28/170	(22.2 - 17.2 C)
Psychomyiidae		
Lype diversa	(1 male; 5 females)	6
Polycentropodidae		
Nyctiophylax affinis	(1 male)	
Polycentropus cinereus	(1 male)	
Polycentropus crassicornis	(1 female)	
Phylocentropus placidus	(2 females)	2
Hydropsychidae		
Cheumatopsyche aphanta	(1 female)	
Cheumatopsyche campyla	(1 male; 28 females)	29
Cheumatopsyche pettiti	(4 males; 23 females)	27
Cheumatopsyche oxa	(1 female)	1
Hydropsyche betteni	(1 male; 5 females)	6
Hydropsyche incommoda	(2 females)	2
Hydropsyche orris	(2 males; 13 females)	15
Symphitopsyche bronta	(15 females)	15
Rhyacophilidae		
Rhyacophila lobifera	(1 male; 2 females)	

Hydroptilidae

<u>Agraylea multipunctata</u>	(1 female)	
<u>Hydroptila angusta</u>	(1 male)	1
<u>Hydroptila grandiosa</u>	(2 females)	2
<u>Hydroptila waubesiana</u>	(7 females)	7
<u>Orthotrichia aegerfasciella</u>	(1 male)	

Phryganeidae

<u>Ptilostomis ocellifera</u>	(3 females)	3
<u>Ptilostomis postica</u>	(1 female)	1

Limnephilidae

<u>Hydatophylax argus</u>	(1 female)	

Leptoceridae

<u>Nectopsyche albida</u>	(1 fem[illegible])	
<u>Nectopsyche diarina</u>	(4 females)	4
<u>Triaenodes marginatus</u>	(3 males; 6 females)	-
<u>Triaenodes tardus</u>	(1 male; 6 females)	7
<u>Oecetis cinerascens</u>	(1 male)	
<u>Oecetis inconspicua</u>	(14 males; 7 females)	21

TABLE A6. Week 24 Collection Summary.

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
VI-11-84	19/226	(19.4 - 12.8 C)
Polycentropodidae		
Polycentropus cinereus	(3 males; 1 female)	4
Polycentropus crassicornis	(1 female)	1
Hydropsychidae		
Cheumatopsyche aphanta	(1 female)	1
Cheumatopsyche campyla	(2 males; 5 females)	7
Cheumatopsyche oxa	(3 females)	3
Cheumatopsyche pettiti	(3 males; 51 females)	54
Hydropsyche betteni	(3 females)	3
Hydropsyche dicantha	(1 male; 2 females)	3
Symphitopsyche bronta	(6 females)	6
Symphitopsyche slossonae	(3 females)	3
Potamyia flava	(1 female)	1
Hydroptilidae		
Hydroptila angusta	(1 male)	
Hydroptila waubesiana	(2 females)	2
Leptoceridae		
Nectopsyche diarina	(22 females)	

Triaenodes marginatus	(3 males; 26 females)	29
Triaenodes tardus	(1 male; 1 female)	2
Oecetis cinerascens	(4 males)	4
Oecetis ditissa	(2 females)	2
Oecetis inconspicua	(50 males; 28 females)	78

TABLE A7. Week 25 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sexes	No. Individuals
VI-18-84	66/1868	(23.3 - 20.0 C)
"" iopotamidae		
Chimarra obscura	(3 females)	3
Dolophilodes distinctus	(1 male)	1
Psychomyiidae		
Lype diversa	(1 male; 1 female)	2
Polycentropodidae		
Nyctiophylax affinis	(1 male)	1
Nyctiophylax moestus	(3 males; 7 females)	10
Polycentropus aureolus	(1 male)	1
Polycentropus cinereus	(6 males; 41 females)	47
Polycentropus clinei	(1 male)	1
Polycentropus ~~confusus~~	(2 females)	2
Pc;ycentropus ~-ass;corn;s	(13 males; 29 females)	42
Polycentropus interruptus	(1 female)	1
Poiycentropus remotus	(2 females)	2
Hydropsychidae		
Cheumatopsyche aphanta	(1 male; 10 females)	11
Cheumatopsyche campyla	(30 males; 59 females)	89

Cheumatopsyche gracilis	(2 males; 4 females)	6
Cheumatopsyche halima	(7 females)	7
Cheumatopsyche oxa	(3 males; 14 females)	17
Cheumatopsyche pettiti	(45 males; 155 em les)	200
Cheumatopsyche nr smithi	(1 male)	1
Hydropsyche betteni	(1 male; 15 females)	16
Hydropsyche dicantha	(15 males; 2_ females)	37
Hydropsyche orris	(.2 males; 56 females)	68
Hydropsyche phalerata	.1 fe ale)	1
Symphitopsyche bronta	(1 l ; 13 f males)	14
Symphitopsyche cheilonis	(1 male, 1 fem le)	2
Symphitopsyche morosa	(1 female)	1
Symphitopsyche slossonae	(males; 8 females)	10
Symphitopsyche nr sparna	(1 female)	1
Symphitopsyche walkeri	(1 male	1
Potaymia flava	(15 m.les; 232 females)	247
Macrostemum zebratum	(1 male)	1

Rhyacophilidae

Rhyacophila ledra	(4 males)	

Hydroptilidae

Agraylea multipunctata	(1 male)	1
Hydroptila ajax	(4 males; 5 females)	9
Hydroptila angusta	(1 male; 1 female)	2
Hydroptila consimilis	(26 males; 19 females)	45
Hydroptila jackmanni	(22 males; 20 females)	42

Hydroptila waubesiana	(5 females)	5
Ochrotrichia spinosa	(11 males; 3 females)	14
Ochrotrichia sp.	(1 female)	1
Orthothrichia aegerfasciella	(19 males; 30 females)	49
Orthothrichia cristata	(5 males; 1 female)	6
Oxyethira nr *dualis*	(1 female)	1
Oxyethira pallida	(1 male; 1 female	2
Stactobiella palmata	(1 male)	1

Phryganeidae

Banksiola ~~crotchi~~	(1 female)	1
Banksiola dossuaria	(1 male; 1 female)	2
Ptilostomis ocellifera	(6 males; 9 females)	15

Limnephilidae

Limnephilus indivisus	(1 male; 3 females)	

Leptoceridae

Ceraclea alagma	(4 males)	4
Ceraclea cancellata	(1 male; 1 female)	[illegible]
Ceraclea diluta	(5 females)	[illegible]
Ceraclea tarsi-punctata	ill males; 14 females)	[illegible]
Ceraclea transversa	(18 males; 37 females)	[illegible]
Leptocerus americanus	(2 males; 2 females)	4
Nectopsyche candida	(6 females)	6
Nectopsyche ~~diarina~~	(69 females)	69
Triaenodes aha	(1 female)	

Triaenodes dipsius	(1 male)	1
Triaenodes injustus	(2 males; 1 female)	3
Triaenodes marginatus	(23 males; 269 females)	292
Triaenodes tardus	(1 male; 2 females)	3
Oecetis cinerascens	(6 males; 3 females)	9
Oecetis ditissa	(1 male; 16 females)	17
Oecetis inconspicua	(151 males; 172 females)	323
Oecetis nocturna	(1 male; 1 female)	2
Oecetis sp.	(1 female)	1

TABLE A8. Week 26a Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sexes	No. Individuals
VI-24-84	12/43	(17.8 - 12.8 C)
Polycentropodidae		
Polycentropus aureolus	(2 males)	2
Polycentropus crassicornis	(1 male)	1
Hydropsychidae		
Cheumatopsyche aphanta	(1 female)	1
Cheumatopsyche pettiti	(4 females)	4
Hydroptilidae		
Orthotrichia aegerfasciella	(1 male; 1 female)	2
Lep[illegible]		
Ceraclea [illegible]	(1 male)	[illegible]
Ceraclea tarsi-punctata	(1 male)	1
Ne*ctopsyche diarina*	(1 female)	
Triaenodes tardus	(2 males)	2
Oecetis cinerascens	(2 males)	2
Oecetis ditissa	(3 males)	3
Oecetis inconspicua	(23 males)	23

TABLE A9 Week 4 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sexes	No. Individuals
VII-1-84	16/74	(19.4 - 14.4 C)
Polycentropodidae		
Polycentropus aureolus	(1 male; 1 female)	2
Polycentropus crassicornis	(2 males)	2
Hydropsychidae		
Cheumatopsyche pettiti	(1 male; 1 female)	2
Symphitopsyche bronta	(2 males)	2
Potamyia flava	(1 female)	1
Hydroptilidae		
Orthotrichia cristata	(1 female)	
Oxyethira sp.	(1 female)	
Phryganeidae		
Ptilostomis ocellifera	(1 female)	
Limnephilidae		
Anabolia consocius	(1 male)	
Leptoceridae		
Ceraclea maculata	(1 male)	
Ceraclea tarsi-punctata	(3 males)	

Leptocerus americanus	(3 males)	3
Nectopsyche sp.	(1 female)	1
Triaenodes marginatus	(30 females)	30
Oecetis cinerascens	(1 male)	1
Oecetis inconspicua	(15 males; 7 females)	22

TABLE A10. Week 27 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
VII-8-84	39/476	(18.1 - 15.8 C)
Polycentropodidae		
Polycentropus aureolus	(9 males)	9
Polycentropus cinereus	(1 male; 2 females)	3
Polycentropus confusus	(1 male)	1
Polycentropus sp.	(1 female)	
Philopotamidae		
Chimarra obscura	(1 male;	1
Wormaldia shawnee	(1 female)	1
Hydropsychidae		
Cheumatopsyche aphanta	(1 male)	
Cheumatopsyche campyla	(1 male; 2 females)	3
Cheumatopsyche pettiti	(7 males; 40 females)	47
Hydropsyche betteni	(7 females)	7
Hydropsyche dicantha	(4 females)	4
Hydropsyche orris	(5 males; 9 females)	14
Symphitopsyche bronta	(2 females)	2
Potaymia flava	(40 female)	40

Hydroptilidae

Agraylea multipunctata	(10 females)	10
Hydroptila angusta	(2 females)	2
Hydroptila consimilis	(1 male)	
Hydroptila perdita	(1 male)	
Hydroptila waubesiana	(23 males; 61 females)	94
Ochotrichia sp.	(1 female)	1
Orthotrichia aegerfasciella	(5 males; 11 females)	16
Orthotrichia cristata	(4 males; 1 female)	5
Oxyethira nr *dualis*	(3 females)	3
Oxyethira forcipata	(2 males)	2
Oxyethira pallida	(8 females)	8

Phryganeidae

Ptilostomis ocellifera	(2 females)	2

Leptoceridae

Ceraclea alagma	(1 male:	
Ceraclea maculata	(1 male)	
Ceraclea tarsi-punctata	(1 male; 2 females)	3
Ceraclea transversa	(5 males; 1 female)	6
Leptocerus americanus	(2 females)	2
Nectopsyche sp.	(14 females)	14
Triaenodes flavescens	(1 female)	1
Triaenodes marginatus	(11 males: 45 females)	96
Triaenodes tardus	(1 male; 2 females)	3
Oecetis cinerascens	(1 male)	

Oecetis citissa	(1 male; 2 females)	3
Oecetis nocturna	(1 male)	1
Oecetis inconspicua	(32 males; 33 females)	65

TABLE A11. Week 28 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
VII-14-84	31/560	(21.7 - 16.7 C)
Psychomyiidae		
Lype diversa	(1 female)	
Psychomyia flavida	(1 female)	1
Polycentropodidae		
Polycentropus cinereus	(1 female)	
Hydropsychidae		
Cheumatopsyche aphanta	(3 females)	3
Cheumatopsyche campyla	(2 males; 9 females)	11
Cheumatopsyche oxa	(1 female)	1
Cheumatopsyche pettiti	(3 males; 28 females)	31
Hydropsyche betteni	(1 male; 3 females)	4
Hydropsyche dicantha	(1 female)	1
Hydropsyche orris	(4 males; 9 females)	13
Symphitopsyche bronta	(11 females)	11
Potamyia flava	(7 males; 42 females)	49
Hydroptilidae		
Agraylea multipunctata	(1 female)	
Hydroptila consimilis	(1 female)	

Hydroptila waubesiana	(43 males; 296 females)	339
Orthotrichia aegerfasciella	(2 males; 1 female)	3
Orthotrichia cristata	(2 males; 2 females)	4
Oxyethira nr *novasota*	(1 female)	1
Oxyethira pallida	(1 male; 4 females)	5
Phryganeidae		
Ptilostomis ocellifera	(1 male; 6 female)	
Limnephilidae		
Platycentropus radiatus	(1 female)	
Leptoceridae		
Ceraclea flavus	(1 male)	
Ceraclea tarsi-punctata	(1 female)	
Leptocerus americanus	(1 female)	1
Nectopsyche candida	(3 males; 10 females)	[illegible]
Triaenodes flavescens	(2 females)	
Triaenodes injustus	(1 male; 1 female)	[illegible]
Triaenodes marginatus	(1 male; 27 females)	28

TABLE A12. Week 29 Collection Summary

Date / Taxon	No. Species/Collection Total / No. Individuals by Sex	Temperature Range / No. Individuals
VII-20-84	25/360	(18.9 - 16.1 C)
Polycentropodidae		
Polycentropus confusus	(1 male)	1
Polycentropus sp.	(1 female)	1
Hydropsychidae		
Cheumatopsyche campyla	(1 male; 11 females)	12
Cheumatopsyche pettiti	(23 females)	23
Hydropsyche dicantha	(1 female)	1
Hydropsyche [illegible]*is*	(3 males; 1 female)	4
Hydropsyche valanis	(2 females)	2
Symphitopsyche bronta	(4 males; 8 females)	12
Symphitopsyche slossonae	(1 male)	1
Potaymia flava	(11 females)	11
Hydroptilidae		
Agraylea multipunctata	(6 females)	6
Hydroptila ajax	(15 females)	15
Hydroptila angusta	(1 male)	1
Hydroptila waubesiana	(37 males; 110 females)	147
Orthothrichia aegerfasciella	(17 males; 6 females)	23

Orthotrichia cristata	(5 males)	5
Oxyethira pallida	(2 males; 8 females)	10
Phryganeidae		
Ptilostomis ocellifera	(11 females)	
Limnephilidae		
Platycentropus radiatus	(1 female)	
Leptoceridae		
Ceraclea transversa	(2 females)	2
Nectopsyche sp.	(3 females)	3
Triaenodes marginatus	(17 females)	17
Triaenodes tardus	(1 female)	

TABLE A13. Week 30 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
VII-23-84	39/453	(21.7 - 16.7 C)
Polycentropodidae		
Nyctiophylax affinis	(1 male)	1
Polycentropus sp.	(1 female)	1
Phylocentropus placidus	(1 female)	1
Hydropsychidae		
Cheumatopsyche campyla	(3 males; 13 females)	16
Cheumatopsyche oxa	(4 males; 2 females)	6
Cheumatopsyche pettiti	(7 males; 53 females)	60
Hydropsyche betteni	(4 female)	4
Hydropsyche dicantha	(1 female)	1
Hydropsyche orris	(1 male; 1 female)	2
Hydropsyche valanis	(1 female)	1
Symphitopsyche bronta	(3 males; 7 females)	10
Symphitopsyche slossonae	(1 male; 1 female)	2
Potamyia flava	(3 males; 63 females)	66
Hydroptilidae		
Agraylea multipunctata	(1 female)	
Hydroptila ajax	(3 males; 4 females)	7
Hydroptila angusta	(1 male; 1 female)	

Hydroptila amoena →	(1 female)	
Hydroptila consimilis	(1 female)	
Hydroptila grandiosa	(1 female)	
Hydroptila perdita	(1 female)	
Hydroptila waubesiana	(12 males; 34 females)	46
Orthothrichia aegerfasciella	(20 males; 10 females)	30
Orthothrichia cristata	(1 female)	1
Oxyethira forcipata	(2 males)	2
Oxyethira pallida	(9 males; 26 females)	35
Neotrichia sp.	(1 female)	

Phryganeidae

Banksiola ~~*crotchi*~~	(1 male)	
Pi·? *Phryganea sayi*	(1 male)	1
Ptilostomis ocellifera	(5 females)	5

Leptoceridae

Ceraclea tarsi-punctata	(1 female)	1
Ceraclea transversa	(2 males; 1 female)	3
Leptocerus americanus	(1 female)	1
Nectopsyche sp.	(2 females)	2
Triaenodes flavescens	(1 female)	1
Triaenodes marginatus	(2 males; 18 females)	20
Triaenodes tardus	(1 male; 2 females)	3
Oecetis cinerascens	(1 male)	1
Oecetis ditissa	(2 males)	2
Oecetis inconspicua	(54 males; 57 females)	111

TABLE A14. Week 31 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
VII-31-84	13/38	(20.0 - 13.3 C)
Polycentropodidae		
Polycentropus aureolus	(1 male)	
Hydropsychidae		
Cheumatopsyche oxa	(1 male)	
Cheumatopsyche pettiti	(9 females)	9
Hydropsyche dicantha	(1 female)	
Symphitopsyche bronta	(1 female)	
Hydroptilidae		
Hydroptila waubesiana	(2 females)	2
Orthotrichia aegerfasciella	(3 males; 2 females)	5
Orthotrichia cristata	(1 male)	
Oxyethira pallida	(1 female)	
Phryganeidae		
Ptilostomis ocellifera	(4 males; 1 female)	5
Leptoceridae		
Triaenodes marginatus	(3 females)	3
Triaenodes tardus	(1 female)	
Oecetis inconspicua	(6 males; 1 females)	

TABLE A15. Week 32 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
VIII-6-84	33/407	(21.7 - 18.3 C)
Philopotamidae		
Chimarra aterrima	(1 female)	
Hydropsychidae		
Cheumatopsyche campyla	(3 females)	3
Cheumatopsyche gracilis	(1 male; 4 females)	5
Cheumatopsyche oxa	(1 female)	1
Cheumatopsyche pettiti	(3 males; 14 females)	17
Hydropsyche betteni	(2 females)	2
Hydropsyche orris	(2 females)	2
Symphitopsyche bronta	(1 female)	1
Symphitopsyche slossonae	(1 female)	1
Potamyia flava	(162 females)	162
Hydroptilidae		
Agraylea multipunctata	(1 female)	1
Hydroptila ajax	(1 male; 5 females)	6
Hydroptila angusta	(2 females)	3
Hydroptila consimilis	(1 male)	
Hydroptila waubesiana	(4 females)	

Hydroptila sp.	(1 female)	1
Orthothrichia aegerfasciella	(25 males; 12 females)	37
Oxyethira dualis	(1 male; 3 females)	4
Oxyethira forcipata	(2 males)	2
Oxyethira sp.	(1 female)	1
Oxyethira pallida	(2 males; 28 females)	30

Phryganeidae

Banksiola crotchi	(1 male)	
Phryganea sayi	(6 males; 6 females)	12
Ptilostomis ocellifera	(3 females)	3

Leptoceridae

~~*Ceraclea*~~ *maculata*	(2 females)	2
Ceraclpa. transversa	(2 males; 2 females)	4
Nectopsyche diarina	(5 females)	5
Triaenodes marginatus	(29 females)	29
Triaenodes tardus	(1 male; 26 females)	27
Oecetis cinerascens	(3 males)	3
Oecetis ditissa	(1 male; 1 female)	2
Oecetis inconspicua	(15 males; 12 females)	27
Oecetis nocturna	(2 males; 4 females)	6
Oecetis nr *ochracea*	(1 male; I female)	2

TABLE A16. Week 33 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
VIII-13-84	30/257	(21.7 - 18.3 C)
Polycentropodidae		
Polycentropus centralis	(1 male)	1
Hydropsychidae		
Cheumatopsyche aphanta	(1 female)	1
Cheumatopsyche campyla	(1 male; 2 females)	3
Cheumatopsyche pettiti	(7 males; 18 females)	25
Hydropsyche bettení	(2 females)	2
Hydropsyche cuanis	(1 male)	1
Hydropsyche simulans	(1 male)	1
Symphitopsyche bronta	(1 male; 4 females)	5
Symphitopsyche slossonae	(3 females)	3
Hydroptilidae		
Hydroptila grandiosa	(3 females)	3
Hydroptila perdita	(1 female)	1
Hydroptila waubesiana	(2 males; 17 females)	17
Orthothrichia aegerfasciella	(45 males; 13 females)	58
Oxyethira farcipats	(1 male)	

Oxyethira pallida	(1 male; 9 females)	10
Phryganeidae		
Phryganea sayi	(4 males; 7 females)	11
Ptilostomis postica	(1 female)	1
Limnephilidae		
Limnephilus indivisus	(1 male; 1 female)	2
Leptoceridae		
Nectopsyche diarina	(3 females)	3
Nectopsyche candida	(1 female)	1
Triaenodes flavescens	(2 females)	2
Triaenodes marginatus	(5 males; 33 females)	38
Triaenodes tardus	(2 females)	2
Oecetis cinerascens	(2 males; 1 female)	3
Oecetis ditissa	(1 male; 2 females)	[illegible]
Oecetis immobilis	(4 females)	4
Oecetis inconspicua	(16 males; 17 females)	33
Oecetis nocturna	(1 female)	
Oecetis nr *ochracea*	(3 females)	3

TABLE A17. Week 34 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
VIII-20-84	2/2	(13.9 - 7.8 C)
Hydroptilidae		
Orthotrichia aegerfasciella	(1 male)	1
Phryganeidae		
Ptilostomis postica	(1 male)	

TABLE A18. Week 35 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
VIII-28-84	27/499	(22.8 - 17.2 C)
Polycentropodidae		
Polycentropus cinereus	(1 male)	
Hydropsychidae		
Cheumatopsyche campyla	(1 male; 2 females)	3
Cheumatopsyche pettiti	(5 males; 5 females)	10
Hydropsyche betteni	(3 females)	3
Hydropsyche phalerata	(1 female)	1
Symphitopsyche slossonae	(9 female)	9
Potaymia flava	(4 males; 271 females)	275
Hydroptilidae		
Hydroptila waubesiana	(2 males; 4 females)	[illegible]
Orthothrichia aegerfasciella	(1 male; 1 female)	2
Oxyethira forcipata	(1 male)	1
Oxyethira pallida	(2 males; 2 females)	4
Phryganeidae		
Agrypnia vestita	(4 males; 3 females)	7
Phryganea sayi	(9 males; 3 females)	12
Ptilostomis postica	(2 females)	2

Limnephilidae		
Ironoquia punctatissima	(42 males; 25 females)	67
Pycnopsyche divergens	(1 male)	1
Anabolia consocius	(1 male)	1
Limnephilus indivisus	(10 males; 9 females)	19
Leptoceridae		
Nectopsyche candida	(2 females)	2
Nectopsyche diarina	(3 females)	3
Triaenodes marginatus	(2 males; 49 females)	51
Triaenodes tardus	(1 male; 3 females)	4
Oecetis cinerascens	(1 male)	1
Oecetis ditissa	(1 female)	1
Oecetis immobilis	(1 male)	1
Oecetis inconspicua	(5 males; 3 females)	8
Oecetis nocturna	(1 male; 2 females)	3

TABLE A19. Week 36 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
IX-8-84	8/44	(16.1 - 9.4 C)
Hydropsychidae		
Hydropsyche valanis	(1 female)	
Symphitopsyche bronta	(3 females)	8
Potaymia flava	(1 male)	1
Phryganeidae		
Agrypnia vestita	(4 males; 5 females)	9
Phryganea sayi	(1 female)	1
Limnephilidae		
Ironoquia punctatissima	(5 males; 6 females)	11
Limnephilus indivisus	(9 males; 5 females)	14
Limnephilus submonilifer	(4 males)	4

TABLE A20. Week 37 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
IX-13-84	24/766	(20.6 - 18.3 C)
Polycentropodidae		
Polycentropus cinereus	(5 fern.~es)	5
Polycentropus remotus	[illegible] female)	1
Phylocentropus lucidus	(1 female)	1
Hydropsychidae		
Cheumatopsyche pettiti	([illegible] males; 27 females)	[illegible]
Symphitopsyche bronta	(1 female)	[illegible]
Symphitopsyche slossonae	(1 male; 3 females)	4
Potamyia flava	(2 males; [illegible] females)	[illegible]
Hydroptilidae		
Agraylea multipunctata	(1 female)	
Hydroptila amoena	(1 female)	
Hydroptila grandiosa	(1 female)	
Hydroptila hamata	([illegible] female)	
Hydroptila waubesiana	(9 males; 22 females)	31
Orthothrichia aegerfasciella	(1 male)	
Oxyethira pallida	(2 males; 16 females)	[illegible]

Phryganeidae		
Agrypnia vestita	(6 males; 9 females)	15
Phryganea sayi	(10 males; 16 females)	26
Limnephilidae		
Ironoquia punctatissima	(114 males; 40 females)	154
Pycnopsyche lepida	(1 male)	1
Anabolia consocius	(3 males; 2 females)	5
Limnephilus indivisus	(157 males; 176 females)	333
Limnephilus submonilifer	(30 males; 18 females)	48
Leptoceridae		
Triaenodes tardus	(1 male; 61 females)	62
Oecetis ditissa	(1 female)	1
Oecetis inconspicua	(7 females)	7

TABLE A21. Week 38 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
IX-22-84	24/425	(19.4 - 14.4 C)
Philopotamidae		
Chimarra obscura	(1 male)	
Polycentropodidae		
Polycentropus confusus	(1 female)	
Hydropsychidae		
Cheumatopsyche campyla	(1 female)	1
Cheumatopsyche pettiti	(6 males; 9 females)	15
Symphitopsyche bronta	(1 female)	1
Symphitopsyche slossonae	(10 females)	10
Hydroptilidae		
Hydroptila angusta	(1 female)	1
Oxyethira dualis	(3 females)	3
Oxyethira pallida	(7 males; 39 females)	46
Phryganeidae		
Agrypnia straminea	(1 female)	
Agrypnia vestita	(6 males)	
Phryganea sayi	(1 female)	

Ptilostomis ocellifera	(1 female)	1
Ptilostomis postica	(1 male)	1
Limnephilidae		
Ironoquia punctatissima	(12 males; 12 female)	24
Pycnopsyche aglona	(1 male)	1
Pycnopsyche lepida	(2 males)	2
Anabolia consocius	(5 males)	5
Limnephilus indivisus	(85 males; 102 females)	187
Limnephilus submonilifer	(31 males; 41 females)	72
Leptoceridae		
Triaenodes tardus	(2 males; 8 females)	10
Oecetis ~~ditissa~~	(1 male)	1
Sere?:s *inconspicua*	(6 males)	6

TABLE A22. Week 39 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
IX-25-84	24/624	(21.1 - 19.4 C)
Philopotamidae		
Chimarra aterrima	(1 female)	
Polycentropodidae		
Polycentropus nr. _nascotius_	(2 females)	2
Hydropsychidae		
Cheumatopsyche pettiti	(14 males; 19 females)	33
Symphitopsyche bronta	(1 male; 2 females)	3
Potaymia flava	(50 females)	50
Hydroptilidae		
Agraylea multipunctata	(1 male; 5 females)	6
Hydroptila angusta	(12 males; 17 females)	29
Orthothrichia aegerfasciella	(1 female)	1
Oxyethira dualis	(1 female)	1
Oxyethira pallida	(1 male; 33 females)	34
Phryganeidae		
Agrypnia straminea	(7 females)	
Agrypnia vestita	(1 male)	

Phryganea sayi	(1 male)	
Ptilostomis postica	(1 male)	
Limnephilidae		
Ironoquia parvula	(2 males)	2
Ironoquia punctatissima	(19 males; 16 females)	35
Pycnopsyche aglona	(5 males)	5
Pycnopsyche lepida	(3 males; 3 females)	6
Anabolia consocius	(1 male)	1
Limnephilus indivisus	(129 males; 114 females)	243
Limnephilus submonilifer	(95 males; 28 females)	123
Leptoceridae		
Triaenodes tardus	(3 males; 8 females)	11
Oecetis cinerascens	(2 females)	2
Oecetis inconspicua	(1 males; 5 females)	6

TABLE A23. Week 40 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
X-7-84	10/223	(15.5 - 13.9 C)
Hydropsychidae		
Cheumatopsyche pettiti	(1 female)	1
Hydroptilidae		
Oxyethira pallida	(1 male; 6 females)	7
Phryganeidae		
Agrypnia straminea	(1 male; 1 female)	2
Limnephilidae		
Ironoquia parvula	(19 males; 3 female)	22
Ironoquia punctatissima	(1 male; 2 females)	3
Pycnopsyche aglona	(39 males; 1 female)	40
Pycnopsyche indiana	(11 males; 2 females)	2
Limnephilus indivisus	(13 males; 25 females)	38
Limnephilus submonilifer	(52 males; 44 females)	96
Neophylax concinnus	(1 female)	1

TABLE A24. Week 41 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
X-13-84	11/80	(13.3 - 13.3 C)
Hydroptilidae		
Hydroptila angusta	(1 female)	
Oxyethira pallida	(3 females)	3
Limnephilidae		
Ironoquia parvula	(1 male)	1
Ironoquia punctatissima	(1 male; 1 female)	2
Pycnopsyche aglona	(10 males; 6 females)	16
Pycnopsyche guttifer	(1 male)	1
Pycnopsyche lepida	(2 males; 2 females)	4
Anabolia consocius	(1 male)	1
Limnephilus indivisus	(6 males; 3 females)	9
Limnephilus submonilifer	(32 males; 6 females)	38
Neophylax concinnus	(4 females)	4

TABLE A25. Week 42 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
X-20-84	5/126	(18.9 - 13.9 C)
Hydroptilidae		
Oxyethira pallida	(1 male; 67 females)	68
Limnephilidae		
Pycnopsyche guttifer	(1 male)	1
Limnephilus indivisus	(1 male; 1 female)	2
Limnephilus submonilifer	(45 males; 9 females)	54
Neophylax concinnus	(1 male)	1

TABLE A26. Week 43 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
X-26-84	3/111	(15.5 - 13.9 C)
Hydroptilidae		
Oxyethira pallida	(2 males; 67 females)	69
Limnephilidae		
Limnephilus indivisus	(1 male)	1
Limnephilus submonilifer	(39 males; 2 females)	41

TABLE A27. Week 44 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
IX-1-84	4/34	(15.5 - 8.9 C)
Hydroptilidae		
Oxethira pallida	(6 females)	
Limnephilidae		
Limnephilus submonilifer	(12 males; 1 female)	13
Frenesia difficilis	(1 male)	1
Frenesia missa	(3 males)	3

TABLE A28. Week 45 Collection Summary

Date	No. Species/Collection Total	Temperature Range
Taxon	No. Individuals by Sex	No. Individuals
IX-9-84	2/18	(10.6 - 7.2 C)
Limnephilidae		
Frenesia difficilis	(2 males)	2
Frenesia missa	(16 males)	16

APPENDIX B

Reported Habitat, Trophic Group, and North American Distribution of Stillfork Swamp Trichoptera.

PAGE

TABLE B1. Provincial and State species lists; References for Distributions listed in Appendix B. 161

TABLE B2. Trichoptera of Stillfork Swamp Nature Preserve, Carroll County, Ohio. Summary of their distributional ranges, habitats, and trophic relationships based on Merritt and Cummins (1984) 164

TAELE B1. Provincial and State species lists: References for distributions listed in Table B2.

Provinces/States	Reference Source
Alberta (AB.)	Nimmo (1971, 1974, 1977a, 1977b).
British Columbia (BC.)	Nimmo and Scudder (1978).
Manitoba (MN.)	Lehmkuhl and Kerst (1979).
New Brunswick (NB.)	
Newfoundland (NF.)	Wiggins (1961).
Northwest Territory (NT.)	Lehmkuhl and Kerst (1979).
Nova Scotia (NS.)	
Ontario (ON.)	
Province of Quebec (PQ.)	Nimmo (1966); Gutheron and Pilon (1973); Harper et al. (1975); Roy and Harper (1979).
Saskatchewan (SK.)	
Yukon (YK.)	
Alabama (AL)	Harris et al. (1984)
Alaska (AK)	Unzicker et al. (1970).
Arizona (AZ)	
California (CA)	Denning (1956).
Colorado (CO)	
Connecticut (CT)	
Delaware (3E)	
District of Columbia (DC)	

Florida (FL)	Blicke (1962); Harris et al. (1982).
Georgia (GA)	
Hawaii (HI)	
Idaho (ID)	Smith (1965).
Illinois (IL)	Ross (1944).
Indiana (IN)	Ross (1944).
Iowa (IA)	Ross (1944).
Kansas (KS)	Hamilton and Schuster (1978); Hamilton et al. (1983)
Kentucky (KY)	Resh (1975)
Louisiana (LA)	Harris et al. (1982); Holzenthal et al. (1982); Lago et al. (1982).
Maine (ME)	Blickle (1964); Blicke and Morse (1966).
Maryland (MD)	
Massachusetts (MA)	Neves (1979).
Michigan (MI)	Leonard and Leanard (1949); Ellis (1962).
Minnesota (MN)	Etnier (1965); Lager et al. (1979).
Mississippi (MS)	Harris et al. (1982); Holzenthal et al. (1982); Lago et al. (1982).
Missouri (MO)	
Montana (MT)	Newell and Potter (1973); Rosemhild (1982).
Nebraska (NB)	
Nevada (NV)	
New Hampshire (NH)	Morse and Blicke (1953, 1957).
New Jersey (NJ)	

New Mexico (NM)	
New York (NY)	Betten (1934).
North Carolina (NC)	Denning (1950); Unzicker et al. (1982).
Ohio (OH)	Huryn and Foote (1983); MacLean and MacLean (1984).
Oklahoma (OK)	Resh et al. (1978)
Oregon (OR)	Anderson (1976).
Pennsylvannia (PA)	Hyland (1948); Masteller and Flint (1979); Seward and Swegman (1979).
Rhode Island (RI)	
South Carolina (SC)	Morse et al. (1980); Unzicker et al. (1982).
Tennessee (TN)	Edwards (1966); Etnier and Schuster (1979).
Texas (TX)	Edwards (1973).
Utah (UT)	Bauman and Unzicker (1981).
Vermont (VT)	Betten (1934); Ross (1944).
Virginia (VA)	Parker and Voshell (1981).
Washington (WA)	
West Virginia (WV)	Hill et al. (1977, 1978); Hill and Tarter (1978); Tarter and Hill (1979))
Wisconsin (WI)	Hilsenhoff (1981).
Wyoming (WY)	

TABLE B2. Trichoptera of Stillfork Swamp Nature Preserve, Carroll Country, Ohio. Summary of their distributional ranges, habitats, and trophic relationships based on Merritt and Cummins (1984).

Taxon	Habitat	Trophic Relationship	North American Distribution
Philopotamidae			
Dolophilides distinctus (Walker).			
	Lotic erosional small streams.	Collector-filterer.	Northeastern NF., NS., ON., PQ., IN, KY, ME, MA, MI, MN, NH, NC, OH, PA, TN, WI.
Woemaldia shawnee (Ross).			
	Lotic erosional temporary stream.	Collector-filterer.	Eastern IL, KY, NH, OH, TN, VA.
Chimarra aterrima Hagen.			
	Lotic erosional spring fed brooks.	Collector-filterer.	Eastern NF., NS., ON., PQ., AL, AR, FL, IL, IN, KY, LA, ME, MA, MI, MN, NH, NC, OH, PA, SC, TN, VA, WI.
Chimarra obscura (Walker).			
	Lotic ?TO=-onal raeip, clear streams,	Collector-filterer.	Eastern ON., PQ., AL, AK, IL, IN, KY, LA, ME, MD, MA, MI, MN, MO, NY, OH, OK, PA, TN, TX, VA, WI.

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
Psychomyiidae			
Psychomyia flavida Hagen.			
	Lotic erosional swift, cold streams.	Collector-gatherer.	Transcontinental BC., MN., NB., PQ., SK., AL, AK, CO, ID, IL, KY, ME, MI, MN, MO, MT, NH, NY, NC, ND, OH, OK, PA, TN, UT, VA, WV, WY.
Lype diversa (Banks).			
	Lotic erosional small, cool streams.	Scraper.	Eastern AL., NB., ON., PQ., AL, AK, FL, IL, KY, LA, ME, MA, MI, MS, MN, MN, NH, NY, NC, OH, PA, SC, TN, VT, VA, WI.
Polycentropodidae			
Nyctiophylax affinis (Banks).			
	Lotic erosional.	Predator engulfer.	Eastern BC., AL, FL, KY, LA, MA, MT, NC, OH, PA, SC, TN, VA, WV.
Nyctiophylax moestus Banks.			
	Lotic erosional.	Predator	Northeastern BC., PQ., AL, IL, IN, MA, MI, MN, OH, SC, TN, VA, WV.

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
Phylocentropus lucidus (Hagen).			
	Lotic depositional headwater streams.	Collector-filterer.	Eastern NS., LA, ME, MA, NY, OH, PA, SC, TN, VA, WV.
Phylocentropus placidus (Banks).			
	Lotic depositional headwater streams.	Collector-filterer.	Eastern MN., NB., ON., PQ., AL, GA, IL, IN, KY, LA, ME, MA, MI, MN, NY, OH, PA, SC, TN, VA, WI.
Polycentropus aureolus (Banks).			
	Lentic littoral temporary ponds.	Predator.	Northern BC., NS., ME, MA, MI, MN, NH, ND, OH, WI.
Polycentropus centralis Banks.			
	Small, ragid streams.	Predator.	Central AR, IL, LA, MN, MO, NY, OH, OK, PA, TN, TX, WI.
Polycentropus cinerus (Milne)			
	Lotic erosional.	Collector-filterer.	Northeastern PQ., IL, ME, MN, NH, ND, WI.

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
Polycentropus cinereus Hagen.			
	Lakes and rivers.	Predator.	Transcontinental BC., NF., NS., PQ., SK., AL, AR, DE, FL, ID, IL, IN, KY, LA, ME, MD, MA, MI, MN, MT, MO, NH, NC, ND, OH, OK, OR, PA, SC, SD, TN, TX, UT, VA, WI.
Polycentropus confusus Hagen.			
		Predator.	Northeastern ON., PQ., AL, AR, KY, ME, MA, MI, MN, MO, NH, NY, OH, PA, TN, VA, WI.
Polycentropus crassicornis Walker.			
	Marsh swamp areas temporary ponds.	Shredder.	Northeastern PQ., AL, AR, ID, KY, LA, ME, MA, MI, MN, NH, NC, OH, PA, TN, WI.
Polycentropus interruptus (Banks).			
	Lakes and ponds.	Shredder.	Northeastern BC., PQ., CO, IL, ME, MA, MI, MN, NH, NY, ND, OH, PA, TN, WI.
Polycentropus pentus Ross.			
			Northeastern ON., PQ., IL, ME,

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
			MI, MN, NH, OH, PA, TN, WV, WI.
Polycentropus remotus Banks.	Slow-flowing waters and marshes;		Transcontinental BC., PQ., IL, KY, ME, MA, MI, MN, NH, NY, OH, PA, WI.
Hydropsychidae			
Cheumatopsyche aphanta Ross.	Lotic erosional.	Collector-filterer.	Eastern AR, IL, IN, KY, MN, ND, OH, OK, OR, TN, TX, WI.
Cheumatopsyche campyla Ross.	Lotic erosional Large rivers.	Collector-filterer.	Transcontinental BC., MN., ON., PQ., SK., AL, AR, CA, GA, ID, IL, IN, IA, KS, KY, ME, MA, MI, MN, MO, MT, NB, NH, NM, NY, ND, OH, OK, OR, PA, TN, TX, UT, VA, WA, WI, WY.
Cheumatopsyche gracilis (Banks).	Lotic erosional.	Collector-filterer.	Transcontinental BC., MN., NS., PQ., AL, AR, CT, ME, MA, MI, MN, MT, NY, NC, ND, OH, OK, PA, TN, UT, VA, WV, WI.

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
<u>Cheumatopsyche</u> <u>halima</u> Denning.			
	Lotic erosional.	Collector-filterer.	Northeastern AR, ME, MA, OH, PA, VA.
<u>Cheumatopsyche</u> <u>oxa</u> Ross.			
	Lotic erosional spring fed streams.	Collector-filterer.	Central AR, GA, IL, IN, KY. MI, MN, MO. NH. NY NC, OH, SD. TN. VA, WV. [illegible].
<u>Cheumatopsyche</u> <u>pettiti</u> (Banks).			
	Lotic erosional small stream.	Collector-filterer.	Transcontinental BC., MN., ON., PQ., SK., AL, AR, CO, CT, DE, FL, GA, HI, ID, IL, IN, KY, LA, ME, MD, MA, MI, MN, MT, MO, NH, NJ, NY, NC, ND, OH, OK, OR, PA, SC, SD, TN, TX, UT, VA, WA, WI, WY.
<u>Hydropsyche</u> <u>betteni</u> Ross.			
	Lotic erosional riffles and rapids.	Collector filterer.	Northeastern ON., PQ., AL, AR, GA, IL, IN, KY, LA, ME, MA, MI, MN, NH, NY, NC, ND, OH, PA, SC, TN, VA, WI.

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
Hydropsyche dicantha Ross.			
	Lotic erosional	Collector-filterer.	Northeastern ON. PQ., AL, DC, KY, MD. MI, MN, NH, NY, OH, PA, TN, VA, WI.
Hydropsyche incommoda Hagen.			
	Lotic erosional.	Collector-filterer.	Eastern AL, AR, FL GA, IL, KY, LA, NY NC, SC, TN, VA.
Hydropsyche orris Ross.			
	Large rivers.	Collector-filterer.	Central AL, AR, GA, IL, IN, IA, KS, KY, LA, MI, MN, MS, OH, OK, SC, TN, TX, WI
Hydropsyche phalerata Hagen.			
	Lotic erosional, rapids of rivers	Collector-filterer.	Eastern GA, IL, IN, KS, KY, LA, MA. MI, MN, NJ, NY, NC, OH. PA, TN, VA, WI.
Hydropsyche simulans Ross.			
	Large Rivers.	Collector	Central AR, CO, IL, IN, KS, KY, LA, MN, MO, MT, ND, OH. OK, TN, TX, WI.

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
Hydropsyche valanis Ross.			
	Large river riffles.	Collector.	Central IL, IN, IA, KY, MN, OH, WI.
Symphitopsyche bronta (Ross).			
	Small to medium-sized Streams.	Collector-filterer.	Northeastern NB., ON., PQ., AR, GA, IL, IN, KY, ME, MD, MA, MI, MN, MT, NY, NC, ND, OH, PA, TN, VA, WI, WY.
Symphitopsyche cheilonis (Ross).			
	Lotic erosional.	Collector-filterer.	Northeastern AL, IL, IN, KY, MI, OH, TN, VA, WV, WI.
Symphitopsyche morosa (Hagen).			
	Medium-sized rivers.	Collector-filterer.	Northeastern MN., ON., PQ., KY, ME, MA, MI, MN, NH, NY, NC, ND, OH, PA, TN, VA, WV, WI.
Symphitopsyche slossonae (Banks).			
	Cold streams.	Collector-filterer.	Northeastern NF., NS., SK., AR, IL, KY, ME, MA, MI, MN, MT, NH, NY, NC, ND, OH, PA, TN, VA, WI.

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
Symphitopsyche sparna Ross.			
	Lotic erosional.	Collector-filterer.	Eastern NS., ON., PQ., AL, GA, KY, LA, ME, MA, MI, MN, NH, NY, NC, OH, PA, SC, TN, VA, WV, WI.
Symphitopsyche walkeri (Betten and Mosely).			
	Small to medium rivers.	Collector-filterer.	Northeastern ON., PQ., ME, MA, MN, NH, NY, ND, OH, VA, WI.
Potamyia flava (Hagen).			
	Lotic erosional warm rivers.	Collector-filterer.	Central AL, AR, GA, IL, IN, KS, KY, LA, MI, MN, MT, MO. ND, OH, OK, PA, SC, SD, TN, TX, VA, WI.
Macrostemum zebratum (Hagen).			
	Larger rivers.	Collector-filterer.	Eastern ON, PQ., AL, CT, GA, IL, IN, KY, ME, MA, MI, MN, NH, NY, ND, OH, PA, TN, UT, VA, WA, WI.
Rhyacophilidae			
Rhyacophila ledra Ross.			
	Lotic erosional.	Predator.	Northern

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
			AL, KY, IL, MI, OH, TN.
Rhyacophila lobifera Betten.			
	Lotic erosional, Temporary streams.	Predator.	Central KY, IL, IN, OH, OK, PA, YN, WV.
Hydroptilidae			
Agraylea multipunctata Curtis.			
	Lentic - lakes and ponds.	Piercer-herbivore.	Holarctic BC., MN., NB., NS., ON., PQ., CO, KY, IL, ME, MA, MI, MN, MT, NH, NY, ND, OH, OR, PA, SD, TN, UT, VA, WI.
Hydroptila ajax Ross.			
	Small rivers and creeks.	Piercer-herbivore.	Transcontinental KS, KY, ID, IL, MN, MT, NY, OH, OK, OR, TX, UT, VA, WA, WI.
Hydroptila amoena Ross.			
	Small streams.	Piercer.	Eastern PQ., AR, IL, KY, MN, NH, OH, OK, TN, VA, WI.
Hydroptila angusta Ross.			
	Large to medium river.	Piercer.	Central

TABLE 52. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
			AL, IL, IN, KY, MO, NM, OH, OK, SC, TX.
Hydroptila consimilis Morton.			
	Clear permanent streams.	Piercer.	Transcontinental
			AB., BC., PQ., AR, AZ, ID, IL, KY, ME, MI, MN, NH, MT, NM, NY, OH, OK, OR, PA, SC, TN, TX, UT, VA, WA, WI.
Hydroptila grandiosa Ross.			
	Clear permanent streams.	Piercer.	Eastern
			AR, IL, IN, KS, KY, LA, MN, MO, OH, OK, TX, VA, WI.
Hydroptila hamata Morton.			
	Lakes and Rivers.	Piercer.	Transcontinental
			ON., PQ., AL, AZ, AR, CA, CO, FL, ID, IL, IN, KY, LA, ME, MI, MN, MO, NH, NM, NY, NC, OH, OK, OR, PA, TN, TX, UT; VA, WA, WI.
Hydroptila jackmanni Blickle.			
		Piercer.	Northeastern
			PQ., ME, MN, OH, VA, WI.
Hydroptila perdita Morton.			
			Northeastern

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
			ON., PQ., AR, IL, KS, KY, MI, MN, NH, NY, OH, PA, WI.
Hydroptila waubesiana Betten.			
	Lakes, streams and rivers.	Piercer-Herbivore.	Northeastern
			ON., PQ., SK., AL, AR, FL, IL, IN, KS, KY, LA, MI, MN, MS, MT, NJ, ND, OH, OK, PA, SC, TX, VA, WI.
Ochrotrichia spinosa (Ross).			
	Lotic erosional and depositional, spring fed brooks.	Collector-gatherer.	Central
			IL, KY, MN, OH, OK, WI.
Oxyethira dualis Morton.			
	Lentic - littoral.	Piercer.	Transcontinental
			ON., AK, AZ, CA, IL, MO, MT, NH, NM, NY, OR, OH, TN, TX, UT, VA.
Oxyethira forcipata Mosely.			
		Piercer.	Northeastern
			ON., PQ., AL, IL, ME, MI, MN, NY, OH, PA, TN, VA, WI.
Oxyethira pallida (Banks).			
	Streams, Lakes and ponds.	Piercer.	Transcontinental
			NB., AL, AZ, CA, DE, DC, FL, GA, IL, KY,

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
			LA, ME, MD, MN, NH, NY, OH, OK, SC, TX, VA, WI, WY.
Stactobiella palmata (Ross).			
	Lotic erosional, Small, swift streams.	Shredder.	Northern AB., IL, KY, ME, NH, OH, OK, OR, SD, TN, VA, WI.
Orthotrichia aegerfasciella (Chambers).			
	Lentic, ponds and lakes.	Piercer-herbivore.	Eastern PQ., AL, AR, CT, FL, IL, IN, KS, KY, LA, ME, MD, MA, MN, NH, NJ, NY, OH, OK, TN, TX, SC, VA, WI.
Orthotrichia cristata Morton.			
	Lentic, ponds and lakes; small streams.	Piercer-herbivore.	Eastern BC., PQ., AL, DE, FL, IL, IN, KS, KY, LA, ME, MI, MN, MT, NH, OH, OK, TN, TX, VA, WI.
Phryganeidae			
Agrypnia straminea Hagen.			
	Lentic - littoral ponds lotic depositional.	Shredder-detritivore.	Northern MN., NT., ON., PQ., AK, ME, MI, MN, MT, ND, OH, WI.

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
Agrypnia vestita (Walker).			
	Lentic - littoral ponds, Lotic depositional.	Shredder-detritivore.	Eastern PQ., AL, AR, KY, LA, ME, MA, MN, NH, NC, ND, OH, PA, SC, TN, VA, WV, WI.
Banksiola crotchi Banks.			
	Lotic and lentic depositional.	Shredder-herbivore.	Northern BC., PQ., ME, MA. MN, MT, ND, OH, PA. UT, WI.
Banksiola dossuaria (Say).			
	Lotic and lentic depositional.	Shredder.	Northeastern PQ., KY, ME, MA, NH, NY, OH, PA, VA.
Ptilostomis ocellifera (Walker).			
	Lotic and lentic depositional.	Shredder.	Northern BC., PQ., AL, AR, KY, LA, ME, MA, MN, NH, ND, OH, PA, SC, TN, VA, WV, WI.
Ptilostomis postica (Walker).			
	Lotic and lentic depositional.	Shredder.	Northeastern AL, LA, ME, MA, NH, NC, OH, PA, TN, VA.
Phryganea sayi Milne.			
	Lotic and lentic depositional.	Shredder-herbivore.	Northeastern

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
			DC, IL, ME, MA, MI, MO, NJ, NY, ND, OH, PA, TN, VA, WI.
Limnephilidae			
Ironoquia parvula (Banks).			
	Lotic depositional, lentic littoral, temporary waters.	Shredder.	Northeastern MA, MN, NH, NY, OH.
Ironoquia punctatissima (Walker).			
	Marshes, slow-flowing streams, temporary waters.	Shredder.	Eastern NF., PQ., AL, IL, IN, KY, LA, ME, MD, MA, MI, MN, NH, NY, NC, OH, PA, YN, VA, WV, WI.
Hydatophylax argus (Harris).			
	Lotic depositional.	Shredder-detritivore.	Northeastern PQ., ME, MA, MN, NH, OH, PA, TN, VA, WI.
Pycnopsyche aglona Ross.			
	Lentic - littoral.	Shredder-detritivore.	Northeastern ME, MA, OH, WI.
Pycnopsyche divergens (Walker).			
	Lentic - littoral.	Shredder-detritivore.	Northeastern MA, NH, OH, PA, VA, WV.

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
Pycnopsyche guttifer (Walker).			
	Lotic and lentic depositional.	Shredder-herbivore.	Northeastern
			PQ., KY, ME, MA, MI, MN, MT, NH, ND, OH, PA, TN, VA, WV, WI.
Pycnopsyche indiana (Ross).			
	lotic and lentic depositional.	Shredder.	Eastern
			AL, LA, OH, SC, TN.
Pycnopsyche lepida Hagen.			
	Large, warm streams.	Shredder.	Eastern
			PQ., GA, IL, KY, LA, ME, MA, MI, MN, NH, NJ, NY, NC, ND, OH, PA, SC, TN, VA, WV, WI.
Anabolia consocius (Walker).			
	Lentic - temporary ponds.	Shredder-detritivore	Northeastern
			ME, MA, MI, MN, NH, ND, OH, PA, VA, WI.
Limnephilus indivisus Walker.			
	Lentic - littoral, temporary ponds.	Shredder.	Transcontinental
			BC., PQ, MA, MI, MN, NH, ND, OH, PA, VA, WI.
Limnephilus submonilifer Walker.			
	Lentic - littoral, temporary ponds.	Shredder.	Northern

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
			NF., ON., PQ., AR, DC, IL, IN, ME, MD, MA, MI, MN, NH, NJ, NY, NC, ND, OH, PA, RI, SD, TN, VA, WI.
Platycentropus radiatus (Say).			
	Lentic - littoral, lotic depositional.	Shredder-detritivore.	Eastern PQ., KY, LA, MA, ME, MI, MN, NH, ND, Oh, PA, TN, VA, WI.
Frenesia difficilis (Walker).			
	Lotic erosional and depositional.	Shredder-detritivore.	Northeastern ME, MA, NH, OH, VA.
Frenesia missa (Milne).			
	Lotic erosional and depositional.	Shredder.	Northeastern ME, MA, MI, MN, NH, ND, OH, VA, WI.
Neophylax concinnus McLachlan.			
	Lotic erosional, cold swift streams.	Scraper.	Northeastern AR, KY, ME, MA, MI, NH, OH, PA, TN, VA, WI.
Leptoceridae			
Ceraclea alagma (Ross)			
	Lotic and lentic.	Collector.	Northern PQ., ME, MI, MN, NH, ND, OH, PA, WI.

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
Ceraclea cancellata (Betten).			
	Stream and rivers.	Collector.	Transcontinental BC., PQ., AL, AR, GA, KY, LA, IL, IN, ME, MA, MI, MN, MO, MT, OH, OK, PA, SC, TN, VA, WI.
Ceraclea diluta (Hagen).			
			Eastern PQ., LA, ME, MN, NH, ND, OH, PA, SC, TN, VA, WI.
Ceraclea flava (Banks).			
			Eastern AL, KY, LA, MN, NH, OH, PA, SC, TN, TX, VA, WI.
Ceraclea maculata (Banks).			
	Streams and rivers.	Collector.	Eastern BC., PQ., AL, FL, KY, KY, LA, MA, MN, NC, ND, OH, OK, SC, TN, TX, VA.
Ceraclea tarsi-punctata (Vorhies).			
	Streams and rivers.	Collector.	Transcontinental MN., NB., NS., ON., PQ., AL, AR, CA, FL, GA, ID IL, IN, KY, LA, ME, MA, MI, MN, MO, MT, NH, NY, ND,

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
			OH, PA, SC, TN, VA, WI.
Ceraclea transversa (Hagen).			
	Freshwater sponge areas in ponds.	Predator.	Transcontinental
			PQ., AL, AR, CA, ID, KY, LA, ME, MA, MI, MN, MT, NH, NC, ND, OH, PA, SC, VA, TN, TX, WI.
Leptocerus americanus (Banks).			
	Lentic - marshes, slow-flowing streams.	Shredder-herbivore.	Eastern PQ., AR, LA, ME, MA, MI, MN, NH, ND, OH, PA, SC, TN, TX, VA, WI.
Nectopsyche albida (Walker).			
	Lentic - littoral.	Shredder-herbivore.	Transcontinental BC., PQ., KY, LA, MA, MI, MN, MT, NC ND, OH, PA, UT, WI.
Nectopsyche candida (Hagen).			
	Streams, rivers and marshes.	Shredder.	Eastern PQ., AL, AR, KY, LA, MN, MT, NH, ND, OH, SC, TN, VA.
Nectopsyche diarina (Ross).			
	Lentic - littoral.	Shredder-herbivore.	Northern ID, MN, MT, ND, OH.

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
			UT, VA.
Triaenodes abus Milne.			
	Lentic - littoral.	Shredder.	Eastern PQ., AR, KY, LA, ME, MA, MN, NH, OH, SC, TN, WI.
Triaenodes dipsius Ross.			
	~ etm, - littor?! , lotic depositional.	Shredder-herbivore.	Northern PQ., KY, MN, NB, OH.
Triaenodes flavescens Banks.			
	Lentic - littoral, lotic depositional.	Shredder-herbivore.	Eastern FW., KY, LA, ME, MN, OH, OK, TN, TX, MH.
Triaenodes injustus (Hagen).			
	Lentic - littoral.	Shredder.	Eastern PQ., AL, AR, FL, KY, ME, MA, MI, MN, NH, OH, OK, PA, TN, TX, WI.
Triaenodes marginatus Sibly.			
	Lentic - littoral.	Shredder-herbivore.	Eastern NS., PQ., AR, IL, LA, MA, MI, MN, NJ, NY, ND, OH, SD, TN, VA, WI.

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
Triaenodes tardus Milne.	Lentic - littoral.	Shredder.	Eastern PQ., AL, AR, KY, ME, MA, MI, MN, MT, NH, ND, OH, PA, TN, UT, WI.
Oecetis cinerascens (Hagen).	Lotic erosional and depositional.	Predator.	Eastern PQ., AL, AR, FL, KY, LA, ME, MA, MI, MN, NH, ND, OH, PA, SC, TN, VA, WI.
Oecetis ditissa Ross.	Lotic erosional and depositional; lentic - littoral.	Shredder.	Eastern AL, KY, LA, MA, OH, OK, PA, SC, TN, TX, NH.
Oecetis immobilis (Hagen).	Lotic erosional and depositional.		Northern PQ., ME, MN, MT, NH, ND, OH, PA, WI.
Oecetis inconspicua (Walker).	Lotic erosional and depositional; lentic - littoral.	Shredder.	Transcontinental BC., NS., [illegible]., ON., PQ., SK., AL, AR, CA, FL, GA, IL, IN, IA, KS, KY, LA, ME, MA, MI, MN, MO, MT NB, NH, NJ, NY, ND, OH, OK, OR, PA, SC,

TABLE B2. (CONTINUED)

Taxon	Habitat	Trophic Relationship	North American Distribution
			SD, TN, TX, UT, VT, VA, WI.
Oecetis nocturna Ross.	Lotic erosional and depositional; lentic - littoral.	Shredder.	Eastern PQ., AL, AR, DE, IL, IN, KY, LA, MS, OH, OK, PA, TN, TX, VA.
Oecetis ochracea (Curtis).	Lotic erosional and depositional, lentic - littoral.	Predator.	Eastern MN, MT, ND, OH, SC, TN, VA, WI.