A SURVEY OF TRICHOPTERA OF OHIO REMNANT BOGS AND FENS

by

Ralph J. Garono

Submitted in Partial Fulfillment of the Requirements
for the degree of
Master of Science
in the Biology Program

David B. MacLean August 1 1986
Adviser Date

Sally M. Hotchkiss August 22, 1986
Dean of the Graduate School Date

YOUNGSTOWN STATE UNIVERSITY
August 1986

THESIS APPROVAL FORM

THESIS TITLE: A survey of Trichoptera of Ohio remnant bogs and fens

AUTHOR: Ralph J. Garono

DEGREE: Master of Science

ADVISOR: Dr. David B. MacLean

COMMITTEE MEMBERS:	ACCEPT	REJECT
David B. MacLean	✓	
Paul C Pregler	✓	
Lauren Schroeder	✓	
Dale Fischbeck	✓	

DATE July 30, 1986

1 copy to accompany library copy

1 copy to advisor

1 copy to Departmental Files

ABSTRACT

A SURVEY OF TRICHOPTERA OF OHIO
REMNANT BOGS AND FENS

Ralph J. Garono

Youngstown State University, 1986

In Ohio, remnant bogs and fens have existed as habitat islands since the retreat of the Wisconsinan Glacier at least 10,000 years before present (B.P.). Preservation of these wetlands has become a major objective of natural areas management. Much emphasis has been placed on preservation of the flora of bogs and fens, a large portion of which includes rare and endangered plant species. In this study, emphasis has shifted to the caddisfly fauna of these habitat islands. It is known that Ohio lies within the southern range of several species of Trichoptera with boreal and transcontinental distributions.

The objectives of this study were to (1) provide baseline data on the composition of the Trichoptera fauna of selected Ohio bogs and fens, (2) document the present land cover of areas adjacent to the study sites, and the water

quality in order to evaluate future changes in the caddisfly fauna and (3) evaluate the caddisfly fauna of bogs and fens by means of discriminant analysis.

The caddisfly fauna of fourteen Ohio remnant bogs and fens was sampled by means of ultra violet light traps operated from May to October of 1984 and 1985. One hundred and twenty three collections resulted in a total of 37,061 adult Trichoptera representing thrteen families, forty three genera, and one hundred and forty two species. New state records are reported for Cyrnellus marginalis (Banks), Glossosoma intermedium Banks, Goera calcarata Banks, Lepidostoma costele (Banks), Limnephilus hyalinus Hagen, and Oecetis ochraceae (Curtis).

The extent of seven land cover types: (1) wooded areas; (2) old fields; (3) agricultural fields; (4) houses, railroad tracks and quarries; (5) continuous Sphagnum mat; (6) lotic; and (7) lentic aquatic habitats was evaluated for a 16.9 ha area (adjacent to each collection site) from recent aerial photographs and confirmed by field observations. The pH and conductivity of surface and subsurface water was measured at most sites.

Discriminant analysis classified the study sites as either bogs or fens based on (1) numerical species abundance and (2) species presence or absence. Analysis of presence/absence data for the Limnephilidae, Leptoceridae and Hydroptilidae correctly classified 100 percent of the

sites. Analysis of species abundance data for the Hydropsychidae and Phryganeidae correctly classified 85.7 percent of the sites.

Results of this study suggest that bog and fen wetlands can be classified on the presence of certain caddisfly species. Documentation of the caddisfly fauna of these bogs and fens may provide important baseline data for the evaluation of future environmental changes and the management of Ohio's wetlands.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

TABLE OF CONTENTS (CONTINUED)

ACKNOWLEDGMENTS

Space does not permit me to thank all those who were helpful during the course of this study. I would like, however, to acknowledge Dr. David MacLean, my adviser, for his help and support, and Drs. Lauren Schroeder, Dale Fishbeck, and Paul Peterson. I would also like to thank Dr. Barbara Andreas for the time she spent with me.

Special thanks to The Nature Conservancy and the Ohio Department of Natural Resources for permission to collect on their properties and to Garr-Safe Systems, Inc. for the use of their vehicle.

I would like to express a heartfelt "thank you" to my future wife, Barbara. Without her understanding, support and appreciation of the natural world this project would not have been possible.

This research was funded in part by O.D.N.R. grant number 910120 and Youngstown State University Research Council grants numbers 546 and 572.

LIST OF SYMBOLS

SYMBOL	DEFINITION
r	Pearson's Correlation Coefficient
H	Brillouin's Diversity Index
J	Evenness Value
H_{max}	Maximum Diversity
CC_j	Jaccard's Coefficient of Community Similarity

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES CONTINUED

LIST OF TABLES CONTINUED

INTRODUCTION

Since creation of the Ohio state nature preserve system in 1970, over 5,868 hectacres (ha) of Ohio's landscape have been preserved at a cost of over five million dollars (Jan Williams, Ohio Division of Natural Resources, personal communication). After sixteen years of acquisition and land dedication, Ohio's system of natural areas and preserves harbors the best remaining examples of: oak-savannah (Goll Woods, Fulton County); tall grass prairie (Schwamberger Prairie, Fairfield County); freshwater estuary (Old Woman's Creek, Erie County); dune community (Headland Dunes, Lake County); minerotrophic fen (Prairie Road Fen, Clark County); and weakly ombrotrophic bog (Brown's Lake Bog, Wayne County). Some preserves contain the only known examples of these habitats within the state. Through the concerted efforts of both state and private agencies these representative habitats have been set aside for future generations.

Many Ohio preserves exist solely due to the occurrence of threatened or endangered plant species (Andreas 1980, Cooperrider 1982, McCance and Burns 1984, Platt 1985). Protected as nature preserves, some bog and fen wetlands harbor Ohio's only known occurrence of certain boreal vegetation. The elimination of potential competitors due to

extremes in pH, and nutrient deficiencies enable some plant species typical of northern areas to exist in Ohio bogs. Bog and fen wetlands which were formed following the retreat of the Wisconsinan glacier 20,000 to 10,000 years before present (B.P.) are associated with esker-kame complexes (Stuckey and Denny 1981) and buried valleys of the Teays River system (Andreas 1985). Pollen cores indicate that interlobate areas in Portage County, as well as southern Ohio wetlands in Clark County, have been ice-free for approximately 19,000 to 20,000 years (Shane 1974). Bogs and fens covered less than one percent of the land surface of Ohio in 1912 (Dachnowski 1912). Many of these wetlands have been destroyed (Stuckey and Denny 1981) and those that remain are often completely surrounded by agricultural land, e.g., Liberty Fen, Clark County; Betsch (Blackwater) Fen, Ross County.

Although protected by the Ohio Natural Areas Act of 1970, the integrity of these fragile areas may be threatened by human activities on nearby or adjacent land. Urbanization, mineral extraction and agriculture are largely responsible for the fragmentation and isolation of these wetlands (Marrs 1986). Many indirect threats arise from the "industrial and commercial development [of] adjacent lands, air pollution, urban encroachment, and roads" (Elfring 1986). While human activities have resulted in the destruction of many environmentally significant areas, the

normal course of succession will also result in the loss of these areas (Aldrich 1937). Measures have been taken to preserve the integrity of wetland habitats through restricted use and selective removal of unwanted vegetation (Jora Young, The Nature Conservancy, personal communication). Continued management of these communities is necessary if these wetlands are to survive.

Previous chemical and floristic studies have provided much of the information used for the preservation and management of these wetlands (Andreas 1985, Heinselman 1970, McKnight et al. 1985, Schwintzer and Tomberlin 1982, Stuckey and Denny 1981, Tyrrell 1985). Though it has been reported that "wetland biological communities contain many of the rarest and most interesting plant and animal species native to the Great Lakes Region" (Shuey 1985), few studies have considered the fauna of these glacial remnants (Utter 1971).

Information regarding the insect fauna of remnant glacial wetlands is noticeably lacking. MacLean and MacLean (1984) reported sixty-nine species of caddisflies (Trichoptera) from Watercress Marsh, a fen located near the southern extent of glaciation in Columbiana County, Ohio. One hundred and four species of caddisflies were reported by Usis and MacLean (1986a) from Stillfork Swamp, an unglaciated wetland in Carroll County. Caddisfly species diversity is reportedly higher in unglaciated wetland sites than in glaciated wetlands (Usis & MacLean, 1986b). Thiele

(1977) reported that carabid beetle populations of eutrophic fens have a "typical make up, although no one species is characteristic for, exclusive to, the habitat."

The order Trichoptera, represented by seventeen families in North America (Wiggins 1977), is one of the largest groups of aquatic insects. Wiggins (1977) estimates that worldwide the total number of caddisfly species may exceed 10,000. The North American fauna alone may include as many as 1,200 species. "Apart from the Diptera, the Trichoptera are usually more numerous in species and more diverse biologically . . . than other aquatic insect orders" (Wiggins 1977). Currently, there are 209 species of Trichoptera recorded for the state of Ohio (Huryn and Foote 1983, Usis and MacLean 1986a).

Caddisflies are present in a wide range of habitats and occupy several trophic levels, "only aquatic Diptera approach or exceed the Trichoptera in number of species or genera" (Wiggins and MaKay 1978). All families of caddisflies are represented in cool, fast-flowing streams. Many taxa have secondarily moved into slow-moving, poorly oxygenated bodies of water (Wiggins 1978b). Ross (1956) reported the three most primitive families of caddisflies, Philopotamidae, Rhyacophilidae, and Glossosomatidae live in cool streams with temperatures of 7 to 13 degrees C. Mackay and Wiggins (1979) reported that many species of Limnephilidae, Leptoceridae, Phryganeidae, Molannidae,

Hydroptilidae, and Polycentropodidae tolerate the reduced oxygen tensions of large, slow-moving bodies of water. This adaptive radiation into both lotic and lentic habitats coupled with the successful exploitation of available energy in aquatic systems has been attributed to the ability of caddisfly larvae to spin silk (Makay and Wiggins 1979).

Larval production of silk occurs in both the Trichoptera and its sister order, the Lepidoptera. While silk secretions have permitted the Lepidoptera to achieve a "high level of food specificity . . . Caddisfly larvae use silk in different ways to produce nets, shelters, and portable cases, which lead to marked diversification in the means of obtaining food " (Mackay and Wiggins 1979). Silk produced by larvae of the primitive family Rhyacophilidae enables the free-living larva to maintain its position within a fast moving stream by tethering it to the substrate. Net-spinning caddisflies, i.e., Philopotamidae, Psychomyiidae, and Hydropsychidae spin silken nets to collect particulate inorganic and organic matter. Net placement, mesh size, and temporal variations in net construction maximize niche partitionment among net-spinning species. Silk-spun, portable cases may have evolved initially in response to predation, however, Mackay and Wiggins (1979) note that other requirements of the aquatic habitat are met by this adaptation, i.e., ballast, buoyancy, streamlining, and structural rigidity. Adaptation

of caddisfly larvae to poorly oxygenated, lentic habitats has been facilitated by the evolution of portable tube cases by members of the Limnephiloidea. Undulating abdominal movements within the case cause currents of water to flow over larval tracheal gills thereby increasing oxygen uptake (Wiggins 1978b).

During this two year study, initiated in the spring of 1984, the caddisfly fauna was surveyed at fourteen remnant Ohio wetlands. Glacially derived, these wetlands exhibit many differences in plant communities, topography, hydrogen ion concentration, dissolved mineral levels and size. Environmental heterogeneity was expected to influence the adult Trichoptera fauna inhabiting these natural areas. Objectives of this study were to : (1) provide baseline information on the occurrence of Trichoptera in Ohio's bog and fen wetlands; (2) document current land use and water quality of the study area in order to evaluate the effect of future human activity on the caddisfly fauna, and, (3) discriminate between bog and fen habitats based on the composition of the caddisfly fauna as indicator taxa.

Glacial remnant bog and fen wetlands in Ohio exist at the southernmost edge of their range in North America (Andreas 1985). Though the literature contains many terms and definitions for these wetlands, modern peatland ecologists currently classify wetlands on the basis of their nutrient sources. Nutrient rich peatlands which receive

dissolved minerals in groundwater are termed minerotrophic. Areas that are nutrient poor and receive nutrients only from rainwater are termed ombrotrophic. In many cases the distinction is difficult to make. Shuey (1985) indicated that many "wetlands are mosaics of wetland types and transitional communities are frequently encountered." In this study, bog and fen sites were distinguished using the criteria provided by Andreas (1985). A sphagnous bog

> is considered to be a habitat that (1) develops in an area where drainage is blocked and there is little or no circulation of water, (2) contains a Sphagnum dominated ground layer which accumulates to a more or less continuous mat, (3) has a shrubby vegetation dominated by members of the Ericaceae and a herbaceous layer primarily dominated by members of the Cyperaceae, and (4) has a water pH between 3.5 and 5.5.

Fens are

> characterized by having (1) relatively clear water coming from an artesian source which surfaces as springs or seeps, (2) a wet, springy calcareous substrate which supports minerotrophic species of Sphagnum and other bryophytes which do not accumulate to form a continuous mat, (3) vegetation dominated by members of the Cyperaceae, Compositae, Rosaceae and Gramineae with approximately 20 % of the vegetation made up of shrubs, usually including Potentilla fruticosa and (4) water pH between 5.5 and 8.0.

Bog and fen sites included in this study all occur within glaciated Ohio (Figure 1). Information appearing in the following site descriptions was compiled from field

observations by the author and lists supplied by The Nature Conservancy and the Ohio Department of Natural Resources.

Site 1. Betsch Fen

Betsch Fen is located in northcentral Ross County (T9N, R21W) on till plains near the terminal morain of the Wisconsinan Glacier. This 14.2 ha preserve is completely surrounded by active agricultural and pastural land. Undoubtedly, this area remains today as a preserve because as one local farmer aptly put forth "nobody goes back there anymore, the tractors kept gett'n stuck in the quicksand." Adjacent to the Blackwater River, this area supports a variety of uncommon plant species which include: poison sumac, Rhus vernix L.; shrubby cinquefoil, Potentilla fruticosa L.; small fringed gentian, Gentiana procera Holm.; Ohio goldenrod, Solidago ohioensis Riddell.; queen-of-the-prairie, Filipendula rubra (Hill) Robins.; Grass-of-Parnassus, Parnassia glauca Raf.; slender straw sedge, Carex tenera Dewey.; hairy-fruited sedge, Carex trichocarpa Muhl.; and canada burnet, Sanguisorba canadensis L. This area was acquired by The Nature Conservancy in 1983 (TNC).

Site 2. Brown's Lake Bog

Brown's Lake Bog is one of the state's better known

kettlehole bogs. It is located on the Glaciated Allegheny Plateau southwest of Wooster, Ohio. The area was dedicated as a national landmark in 1968 and as a scientific state nature preserve in 1980. Brown's Lake Bog is owned and managed by The Nature Conservancy.

This preserve exhibits the classic zones of bog vegetation characteristic of such habitats. Significant plant species found at the site include: Bootts's wood-fern, Dryopteris X boottii; Pitcher plant, Sarracenia purpurea L.; cotton grass, Eriophorum virginicum L.; round-leaved sundew, Drosera rotundifolia L.; spatulate-leaved sundew, Drosera intermidia; large cranberry, Vaccinium macrocarpon Ait.; rose pagonia, Pogonia ophioglossoides L.; grass-pink, Calopogon pulchellis (Salisb.); buckbean, Menyanthes trifoliata L. This area is almost completely surrounded by cultivated agricultural fields. Nearby agricultural activities pose an immediate threat to this bog.

Site 3. Cranberry Bog

Located in central Licking County on the Glaciated Allegheny Plateau, Cranberry Island Bog (T19N, R12W) has a very unique history and is a registered national landmark. Floating in alkaline Buckeye Lake, Cranberry Island was unintentionally created in 1830 when an area known as Big

FIGURE 1. Map of Ohio showing the locations of the fourteen sites of this study and glacial maxima.


ASHTABULA
LAKE
Kelso
GEAUGA
TRUMBULL
CUYAHOGA
Gott
Eagle
Triangle
PORTAGE
Kent
Frame
MAHONING
Lone Larch
SUMMIT
COLUMBIANA
Jackson
STARK
WAYNE
Brown's
CARROLL
HOLMES
TUSCARAWAS
COSHOCTON
HARRISON
JEFFERSON
GUERNSEY
BELMONT
MUSKINGUM
Cranberry
MONROE
NOBLE
PERRY
MORGAN
WASHINGTON
HOCKING
ATHENS
MEIGS
PIKE
JACKSON
SCIOTO
GALLIA
LAWRENCE
ADAMS
BROWN
HAMILTON
CLERMONT
HIGHLAND
BUTLER
WARREN
CLINTON
ROSS
Betsch
FAYETTE
PICKAWAY
GREENE
PREBLE
MONTGOMERY
Prairie
MADISON
CLARK
FRANKLIN
FAIRFIELD
DARKE
MIAMI
Kiser
CHAMPAIGN
LICKING
SHELBY
Liberty
LOGAN
UNION
DELAWARE
KNOX
MERCER
AUGLAIZE
MORROW
HARDIN
MARION
RICHLAND
ALLEN
VAN WERT
WYANDOT
CRAWFORD
ASHLAND
PAULDING
PUTNAM
HANCOCK
SENECA
HURON
MEDINA
DEFIANCE
HENRY
WOOD
SANDUSKY
ERIE
LORAIN
WILLIAMS
FULTON
LUCAS
OTTAWA
UNGLACIATED
Wisconsinan
Illinoian
Kansan

Swamp was flooded to furnish Ohio's canal system with water. A Sphagnum area of Big Swamp expanded and rose to the surface of the newly formed reservoir. In 1830 the area of the island was a little over 20 ha. Through the forces of wave action and ice movement, only 8 ha remain today. The Sphagnum mat supports typical bog plant species such as Drosera rotundifolia L., Pogonia ophioglossoides L., Calopogon pulchellis (Salisb.), Menyanthes trifoliata L. and Rhus vernix L. The population of Sarracenia purpurea L., which occurs on the island, was established by individuals introduced in 1921 (Schwaegerle 1983). The juxtaposition of the acidic bog and alkaline lake waters have allowed a ring of red maple, Acer rubrum L., and alders to form around the margin of the preserve which shade the Sphagnum mat community. Cranberry Island was dedicated as a scientific nature preserve on May 18, 1973 and is managed by the Ohio Division of Natural Resources, Division of Natural Areas and Preserves. Heavy recreational use of Buckeye Lake by boaters and invading tree species pose a serious threat to this wetland.

Site 4. Eagle Creek Bog

Eagle Creek is a 178.6 ha state nature preserve located in Portage County, Ohio (T5N, R6W). This large preserve supports a variety of different communities

including: oak woodlands, old field, marshes, buttonbush swamps, etc. Two bog communities in the northeast corner of the preserve are separated by less than 750 m. The first area is a natural bog which lies immediately south of the largest body of water on the preserve. This area consists of open Sphagnum mat and mat covered with shrubby vegetation (mostly Acer rubrum L.). The second bog area was created as an interpretive area. It is located northwest of the previously described area and contains plant species taken from individuals collected at Cranberry Bog (Sarracenia purpurea L., Rhus vernix L., and Vaccinium macrocarpum Ait.).

This area is owned and managed by the Ohio Department of Natural Resources, Division of Natural Areas and Preserves. It was dedicated as a interpretive nature preserve in 1974.

Site 5. Frame Lake Fen

Frame Lake Fen, also known as Herrick Fen and Seasons Road Bog, is located on the Glaciated Allegheny Plateau in northeast Portage County (T4N, R9W). Exhibiting characteristics of both fens and bogs, this 50.6 ha preserve supports a mosaic of bog meadows and tamarack forests, Larix larcina L., on the northeast shore. Some of the tamarack are estimated to be 15 to 25 m in height though there are many

seedlings. The preserve area is primarily surrounded by old field although a mature beech-maple stand and sand and gravel pit exist on the northeast shore. The community includes the following plant species: tamarack, Larix larcina L.; white camas, Zygadenus glaucus Nutt.; Potentilla fruticosa L.; Drosera rotundifolia L.; Parnassia glauca Raf.; bayberry, Myrica pensylvanica Loiser; and Rhus vernix L. A number of unusual northern species of sciomyzid flies were reported for the area (Stein 1974). Frame Lake Fen was dedicated as an interpretive nature preserve on April 14, 1982. It is owned by Kent State University and is managed by the The Nature Conservancy. This area may be threatened by the sand and gravel mining operation which exists on adjacent property.

Site 6. Gott Fen

Gott Fen is one of Ohio's finest examples of a boreal fen. It is located on the glacial plateau in northeast Portage County (T4N, R9W). This 5.5 ha state nature preserve is surrounded by wetlands and is chiefly accessible along the raised gravel road bed of the Norfolk and Western railroad. The fen is bordered by railroad tracks on the west and Tinker's creek on the east. This area supports a diverse plant community including: showy lady's slipper, Cypripedium reginae Walt.; Larix larcina L.; sage willow, Salix candida Fluegge.; Drosera rotundifolia L.; Myrica

pensylvanica Loisel.; Eriophorum virginicum L.; and Potientilla fruticosa L. A large population of the spotted turtle, Clemmys guttata L. is also present. Gott Fen was dedicated as a scientific nature preserve on May 4, 1982. It is owned and managed by the Ohio Division of Natural Resources, Division of Natural Areas and Preserves.

Site 7. Jackson Fen (Jackson Bog)

Jackson Fen, also known as Jackson Bog, is located in northwestern Stark County (T11N, R9W), where the Killbuck Lobe of the Wisconsinan Glacier bordered the Grand River lobe some 18,000 years B.P. This 6.5 ha preserve contains a 2.3 ha calcareous fen, one of only two in the state where the pitcher plant grows. Other significant plant species include: Potientilla fruticosa L.; Gentiana procera Holm.; hooded ladies'-tresses; tufted hairgrass; false asphodel, Tofieldia glutinosa (Michx.) Pers.; arrow grass; Drosera rotundifolia L.; and Parnassia glauca Raf.

Jackson Fen is located 9.7 km northwest of the City of Canton. It is located adjacent to a public area and is potentially threatened by increased recreational use (signs of vandalism, motorcycle and three-wheeler traffic are evident). Additionally, pesticides and fertilizers may run into this area from the adjacent playing fields and golf course.

This nature preserve is owned by the Jackson Local Board of Education and is managed by the Ohio Department of Natural Resources, Division of Natural Areas and Preserves. It was dedicated as an interpretive nature preserve in 1980.

Site 8. Kent Bog

Kent Bog is a 16.9 ha glacial remnant bog situated within a dedicated 30.4 ha state nature preserve in Portage County, Ohio (T2N, R9W). Located on the glaciated plateau and situated within the esker-kame complex of the Kent end moraine, Kent Bog is believed to contain one of the largest and southernmost stands of native tamarack. This mature bog forest contains approximately fifteen hundred to two thousand native tamarack trees ranging in size from small seedlings to mature trees reaching heights of 15-20 m. This acid bog supports such threatened and endangered species as: small leaved cranberry, Vaccinium oxycoccos L.; few-seeded sedge, Carex oligosperma Michx.; Eriophorum virginicum L.; Carex trisperma Dewey; gray birch, Betula populifolia Marsh; leather leaf, Chamaedaphne calyculata (L.) Moench; Virginia chain fern, Anchistea virginica (L.) Smith.; catberry, Nemopanthus mucronata (L.) Trel.; goldthread, Coptis groenlandica; and spotted turtles, Clemmys guttata.

The Kent Bog nature preserve has remained relatively undisturbed since the early nineteen hundreds. While never

logged, there are reports of a fire that swept through the area during the early part of this century. Today the area faces environmental pressures posed by a mining operation located near its southwest border and by increasing population of the City of Kent, Ohio. This area was dedicated as a state nature preserve in 1984 and is owned and managed by the Ohio Department of Natural Resources, Division of Natural Areas and Preserves.

Site 9. Kiser Lake Fen

Kiser Lake Fen is a 20.5 ha fen located in Champaign County, Ohio (T4N, R12W). This fen, located along the southern shore of Kiser Lake on the till plains of west central Ohio, is one of the last remnants of an area known as Mosquito Lake Bog. The original area occupied the upper portion of the Mosquito Creek Valley but was largely destroyed during the construcion of Kiser Lake. The flora of this area is comprised of such plant species as: Potentilla fruticosa; Kalm's lobelia, Lobelia kalmii L.; Parnassia glauca Raf.; Gentiana procera Holm.; prairie valerian, Valerian ciliata; big blue stem, Andropogon gerardi Vitm.; Filipendula rubra; and Solidago ohioensis Riddell. This area is owned by the Ohio Department of Natural Resources, Division of Parks and Recreation, and it is managed by the Division of Natural Areas and Preserves.

It was dedicated as an interpretive nature preserve in 1975.

This fen is located within Kiser Lake State Park. The area is heavily used during summer months by campers, fishermen, and boaters. Evidence of human activity (footpaths, litter, etc.) is present throughout the nature preserve although access to the area is restricted.

Site 10. Lake Kelso Bog

Lake Kelso Bog is located in central Geauga County, Ohio (T7N, R7W). One of several kettlehole lakes of the Cuyahoga Wetlands, Lake Kelso essentially does not have a floating Sphagnum mat. The shoreline is composed primarily of loosestrife, Decodon verticillatus (L.) Ell. The northwest shore of this 16.2 ha preserve contains a remnant white pine-bog community. Many large white pine, Pinus strobus L. (estimated to be 15 m), cover the existing consolidated Sphagnum mat. Lake Kelso Bog, the site of a hunting club, contains at least four rare plants: coral-root, Corallorhiza maculata Raf.; horsetail, Equisetum sylvaticum L.; pondweed, Potamogeton epihydrus Raf.; and large-leaf pondweed, Potamogeton amplifolius Tuckerm. Lake Kelso was acquired by The Nature Conservancy in 1984. Daming and destruction of tamarack seedlings by beaver have seriously threatened this site.

Site 11. Liberty Fen

Liberty Fen is one of the best remaining fen communities in western Ohio. It is located on the till plains of Logan County (T5N, R13W). This 3.6 ha preserve is virtually an island surrounded by cultivated agricultural land. Fed by a small stream which flows through the area, this site supports such fen and prairie plant species as: twig-rush, Cladium mariscoides (Muhl.) Torr.; prairie rattlesnakeroot, Prenanthes racemosa Michx.; low not-rush, Scleria verticillata Much.; Tofieldia glutinosa (Michx.) Pers.; seaside arrow-grass, Triglochin maritimum L.; Valerian ciliata (T.&G.) Cronq.; Zygadenus glaucus Nutt.; beaked spikerush, Eleocharis rostellata Torr.; Filipendula rubra (Hill) Robins.; Gentian procera Holm.; Parnassia glauca Raf.; Solidago ohioensis Riddell.; and Potentilla fruticosa L.

Access to the site is restricted by two crossing railroad tracks. Additional pressures posed by the City of West Liberty (less than 1.2 km from the preserve) and agricultural runoff may threaten this site. The area is owned and managed by the Ohio Department of Natural Resources, Division of Natural Areas and Preserves and was dedicated as a scientific nature preserve in 1981.

Site 12. Lone Larch Bog

Lone Larch Bog is located within Quail Hollow State Park, Stark County, Ohio (T20N, R12W). In addition to the 0.61 ha bog, the 283 ha park contains examples of different habitats, e.g., a white pine forest, a tall grass prairie, and old field.

The park was dedicated in 1975 and is owned and managed by the Ohio Department of Natural Resources, Division of Parks and Recreation. Prior to 1975, during the years 1811-1914 the property was owned by Conrad Brumbaugh. In 1914, the property was purchased by the Stewart family whose residence was located on the property until 1975. The bog area is located thirty m from what is now an animal rehabilitation center, north of the old Stewart home. A derelict coal pile is adjacent to the bog on the west and runoff may introduce silt and undesired materials into the area.

This mature bog contains only a few remnant bog indicator plant species, e.g., tamarack and poison sumac. Woody vegetation covers much of the area which is entirely flooded in early spring and late fall. A wooden boardwalk was constructed through the bog area in the fall of 1984. Early photographs, circa 1930, show the bog area to be clear cut and partially drained. Later photographs show a mature stand of tamarack located in the area, remnants of which are

visible today. According to the park manager, Ted Scheriff, plans to restore the bog community are underway. Much of the native woody vegetation has been removed by hand. Pitcher plants, leather leaf, and cotton grass were reintroduced to the area early in 1986.

Site 13. Prairie Road Fen

Located on the till plains in southeastern Clark County, Prairie Road Fen (T5N, R13W) is one of Ohio's largest fens. Within this 38.5 ha preserve, artesian springs and areas of exposed marl harbor a mixture of both prairie and boreal plant species including: false gromwell, Onosmodium molle Michx.; Gentiana procera Holm.; Prenanthes racemosa Michx.; Solidago ohioensis Riddell.; Filipendula rubra (Hill) Robins.; Sanguisorba canadensis L.; Potentilla fruticosa L.; baltic rush; arrow-grass; and Drosera rotundifolia L. The area is owned by the U.S. Army Corps of Engineers and is administered under a lease agreement between the corps and the Ohio Department of Natural Resources. It was dedicated in 1981.

Site 14. Triangle Lake Bog

Triangle Lake Bog located in northeast Portage County (T2N, R9W), is one of the best examples of a bog sere in

Ohio. The 25 ha preserve is jointly owned by the City of Ravenna and the Ohio Department of Natural Resources. Located within the Glaciated Allegheny Plateau, this kettle lake bog exhibits a floating Sphagnum mat covered with unusual plant species, i.e. Vaccinium oxycoccos L., Drosera rotundifolia L. and Sarracenia purpurea L.; a heath zone of Vaccinium corymbosum L., Chamaedaphne calyculata (L.) Moench., and Rhus vernix L.; and an almost complete ring of Larix larcina L. The preserve area was dedicated as a scientific nature preserve on April 8, 1981 and is managed by the Division of Natural Areas and Preserves.

MATERIALS AND METHODS

The fourteen remnant Ohio wetlands selected for this study were designated as either bogs (7) or fens (7) based on floristic and chemical data (Andreas 1985). Sites are managed by either an agency of the Ohio Department of Natural Resources or The Nature Conservancy as indicated in Table 1.

The sites and their locations were (Figure 1): (1) Betsch Fen, Ross County; (2) Brown's Lake Bog, Wayne County; (3) Cranberry Bog, Licking County; (4) Eagle Creek, Portage County; (5) Frame Lake Fen (Herrick Fen), Portage County; (6) Gott Fen, Portage County; (7) Jackson Bog (Jackson Fen), Stark County; (8) Kent Bog, Portage County; (9) Kiser Lake Fen, Champaign County; (10) Lake Kelso Bog, Geauga County; (11) Liberty Fen, Logan County; (12) Lone Larch Bog, Stark County; (13) Prairie Road Fen, Clark County; and (14) Triangle Lake Bog, Portage County.

Light traps used during the course of this study were two Ellisco-type traps, one Bio-quip model 2851A, and two Carolina Biological traps, model # 65-4155. Traps were placed near the center of each site and operated overnight for approximately 6-8 hours. Light trap (a total of 123) collections were made during the summer months from May

TABLE 1. Site number and name, county, size of the preserve in hectacres, elevation in meters, and managing agency (The Nature Conservancy (T.N.C.) and the Ohio Department of Natural Resources (O.D.N.R.).

Site Number and Name	County	Size Hectacres	Elev. Meters	Managing Agency
1. Betsch Fen	Ross	14.2	221.0	T.N.C.
2. Brown's Lake Bog	Wayne	32.4	292.6	T.N.C.
3. Cranberry Bog	Licking	7.9	274.3	O.D.N.R.
4. Eagle Creek Bog	Portage	178.6	289.6	O.D.N.R.
5. Frame Lake Fen	Portage	50.58	320.0	O.D.N.R.
6. Gott Fen	Portage	5.5	320.0	O.D.N.R.
7. Jackson Fen	Stark	6.5	320.0	O.D.N.R.
8. Kent Bog	Portage	17.0	341.4	O.D.N.R.
9. Kiser Lake Fen	Champaign	20.64	336.8	O.D.N.R.
10. Lake Kelso Bog	Geauga	18.9	340.8	T.N.C.
11. Liberty Fen	Logan	3.64	333.8	O.D.N.R.
12. Lone Larch Bog	Stark	282	320.0	O.D.N.R.
13. Prairie Road Fen	Clark	38.5	320.0	O.D.N.R.
14. Triangle Lake Bog	Portage	24.8	344.4	O.D.N.R.

through October in 1984 and 1985 (Table 2). On most collection nights, traps were operated at two or more sites. Adult caddisflies were sorted from the light trap collections and placed into smaller vials for easier handling. Specimens were later sexed and identified to family, genus and species with the use of keys and descriptions from Betten (1950); Blickle (1963, 1979); Flint (1964); Gordon (1974); Morse (1972, 1975); Ross (1938, 1944, 1956); Ross and Merkley (1950); and Schmid (1951, 1955, 1970, 1983). Several specimens were sent to Dr. G. B. Wiggins, Curator-in-Charge, Department of Entomology, the Royal Ontario Museum and to Dr. O. J. Flint, Curator of Neuropteroids, National Museum of Natural History, the Smithsonian Institution, for confirmation and identification. Collection data were tallied by site, date and species abundance by the schedule of Lewis and Taylor (1967) (Table 2) using computer programs written by the author.

The extent of seven land cover types was evaluated for each site by field observations and measurements made from recent aerial photographs obtained from the Ohio Department of Natural Resources, Division of Soil and Water Conservation, Remote Sensing Section (Appendix 1-14). A circle, equivalent to a diameter of 500 m, was cut from an aerial photograph of each site at the location of the light trap. Each circle represented a total area of 19.6 ha.

Areas of seven different types of land covers were estimated for each site by carefully cutting and weighing the corresponding areas of the photographs (Marrs et al. 1986): (1) wooded areas; (2) old fields; (3) agricultural fields; (4) houses, roads, railroad tracks, sand and gravel pits, etc.; (5) continuous Sphagnum mat; (6) lotic habitats; and, (7) lentic habitats. The presence of these areas was confirmed by field observation.

Water chemistry measurements were made at all but one site in the early spring of 1986. Acidity and conductivity (corrected for 25 C) were measured with a Hach digital pH meter (model 19000) and a Fisher conductivity meter (model 152). Three samples were taken at each site, two from shallow (15 cm) wells and one from surface water (Schwintzer 1977).

Discriminant analyses and correlation analyses were performed on the data using the Statistical Package for the Social Sciences, personal computer version (SPSS/PC). Species were included in the analyses if their total numerical abundance was greater than ten individuals. Seventy-six species met this criterion. Discriminant analysis is a multivariate technique which attempts to (1) generate a discriminant function to separate groups and (2) classify each case on the basis of discriminant function scores. Case assignment into groups is accomplished using a cutoff score. In this study, species abundance or

presences/absence data were used as predictor variables. During the procedure, SPSS/PC attempted to classify wetland sites into two groups, bogs or fens. Discriminant functions were calculated for each of five families of Trichoptera. Indicator species, selected by SPSS/PC in classifying the fourteen sites, were also identified.

In order to determine the environmental significance of the discriminant scores, correlations were calculated for both conductivity and pH.

Brillouin's diversity index (H),

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

evenness (J),

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

and maximum diversity (H_{max}),

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

were calculated from the data by a computer program written

by the author for the Apple II computer. Strickland's approximation was used for factorial numbers (Zar 1978). Jaccard's coefficient of community similarity,

$$CCj = \frac{c}{s_1 + s_2 - c.}$$

was also calculated for each of the fourteen sites using the results of all light trap collections. Where c is the number of species both sites have in common and s_1 is the total number of species found at site one and s_2 is the total number of species found at site two. Community similarity is an indication of how similar two communities are on the basis of collected species.

RESULTS

A total of 37,061 adult caddisflies were collected from 123 light trap collections made during the summer months from May 1984 through October 1985 (Table 2). There were thirteen families (Table 3), forty-three genera (Table 4), and one hundred and forty-two species (Table 3)(Appendix 1) represented at fourteen Ohio bog and fen wetlands. Abundances of positively phototaxic, adult caddisflies from light trap collections follow. Genera and species are listed alphabetically within each family by collection site.

New state records are Cyrnellus marginalis (Banks) [Betsch Fen, Kiser Lake Fen, Lake Kelso Bog, Liberty Fen, Prairie Road Fen], Glossosoma intermedium Banks [Liberty Fen], Goera calcarata Banks [Jackson Fen, Eagle Creek Bog], Lepidostoma costele (Banks) [Prairie Road Fen], Limnephilus hyalinus Hagen [Eagle Creek Bog], and Oecetis ochraceae (Curtis) [Brown's Lake Bog, Cranberry Bog, Frame Lake Fen, Liberty Fen, Lone Larch Bog, Prairie Road Fen, Triangle Lake Bog]. Individuals tentatively identified on the basis of female specimens and/or poor specimens include: Hydropsyche cuanis Ross, Hydropsyche placoda Ross, Ochotrichia eliaga (Ross), Ochotrichia confusa (Morton), Oxyethira dualis Morton, Oxyethira novasota, Polycentropus maculatus Banks,

Pycnopsyche auggipennis, and Pycnopsyche subfaciata (Say).

Trichoptera Fauna

Over ninety five percent of all collected caddisflies were members of the families Hydropsychidae and Leptoceridae. The five most frequently collected families, Hydropsychidae, Leptoceridae, Hydroptilidae, Limnephilidae and Phryganeidae contained 98.9 percent of all individuals. Weekly abundances for all collections are given in Figure 3.

The family Hydropsychidae comprised seventy-one percent of the total collection. Members of the Hydropsychidae were among the five most abundant species at all sites except Eagle Creek Bog, Lake Kelso Bog, and Lone Larch Bog. Three of the most abundant species, Potamyia flava (38.1%), Cheumatopsyche pettiti (16.1%), and Cheumatopsyche campyla (4.7%) belong to this family.

The families Leptoceridae and Hydroptilidae comprised 14.7 and 9.5 percent of the total collection. Species of Leptoceridae, Oecetis inconspicus (5.0%) and Leptocerus americanus (4.3%),, were among the five most abundant species at all sites except Betsch Fen, Liberty Fen and Prairie Road Fen. The Hydroptilidae were among the five most abundant species at Brown's Lake Bog, Cranberry Bog, Frame Lake Fen, Jackson Fen, Kiser Lake Fen, Lone Larch Bog,

Prairie Road Fen and Triangle Lake Bog.

The Limnephilidae and Phryganeidae comprised only 1.7 and 1.0 percent of the total collection. Species of these two families were among the five most abundant species at the following collection sites: Eagle Creek Bog, Frame Lake Fen, Gott Fen, Kent Bog, Lake Kelso Bog, Lone Larch Bog and Triangle Lake Bog.

The five most abundant genera which accounted for 77.6 percent of the total collection were: Potamyia (38.3 %), Cheumatopsyche (21.3 %), Ceratopsyche (7.0 %), Oecetis (6.59 %), and, Hydropsyche (4.51 %) (Table 4).

Land Cover Adjacent to Collection Areas

Examination of aerial photographs revealed that most of these fourteen wetlands were bordered by woodland (40 percent of total land area), i.e., Betsch Fen, Brown's Lake Bog, Eagle Creek Bog, Gott Fen, Jackson Fen, Kent Bog, Lone Larch Bog, and Triangle Lake Bog (Table 5). Old field was the second most common land type adjacent to the preserve areas (23.2 percent of total land areas), i.e., Frame Lake Fen, Liberty Fen, and Prairie Road Fen. Standing bodies of water were the most abundant land cover bordering 12.6 percent of the preserves. Cranberry Bog and Kiser Lake Fen had standing water as the most abundant land cover.

TABLE 2. Collection dates arranged by week number after Lewis and Taylor (1967)

Week (No.)	Dates		
18	April 30	-	May 6
19	May 7	-	May 13
20	May 14	-	May 20
21	May 21	-	May 27
22	May 28	-	June 3
23	June 4	-	June 10
24	June 11	-	June 17
25	June 18	-	June 24
26	June 25	-	July 1
27	July 2	-	July 8
28	July 9	-	July 15
29	July 16	-	July 22
30	July 23	-	July 29
31	July 30	-	August 5
32	August 6	-	August 12
33	August 13	-	August 19
34	August 20	-	August 26
35	August 27	-	September 2
36	September 3	-	September 9
37	September 10	-	September 16

TABLE 2. Continued

Week (No.)	Dates		
38	September 17	-	September 23
39	September 24	-	September 30
40	October 1	-	October 7
41	October 8	-	October 14
42	October 15	-	October 21

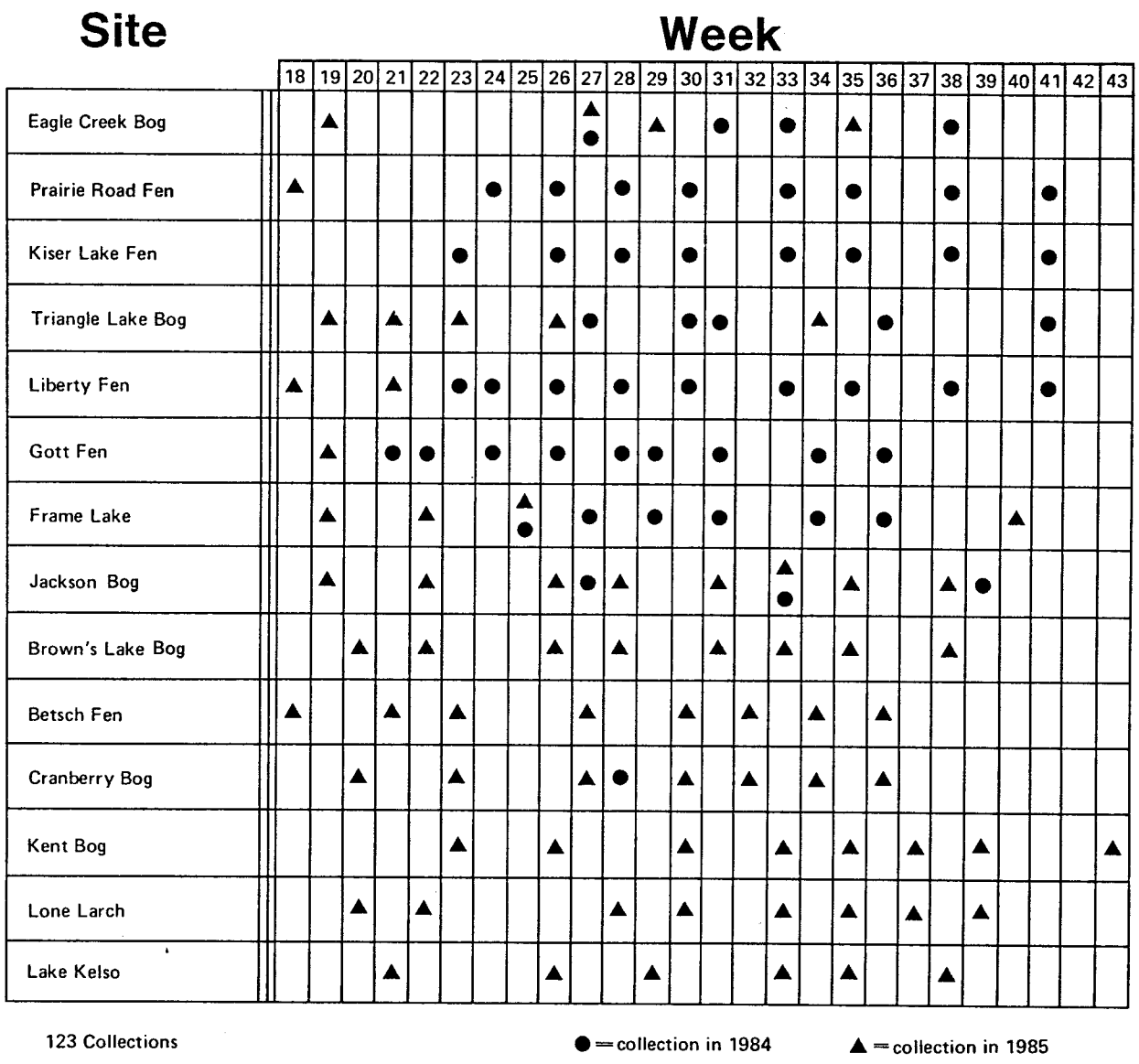

Site
Week
18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43
Eagle Creek Bog
Prairie Road Fen
Kiser Lake Fen
Triangle Lake Bog
Liberty Fen
Gott Fen
Frame Lake
Jackson Bog
Brown's Lake Bog
Betsch Fen
Cranberry Bog
Kent Bog
Lone Larch
Lake Kelso
123 Collections
● = collection in 1984
▲ = collection in 1985

TABLE 3. Numerical abundance of adult Trichoptera, given by taxon, from 123 light trap collections made in 1984 and 1985 at seven Ohio fens: (1) Betsch Fen, (5) Frame Lake Fen, (6) Gott Fen, (7) Jackson Fen, (9) Kiser Lake Fen, (11) Liberty Fen and (13) Prairie Road Fen, and at 7 Ohio bogs: (2) Brown's Lake Bog, (3) Cranberry Bog, (4) Eagle Creek Bog, (8) Kent Bog, (10) Lake Kelso Bog, (12) Lone Larch Bog, and (14) Triangle Lake Bog.

	Fens							Bogs						
	1	5	6	7	9	11	13	2	3	4	8	10	12	14
TAXON														
Glossosomatidae														
Glossosoma														
intermidium	0	0	0	0	0	1	0	0	0	0	0	0	0	0
nigor	0	0	0	0	0	3	0	0	0	0	0	0	0	0
sp.	0	0	0	0	1	70	0	0	0	0	0	0	0	0
Protoptila														
maculata	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Helicopsychidae														
Helicopsyche														
sp.	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Hydropsychidae														
Ceratopsyche														
bifida	0	0	0	0	1	11	1	0	0	0	0	0	0	0
bronta	28	1	16	22	10	879	204	16	0	3	6	1	3	4
cheilonis	155	0	0	28	6	20	55	2	0	1	1	0	6	0

TABLE 3. CONTINUED

TAXON	Fens							Bogs						
	1	5	6	7	9	11	13	2	3	4	8	10	12	14
morosa	12	0	17	2	2	87	85	4	0	1	0	1	2	0
recurvata	0	0	0	0	0	0	1	0	0	0	0	0	0	0
slossonae	0	2	30	21	8	689	73	26	0	18	7	2	4	3
walkeri	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Chesmatopsyche														
aphanta	0	0	0	9	0	12	4	0	0	0	2	1	0	0
campyla	1,457	6	1	60	18	112	30	13	1	0	19	3	1	4
gracilis	0	0	0	1	0	1	1	0	0	0	0	2	0	0
oxa	25	2	0	12	6	74	24	1	1	3	1	0	0	0
pascalis	0	0	0	0	0	1	0	0	0	0	0	0	0	0
pettiti	37	11	13	5,610	8	59	23	28	3	10	42	29	13	81
speciosa	2	0	0	0	0	0	0	0	0	1	0	0	0	0
Diplectrona														
modesta	0	0	0	2	0	0	1	0	0	0	0	0	0	0
Hydropsyche														
bettoni	27	4	29	666	8	26	18	8	0	2	2	17	5	1
bidens	0	0	0	0	8	8	7	0	4	0	0	0	0	0
cuanis	0	0	0	0	0	1	0	0	0	0	0	0	0	0
depravata	0	0	0	0	0	1	0	0	0	0	0	0	0	0
dicantha	0	0	1	2	3	5	6	0	0	0	2	0	0	2
incommoda	0	0	0	0	4	2	4	0	2	0	0	0	0	0

TABLE 3. CONTINUED

TAXON	Fens							Bogs						
	1	5	6	7	9	11	13	2	3	4	8	10	12	14
orris	132	0	0	5	4	1	1	3	35	0	0	0	0	0
placoda	0	0	0	0	0	1	0	0	0	0	0	0	0	0
scalaris	0	0	0	0	1	2	0	0	0	0	0	0	0	0
simulans	63	0	1	7	5	0	1	0	1	1	0	0	0	0
sparna	0	0	1	25	1	325	81	0	0	12	1	3	2	1
valanis	1	0	0	9	62	5	4	1	3	0	0	0	0	0
Macrostemum														
zebratum	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Potamyia														
flava	11,759	1	0	19	1,030	169	441	209	537	0	3	1	11	0
Hydroptilidae														
Agraylea														
multipunctata	0	14	17	24	0	3	0	2	0	3	8	248	49	3
Hydroptila														
ajax	0	0	1	66	6	7	2	3	1	5	2	6	24	2
albicornis	0	0	0	3	1	70	0	0	0	0	0	0	0	0
amoena	1	0	0	27	2	1	608	0	1	1	1	36	1	0
angusta	0	0	0	0	1	5	2	0	1	0	0	2	0	0
armata	3	0	0	1	24	10	1	0	0	0	0	0	0	0

TABLE 3. CONTINUED

TAXON	Fens							Bogs						
	1	5	6	7	9	11	13	2	3	4	8	10	12	14
consimilis	8	0	0	95	10	31	29	9	0	2	0	6	5	4
hamata	0	0	0	0	1	2	0	0	1	0	0	9	2	0
jackmanii	0	0	0	0	0	25	0	0	0	0	0	0	0	0
perdita	12	0	0	0	6	13	3	14	1	0	0	4	3	1
sp.	0	0	0	0	0	0	2	0	0	0	0	0	0	0
spatulata	0	1	0	0	0	0	11	0	0	0	0	1	0	0
vala	0	0	0	0	0	0	1	0	0	0	0	0	2	0
virgata	0	1	0	0	0	5	26	0	0	0	0	0	0	0
waubesiana	2	1	5	37	0	1	3	1	0	3	0	41	9	2
Ithytrichia														
clavata	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Ochrotrichia														
arva	0	0	0	0	0	0	1	0	0	0	0	0	0	0
confusa	0	0	0	0	0	0	4	0	0	0	0	0	0	0
eliasa	0	0	0	0	0	0	1	0	0	0	0	0	0	0
tarsalis	2	0	0	0	0	0	16	0	0	0	0	0	0	0
Orthotrichia														
angerfascicilla	0	32	21	4	80	11	7	27	522	4	12	210	38	104
cristata	3	0	10	11	3	11	2	5	2	0	1	10	0	14
sp.	0	0	0	0	0	5	0	0	0	0	0	0	0	0
Oxyethira														

TABLE 3. CONTINUED

TAXON	Fens							Bogs						
	1	5	6	7	9	11	13	2	3	4	8	10	12	14
dualis	0	0	0	0	0	0	1	0	0	0	0	1	0	0
forcipata	0	0	0	1	0	0	0	0	0	0	1	62	0	0
novasota	0	0	0	0	0	0	0	0	0	0	0	0	1	0
pallida	8	7	5	183	95	21	23	10	7	2	16	27	60	48
Lepidostomatidae														
Lepidostoma														
costale	0	0	0	0	0	0	3	0	0	0	0	0	0	0
griseum	0	0	0	1	0	0	0	0	0	0	0	0	0	0
sp.	0	0	0	15	0	4	3	0	0	1	0	0	0	0
Leptoceridae														
Ceraclea														
alagma	0	0	0	1	0	0	0	0	0	0	0	28	0	0
cancellata	23	0	0	0	1	0	3	4	2	0	0	15	0	1
diluta	0	0	0	0	0	0	0	0	0	0	0	0	0	1
resurgens	0	0	0	5	0	2	0	0	0	0	0	0	0	0
sp.	0	0	0	1	0	0	0	0	0	0	0	0	1	0
tarsipunctata	0	0	1	11	0	0	2	1	0	0	0	20	0	0
transversa	0	0	0	281	0	0	2	1	1	0	0	0	0	1
Leptocerus														
americanus	0	96	22	46	1	38	5	6	1	22	40	1,125	17	168

TABLE 3. CONTINUED

TAXON	Fens							Bogs						
	1	5	6	7	9	11	13	2	3	4	8	10	12	14
Nectopsyche														
albida	2	0	0	8	6	27	25	1	5	0	0	4	0	11
candida	1	0	0	0	0	0	1	0	1	0	0	0	1	0
diarina	0	0	0	0	0	0	1	0	0	0	0	0	0	0
exquisita	3	0	0	0	0	0	0	0	0	0	0	0	0	0
pavida	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Oecetis														
cinerascens	0	4	3	10	232	12	2	6	79	6	1	82	5	10
ditissa	2	0	1	1	17	8	0	1	2	1	0	2	6	24
immobilis	0	1	0	0	0	0	1	0	0	0	0	0	0	0
inconspicua	25	3	16	176	80	129	33	51	95	20	30	169	65	950
nocturna	7	6	1	3	6	0	0	2	4	0	0	16	0	8
ochracea	0	1	0	0	0	1	2	1	12	0	0	0	1	0
osteni	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Triaenodes														
abus	0	0	0	0	0	0	0	1	0	1	0	29	0	5
flavescens	0	0	0	0	3	1	1	0	0	0	0	1	0	0
ignita	0	0	0	7	0	0	0	0	0	0	0	1	0	0
injustus	0	0	0	0	0	1	0	1	0	0	0	3	0	1
marginatus	1	0	7	65	0	56	40	2	0	3	0	9	1	3
tardus	35	3	8	17	6	338	3	22	0	35	19	149	19	15

TABLE 3. CONTINUED

TAXON	Fens							Bogs						
	1	5	6	7	9	11	13	2	3	4	8	10	12	14
Limnephilidae														
Anabolia														
consocius	0	1	1	5	0	11	0	0	0	5	1	0	0	0
Goera														
calcarata	0	0	0	5	0	0	0	0	0	1	0	0	0	0
Ironoquoia														
parvula	0	0	0	0	0	0	0	0	0	0	0	0	0	5
punctatissima	0	3	1	8	1	4	0	0	0	12	0	0	2	0
Limnephilus														
hyalina	0	0	0	0	0	0	0	0	0	1	0	0	0	0
indivisus	0	0	33	4	0	4	0	3	0	42	0	0	3	0
moestus	0	25	10	0	0	0	0	1	0	0	157	0	0	0
ornatus	0	0	1	1	0	1	0	0	0	0	0	0	0	1
rombicus	0	0	1	0	0	0	0	0	0	0	0	0	0	0
submonilifer	0	4	5	1	1	10	0	0	0	0	1	0	0	2
Neophylax														
concinnus	0	1	0	0	0	1	0	0	0	0	0	0	0	0
fuscus	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Platycentropus														
radiatus	0	0	0	0	0	0	0	1	0	0	0	11	4	12

TABLE 3. CONTINUED

TAXON	Fens							Bogs				Fens		
	1	5	6	7	9	11	13	2	3	4	8	10	12	14
Pycnopsyche														
guttipennis	0	0	2	0	0	0	0	0	0	0	0	0	0	0
diversana	0	0	0	5	0	0	0	0	0	0	0	0	0	0
guttifer	0	6	0	31	0	6	16	0	0	4	0	0	0	33
lepida	0	4	1	1	0	3	6	0	0	4	0	0	0	5
luculenta	0	0	0	50	0	0	0	0	0	0	0	0	0	0
scabripennis	12	2	11	13	4	15	31	1	0	0	0	0	0	0
subfasciata	0	0	0	1	0	2	1	0	0	0	0	0	0	0
Molannidae														
Molanna														
blenda	0	1	0	3	0	4	1	1	0	0	0	0	0	0
sp.	0	0	0	0	0	0	2	0	0	1	0	0	0	0
Philopotamidae														
Chimarra														
aterrima	2	0	0	13	0	4	0	0	0	0	0	0	0	0
obscura	10	7	1	118	0	2	0	0	0	1	0	0	0	1
Phryganeidae														
Agrypnia														
straminea	0	0	2	0	1	1	3	0	0	0	0	0	2	0
vestita	3	3	28	8	4	8	0	4	0	49	0	3	0	1

TABLE 3. CONTINUED

TAXON	Fens							Bogs						
	1	5	6	7	9	11	13	2	3	4	8	10	12	14
Banksiola														
crotchi	0	0	1	25	0	0	0	0	0	0	1	27	1	51
dossuaria	0	1	0	0	0	0	0	0	0	4	1	5	0	7
Phryganea														
sayi	1	1	1	3	7	52	1	12	0	2	3	15	0	14
Ptilostomis														
ocellifera	0	0	5	2	1	3	0	0	0	1	0	1	8	1
postica	0	2	0	0	1	0	0	0	0	0	0	0	0	2
semifasciata	0	0	0	0	1	2	0	0	0	1	0	0	0	0
Polycentropodidae														
Cernotina														
ohio	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Cyrnellus														
marginalis	1	0	0	0	67	8	1	0	0	0	0	1	0	0
Neureclipsis														
crepuscularis	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Nyctiophylax														
affinis	0	0	0	0	12	0	0	8	0	0	0	0	0	6
moestus	0	0	0	0	3	0	0	0	0	0	0	3	0	0
sp.	2	0	0	0	30	2	1	19	0	0	1	0	0	0

TABLE 3. CONTINUED

TAXON	Fens							Bogs						
	1	5	6	7	9	11	13	2	3	4	8	10	12	14
Polycentropus														
lucidus	0	0	0	0	0	1	0	5	0	0	0	2	0	0
carolinensis	0	0	0	6	0	0	0	0	0	0	0	0	0	0
cinereus	0	0	9	1	2	7	4	2	0	0	0	7	1	0
confusus	0	0	0	0	0	1	0	0	0	1	0	0	0	0
crassicornis	0	0	0	0	0	0	0	0	0	0	0	1	0	0
interruptus	0	0	0	0	0	5	0	0	0	0	0	58	0	0
maculata	0	0	0	0	0	0	0	0	0	0	0	1	0	0
pentus	0	0	0	1	2	0	0	0	0	0	0	0	0	0
remotus	0	0	0	0	2	2	1	0	0	0	0	41	0	5
sp.	0	1	0	1	0	1	0	0	0	0	0	1	1	0
Psychomyiidae														
Lype														
diversa	0	0	9	49	2	0	0	0	0	1	0	1	0	10
Psychomyia														
flavida	0	0	0	0	0	5	0	1	0	1	0	0	0	0
Rhyacophilidae														
Rhyacophila														
fenestra	0	0	0	0	4	0	0	0	0	0	0	0	0	0
ledra	9	0	0	0	0	0	0	0	0	0	0	0	0	0
	13,888	260	349	7,952	1,190	3,572	2,001	541	1,325	292	382	2,555	381	1,653

Continuous Sphagnum mat was the fourth most common land cover type adjacent to the collection accounting for 8.7 percent of the examined land area; Sphagnum mat was the most common land cover surrounding Lake Kelso Bog. The remaining land cover categories (agricultural, running water, and artificial) made up 7.6, 0.03, and 6.4 percent respectively.

Site 1. Betsch Fen

The largest number of adult caddisflies (13,027) was collected at Betsch Fen on September 7, 1985. The dominant species collected was Potamyia flava (5,334 males and 5,774 females). During the course of the 1985 season 13,888 adult Trichoptera were taken from this southern Ohio wetland. Nine families, twenty genera and thirty-eight species were represented in eight collections made from this site (Table 6). Cyrnellus marginalis, a new state record, was collected at Betsch Fen.The five most most abundant species were: Potamyia flava (11,759 individuals), Cheumatopsyche campyla (1,457 individuals), Cheumatopsyche cheilonis (155 individuals), Hydropsyche orris (132 individuals), and Hydropsyche simulans (63 individuals). These five species comprised 97.7 percent of the total number of individuals collected at this site. Brillouin's diversity index (H) and evenness (J) calculated for this site were 0.28 and 0.18 respectively (Table 7).

TABLE 4. Numerical abundance of Trichoptera genera from 123 light trap collecitons made in 1984 and 1985 at 14 Ohio remnant bogs and fens.

Genus	No.	Percentage
Potamyia	1,4177	38.26
Cheumatopsyche	7,878	21.26
Ceratopsyche	2,580	6.96
Oecetis	2,441	6.59
Hydropsyche	1,676	4.51
Leptocerus	1,587	4.28
Hydroptila	1,379	3.74
Orthotrichia	1,149	3.09
Triaenodes	912	2.45
Oxyethira	579	1.56
Ceraclea	409	1.10
Agraylea	371	1.00
Limnephilus	315	0.84
Pcynopsyche	270	0.72
Polycentropus	170	0.46
Chimarra	159	0.43
Banksiola	124	0.34
Agrypnia	120	0.32
Phryganea	112	0.30
Nectopsyche	98	0.26

TABLE 4. continued.

Nyctiophylax	92	0.25
Cyrnellus	78	0.21
Glossosoma	77	0.19
Lype	72	0.19
Ironoquoia	36	0.09
Ptilostomis	31	0.08
Platycentropus	28	0.08
Lepidostoma	27	0.08
Anabolia	24	0.07
Ochotrichia	24	0.06
Molanna	13	0.04
Rhyacophila	13	0.04
Phylocentropus	8	0.02
Goera	7	0.02
Psychomyia	7	0.02
Diplectrona	5	0.02
Neophylax	3	0.01
Cernotina	2	0.01
Helicopsyche	2	0.01
Neureclipsis	2	0.01
Prototila	2	0.01
Ithytrichia	1	0.01
Macrostemum	1	0.01
	Total 37,061	

TABLE 5. Types of land cover in hectacres surrounding 14 Ohio remnant bog and fen wetlands. W - wooded, O.F. -old field, A -agricultural, S -Sphagnum mat, L.O. -Lotic, L.N. -Lentic, Art -artificial.

Site (No.)	W.	O.F.	A.	S.	L.O.	L.N.	Art.
1. Betsch Fen	14.0	2.1	3.5	0.0	0.7	0.0	0.1
2. Brown's Lake Bog	16.0	0.0	0.6	0.8	0.0	1.5	0.6
3. Cranberry Bog	3.2	0.0	0.0	0.9	0.0	12.5	2.8
4. Eagle Creek Bog	16.8	2.20	0.0	0.3	0.0	0.4	0.0
5. Frame Lake Fen	0.0	11.5	0.6	1.5	0.0	4.8	1.5
6. Gott Fen	11.8	7.3	0.0	0.0	0.1	0.0	1.9
7. Jackson Fen	11.7	6.6	0.7	0.3	0.0	0.4	0.0
8. Kent Bog	7.6	1.9	1.6	7.6	0.0	0.0	1.3
9. Kiser Lake Fen	4.0	1.0	0.0	0.0	0.0	10.3	4.3
10. Lake Kelso Bog	6.2	0.0	0.0	8.9	0.0	4.6	0.0
11. Liberty Fen	0.5	8.8	8.0	0.0	0.0	0.0	2.0
12. Lone Larch Bog	10.3	8.4	0.0	0.0	0.0	0.0	0.9
13. Prairie Road Fen	1.3	11.8	4.2	0.0	0.1	0.0	2.2
14. Triangle Lake Bog	9.5	2.7	2.3	3.8	0.0	0.6	0.8
TOTAL	112.9	64.3	21.5	24.1	0.9	35.1	18.4
%	40	23	7.7	8.6	0.3	12.5	6.6

Chemical analysis of surface and ground water revealed that pH ranged from 7.0 to 7.4 and conductivity (standardized for 25 C) ranged from 475 to 500 micro mhos/cm (Table 8).

Site 2. Brown's Lake Bog

Collections made at Brown's Lake Bog contained 541 individuals and members of eight families, twenty-four genera and forty-seven species (Table 6). Oecetis ochraceae, a new state record, was collected at Browns Lake Bog. Individuals from the five most abundant species, Potamyia flava (209 individuals), Oecetis inconspicua (51 individuals), Cheumatopsyche pettiti (28 individuals), Orthotrichia aegerfasciella (27 individuals), and, Ceratopsyche slossonae (26 individuals), comprised 63.0 percent of the total collection. Brillouin's diversity index (H) and evenness (J) values calculated for this site were 1.07 and 0.68 respectivley (Table 7).

Chemical analysis of surface and ground water determined that the pH ranged from 4.0 to 5.2 and conductivity (standardized for 25 C) ranged from 15 to 35 micro mhos/cm (Table 8).

Site 3. Cranberry Bog

Light trap collections from Cranberry Bog contained

1,325 adult Trichoptera. Three families, nine genera and twenty-five species were represented by collections made at this site. Oecetis ochraceae, a new state record was collected at Cranberry Bog. The five most abundant species were: Potamyia flava (534 individuals), Orthotrichia aegerfasciella (522 individuals), Oecetis inconspicua (95 individuals), Oecetis cinerascens (79 individuals), and Hydropsyche orris (35 individuals). Cranberry Bog had the lowest recorded number of families, genera and species of all fourteen collection sites. Brillouin's diversity index (H) and evenness (J) values calculated for this site were 0.61 and 0.44 respectively (Table 7).

Chemical analysis of surface and ground water determined that the conductivity (standardized for 25 C) ranged from 40 to 95 micro mhos/cm. The pH was not determined due to an equipment malfunction (Table 8).

Site 4. Eagle Creek Bog

The smallest total number of caddisflies was recorded from eight light trap collections made at Eagle Creek Bog (292 individuals). Ten families, twenty-six genera and forty-three species were represented. Goera calcarata and Limnephilus hylanius, new state records, were collected at Eagle Creek Bog. The five most abundant species were: Agrypnia vestita (49 individuals), Limnephilus individus (42

TABLE 6. Number of Trichoptera taxa and individuals from 123 light trap collections made in 1984 and 1985 at 14 Ohio remnant bogs and fens.

Site (No.)	Families	Genera	Species	No.
1. Betsch Fen	9	20	38	13,888
2. Brown's Lake Bog	8	24	47	541
3. Cranberry Bog	3	9	25	1,325
4. Eagle Creek Bog	10	26	43	292
5. Frame Lake Fen	8	23	36	260
6. Gott Fen	7	21	38	349
7. Jackson Fen	10	30	69	7,952
8. Kent Bog	6	17	30	382
9. Kiser Lake Fen	8	23	52	1,910
10. Lake Kelso Bog	7	23	55	2,555
11. Liberty Fen	12	31	82	3,572
12. Lone Larch Bog	6	21	38	381
13. Prairie Road Fen	8	22	63	2,001
14. Triangle Lake Bog	8	24	47	1,653
			TOTAL	37,061

individuals), Triaenodes tardus (35 individuals), Leptocerus americanus (22 individuals), and Oecetis inconspicua (20 individuals). Brillouin's diversity and evenness values calculated for this site were 1.18 and 0.79 respectively (Table 7).

Chemical analysis of surface and ground water determined that the pH ranged from 5.0 to 5.1 and the conductivity standardized for 25 C. ranged from 65 to 100 mhos/cm (Table 8).

Site 5. Frame Lake Fen

Collections from Frame Lake Fen yielded 260 adult caddisflies. Eight families, twenty-three genera and thirty-six species were represented from a total of ten collections. Oecetis ochraceae, a new state record, was collected at Frame Lake Fen. The five most abundant species were: Leptocerus americanus (96 individuals), Orthotrichia aegerfasciella (32 individuals), Limnephilus moestus (25 individuals), Agraylea multipunctata (14 individuals), and Cheumatopsyche pettiti (11 individuals). Brillouin's diversity index (H) and evenness (J) values calculated for this site were 1.00 and 0.70 respectively (Table 7).

Chemical analysis of surface and ground water revealed that the pH ranged from 7.4 to 7.6 and the conductivity (standardized for 25 C) ranged from 450 to 640

micro mhos/cm (Table 8).

Site 6. Gott Fen

Only forty percent of the total collection at Gott Fen is represented by the five most abundant species, Limnephilus moestus (33 individuals), Ceratopsyche slossonae (30 individuals), Hydropsyche betteni (29 individuals), Agrypnia vestita (28 individuals), and Leptocerus americanus (22 individuals). Seven families, twenty-one genera and thirty-eight species were represented by individuals collected in ten light trap collections made at this site. Brillouin's diversity index (H) and evenness (J) values calculated for this site were 1.29 and 0.86 respectively (Table 7).

Chemical analysis of surface and ground water determined that the pH ranged from 7.0 to 7.5. The conductivity was not determined due to an equipment failure (Table 8).

Site 7. Jackson Fen

Caddisflies collected at Jackson Fen in eleven light trap collections numbered 7952. This total was the second largest collection and contained members from ten families, thirty genera and sixty-nine species. Goera calcarata, a new

state record was collected at Jackson Fen. The five most abundant species were: Cheumatopsyche pettiti (5610 individuals), Hydropsyche betteni (666 individuals), Ceraclea transvera (281 individuals), Oxyethira pallida (183 individuals), and Oecetis inconspicua (176 individuals). Brillouin's diversity index (H) and evennes (J) values calculated were 0.63 and 0.34 respectively (Table 7).

Chemical analysis of surface and ground water determined that the pH ranged from 7.2 to 7.6 and the conductivity (standardized for 25 C) ranged from 730 to 810 micro mhos/cm (Table 8).

Collections of Trichoptera revealed members of Hydropsychidae seemed to have many black, tumor-like growths on their abdomens. Also, a male Cheumatopsyche pettiti individual was collected that exhibited two fully developed sets of genitalia.

Site 8. Kent Bog

There are 382 adult Trichoptera recorded from the seven light trap collections made at Kent Bog. Members of six families, seventeen genera and thirty species are represented. The five most abundant species were: Limnephilus moestus (157 individuals), Cheumatopsyche pettitie (42 individuals), Leptocerus americanus (40 individuals), Oecetis inconsipicua (30 individuals) and

TABLE 7. Number of adult Trichoptera (N), Brillouin's diversity index (H), evenness (J), and maximum diversity (H_{max}) for 123 light trap collections made at 14 Ohio remnant bog and fen wetlands.

Site (No.)	N	H	Hmax	J
1. Betsch Fen	13,888	0.279	1.585	0.177
2. Brown's Lake Bog	541	1.070	1.572	0.681
3. Cranberry Bog	1,325	0.611	1.396	0.438
4. Eagle Creek Bog	292	1.177	1.483	0.794
5. Frame Lake Fen	260	1.005	1.441	0.697
6. Gott Fen	349	1.293	1.502	0.861
7. Jackson Fen	7,952	0.624	1.826	0.342
8. Kent Bog	382	0.895	1.391	0.644
9. Kiser Lake Fen	1,910	0.838	1.714	0.489
10. Lake Kelso Bog	2,555	0.983	1.718	0.572
11. Liberty Fen	3,572	1.171	1.881	0.622
12. Lone Larch Bog	381	1.146	1.495	0.767
13. Prairie Road Fen	2,001	1.068	1.792	0.596
14. Triangle Lake Bog	1,653	0.788	1.639	0.481

TABLE 8. PH and Conductivity (micro mhos) (standardized 25 C) for 14 Ohio remnant bog and fen wetlands.

Site (no.)	pH		Conductivity	
	Max	Min	Max	Min
1. Betsch Fen	7.4	7.0	500	475
2. Brown's Lake Bog	5.2	4.0	35	15
3. Cranberry Bog	---	---	95	40
4. Eagle Creek Bog	5.1	5.0	100	65
5. Frame Lake Fen	7.6	7.4	640	450
6. Gott Fen	7.5	7.0	---	---
7. Jackson Fen	7.6	7.2	810	730
8. Kent Bog	3.5	3.2	195	75
9. Kiser Lake Fen	7.7	7.5	440	425
10. Lake Kelso Bog	7.6	7.2	92	92
11. Liberty Fen	7.7	7.2	735	620
12. Lone Larch Bog	6.6	6.3	240	170
13. Prairie Road Fen	7.6	6.8	765	725
14. Triangle Lake Bog	4.9	3.6	88	88

Triaenodes tardius and Cheumatopsyche campyla (both with 19 individuals). Brillouin's diversity index (H) and evenness (J) values calculated were 0.89 and 0.64 respectively (Table 7).

Chemical analysis of surface and ground water determined that the pH ranged from 3.2 to 3.5 and the conductivity (standardized for 25 C) ranged from 75 to 195 micro mhos/cm (Table 8).

Site 9. Kiser Lake Fen

Seven light trap collections made at Kiser Lake Fen yielded 1,910 adult Trichoptera. Members of eight families, twenty-three genera and fifty-two species were represented in the total collection. Cyrnellus marginalis, a new state record was collected at Kiser Lake Fen. The five most abundant species were: Potamyia flava (1030 individuals), Oecetis cinerascens (232 individuals), Oxyethira pallida (95 individuals), Orthotrichia aegerfasciella (80 individuals), and Oecetis inconspicua (80 individuals). Brillouin's diversity index (H) and evenness (J) values calculated for this site were 0.84 and 0.49 respectively (Table 7).

Chemical analysis of surface and ground water determined that the pH ranged from 7.5 to 7.7 and the conductivity (standardized for 25 C) ranged from 425 to 440 micro mhos/cm (Table 8).

Site 10. Lake Kelso Bog

Two thousand, five hundred and fifty-five adult caddisflies were collected at Lake Kelso Bog. Members of seven families, twenty-three genera and fifty-five species were recorded from these six collections. Cyrnellus marginalis, a new state record, was collected at Lake Kelso Bog. The five most abundant species were: Leptocerus americana (1124 individuals), Agraylea multipunctata (248 individuals), Orthotrichia aegerfasciella (210 individuals), Oecetis inconspicua (169 individuals), and Triaenodes tardus (149 individuals). Brillouin's diversity index (H) and evenness (J) values calculated were 0.98 and 0.57 respectively (Table 7).

Chemical analysis of surface and ground water determined that the pH ranged from 7.2 to 7.6 and the conductivity (standardized for 25 C) recorded from one sample was 92 micro mhos/cm (Table 8).

Site 11. Liberty Fen

Eleven collections made at Liberty Fen (one of the smallest preserves studied) yielded representative adult caddisflies in twelve families, thirty-one genera and eighty-two species. The number of families, genera and

species was the highest recorded of all the sites. Cyrnellus marginalis, Glossosoma intermedium, and Oecetis ochraceae, new state records, were collected at Liberty Fen. The five most abundant species were: Ceratopsyche bronta (879 individuals), Ceratopsyche slossonae (689 individuals), Triaenodes tardus (338 individuals), Hydropsyche sparna (325 individuals), and Potamyia flava (169 individuals). Brillouin's diversity index (H) and evenness (J) calculated for this site were 1.17 and 0.622 respectively (Table 7).

Chemical analysis of surface and ground water determined that the pH ranged from 7.2 to 7.7 and the conductivity (standardized for 25 C) ranged from 620 to 735 micro mhos/cm (Table 8).

Site 12. Lone Larch Bog

Adult caddisflies taken from Lone Larch Bog numbered 381. Members of six families, twenty-one genera and thirty-eight species were recorded from eight collections. Oecetis ochraceae, a new state record, was captured at Lone Larch Bog. The five species most abundant were: Oecetis inconspicua (65 individuals), Oxyethira pallida (60 individuals), Agrylea multipunctata (49 individuals), Orthotrichia aegerfasciella (38 individuals), and Hydroptila ajax (24 individuals). Brillouin's diversity index (H) and evenness (J) calculated for this site were 1.15 and 0.77

respectively (Table 7).

Chemical analysis of surface and ground water determined that the pH ranged from 6.3 to 6.6 and the conductivity (standardized for 25 C) ranged from 170 to 240 micro mhos/cm (Table 8).

Site 13. Prairie Road Fen

Collections made at Praire Road Fen yielded 2,001 adult caddisflies. Members from eight families, twenty-two genera and sixty-three species were recorded from eight light trap collections. Cyrnellus marginalis, Lepidostoma costele, and Oecetis ochraceae, new state records, were collected at Prairie Road Fen. The five most abundant species were: Hydroptila amoena (608 individuals), Potamyia flava (441 individuals), Ceratopsyche bronta (204 individuals), Hydropsyche sparna (81 individuals), and Ceratopsyche slossonae (73 individuals). Brillouin's diversity index (H) and evenness (J) calculated for this site were 1.07 and 0.60 respectively (Table 7).

Chemical analysis of surface and ground water determined that the pH ranged from 6.8 to 7.6 and the conductivity (standardized for 25 C) ranged from 725 to 765 micro mhos/cm (Table 8).

Site 14. Triangle Lake Bog

Collections made at Triangle Lake Bog yielded 1,653 adult caddisfly belonging to eight families, twenty-four genera and forty-seven species. Oecetis ochraceae, a new state record, was collected at Triangle Lake Bog. The five most abundant species were: Oecetis inconspicua (950 indivdiuals), Leptocerus americanus (168 individuals), Orthotrichia aegerfasciella (104 individuals), Cheumatopsyche pettiti (81 individuals), and Banksiola crotchi (51 individuals). Brillouin's diversity index (H) and evenness (J) values calculated for this site were 0.79 and 0.48 respectively (Table 7).

Chemical analysis of surface and ground water determined that the pH ranged from 3.6 to 4.9 and the conductivity (standardized for 25 C) taken from one sample was 88 micro mhos/cm (Table 8).

Community Similarity

Jaccard's Coefficient of Community Similarity was calculated for all site comparisons (Table 9). The highest community similarities were recorded between sites 5 and 7 (Frame Lake Fen and Jackson Fen), sites 7 and 11 (Jackson Fen and Liberty Fen), sites 9 and 11 (Kiser Lake Fen and Jackson Fen) and between sites 6 and 7 (Gott Fen and Jackson Fen).

TABLE 9. Jaccard's coefficient of community similarity for 14 Ohio remnant bog and fen wetlands based on adult Trichoptera collected from 123 light trap collections made during the summer months of 1984 and 1985. 1-Betsch Fen, 2-Brown's Lake Bog, 3-Cranberry Bog, 4- Eagle Creek Bog, 5-Frame Lake Fen, 6- Gott Fen, 7-Jackson Fen,8- Kent Bog, 9- Kiser Lake Fen, 10-Lake Kelso Bog, 11-Liberty Fen, 12- Lone Larch Bog, 13-Prairie Road Fen, 14- Triangle Lake Bog.

Site													
1													
2	0.44												
3	0.32	0.38											
4	0.29	0.40	0.17										
5	0.25	0.37	0.21	0.42									
6	0.27	0.43	0.21	0.41	0.33								
7	0.35	0.42	0.25	0.41	0.52	0.51							
8	0.26	0.36	0.27	0.37	0.41	0.43	0.32						
9	0.44	0.42	0.41	0.34	0.28	0.41	0.41	0.37					
10	0.36	0.46	0.28	0.32	0.38	0.41	0.42	0.35	0.38				
11	0.30	0.38	0.24	0.40	0.33	0.33	0.52	0.29	0.52	0.49			
12	0.31	0.45	0.30	0.43	0.32	0.41	0.42	0.37	0.36	0.45	0.38		
13	0.39	0.43	0.34	0.31	0.25	0.31	0.44	0.29	0.44	0.41	0.46	0.38	
14	0.30	0.48	0.32	0.41	0.38	0.47	0.41	0.38	0.37	0.49	0.38	0.36	0.34
	1	2	3	4	5	6	7	8	9	10	11	12	13

The lowest community similarity (0.17) was between sites 3 and 4 (Cranberry Bog and Eagle Creek Bog).

Discriminant Anaylsis

Data for the 76 most abundant caddisflies were subjected to discriminant analysis in order to differentiate between bog and fen wetlands. Discrimination of the two groups was attempted first on the basis of square root transformed abundance data for the five most abundant caddisfly families: Hydropsychidae, Limnephilidae, Leptoceridae, Hydroptilidae and Phryganeidae. Secondly, data concerning the presence of each of these 76 species were subjected to the same technique. A total of ten discriminant analyses was made.

Canonical correlation values, Wilk's lambda values (the residual information unaccounted for by the predictor variables (species)), significance of the discriminant functions and their eigen values are given in Table 10 for the Hydropsychidae, Limnephilidae, Leptoceridae, Hydroptilidae and Phryganeidae. The significance and residuals of the predictor variables (species) for each of the five families are given in Tables 11-20.

Analyses of numerical abundance data correctly classified all sites for the Limnephilidae, Leptoceridae and Hydroptilidae (Tables 12, 13 and 14).

Misclassification of sites occured in the analyses of species of Hydropsychidae (Frame Lake Fen) and the Phryganeidae (Frame Lake Fen, Lone Larch Bog, Cranberry Bog and Brown's Lake Bog)(Tables 11 and 15).

To minimize the non-random nature of light trap collections, discriminant analyses were carried out on the same four families using presence/absence data. Results from these analyses showed once again that bog and fen wetlands could indeed be discriminated based on species of Hydropsychidae, Limnephilidae, Leptoceridae, and Hydroptilidae (Tables 16, 17, 18 and 19). Discriminant functions for the family Phryganeidae once again incorrectly classified Brown's Lake Bog and Frame Lake Fen (Table 20) Histograms of factor scores for the Limnephilidae, Leptoceridae, Hydroptilidae and Phryganeidae derived from both numerical abundance and presence/absence data are presented in Figures 4 and 5.

Table 10. Summary of canonical functions from the discriminant analysis of fourteen Ohio remnant bog and fen wetlands based on four families of Trichoptera.

Set of Predictor Variables (spp.)	Canonical Discriminant Functions					
	No.	Eigen Value	Percent Variation	Canonical Correlation	Wilk's Lambda	Chi-Square
Numerical Abundances:						
Hydropsychidae (18)	1	2.169	100.00	0.8273	0.3155	11.54*
Limnephilidae (10)	1	21.591	100.00	0.9776	0.0443	26.50**
Leptoceridae (13)	1	8.214	100.00	0.9442	0.1085	18.88**
Hydroptilidae (18)	1	7.296	100.00	0.9378	0.1205	16.93*
Phryganeidae (5)	1	0.507	100.00	0.5800	0.6636	4.51
Presence/Absence:						
Hydropsychidae (18)	1	4.1646	100.00	0.8980	0.1936	14.78*
Limnephilidae (10)	1	7.2564	100.00	0.9375	0.1211	21.11**
Leptoceridae (13)	1	2.7652	100.00	0.8570	0.2656	13.26**
Hydroptilidae (18)	1	38.7500	100.00	0.9873	0.0252	31.30**
Phryganeidae (5)	1	1.3977	100.00	0.7635	0.4171	9.18*

* $P < 0.05$

** $P < 0.01$

Table 11. Step-wise discriminant analysis of 14 Ohio remnant bog and fen wetlands based on the numerical abundance of eighteen species of Hydropsychidae.

Step	Predictor Variable	Wilk's Lambda	Significance
1.	Cheumatopsyche oxa	0.6137	0.0176
2.	Hydropsyche betteni	0.5372	0.0328
3.	Cheumatopsyche pettiti	0.3584	0.0134
4.	Hydropsyche valanis	0.31552	0.0227

Table 12. Step-wise discriminant analysis of 14 Ohio remnant bog and fen wetlands based on the numerical abundance of ten species of Limnephilidae.

Step	Predictor Variable	Wilk's Lambda	Significance
1.	Pycnopsyche scabripennis	0.2486	0.0001
2.	Limnephilidae submonilifer	0.1852	0.0001
3.	Platycentropus radiatus	0.1663	0.0003
4.	Anabolia consocius	0.1444	0.0008
5.	Ironoquoia punctatissimus	0.0798	0.0003
6.	Limnephilus individus	0.0564	0.0005
7.	Pycnopsyche guttifer	0.0443	0.0012

Table 13. Step-wise discriminant analysis of 14 Ohio remnant bog and fen wetlands based on the numerical abundance of thirteen species of Leptoceridae.

Step	Predictor Variable	Wilk's Lambda	Significance
1.	*Triaenodes marginata*	0.8071	0.1161
2.	*Oecetis inconspicua*	0.6609	0.1025
3.	*Oecetis ditissa*	0.5370	0.0897
4.	*Oecetis nocturna*	0.4092	0.0656
5.	*Ceraclea alagma*	0.1719	0.0063
6.	*Leptocerus americanus*	0.1297	0.0079
7.	*Triaenodes tardus*	0.1085	0.0149

Table 14. Step-wise discriminant analysis of 14 Ohio remnant bog and fen wetlands based on the numerical abundance of eighteen species of Hydroptilidae.

Step	Predictor Variable	Wilk's Lambda	Significance
1.	Hydroptila armata	0.6582	0.0281
2.	Hydroptila virgata	0.4719	0.0161
3.	Hydroptila angusta	0.3749	0.0166
4.	Orthotrichia cristata	0.2802	0.0138
5.	Hydroptila waubesiana	0.2490	0.0249
6.	Oxyethira pallida	0.1882	0.0261
7.	Hydroptila perdita	0.1205	0.0355
8.	Oxyethira forcipata	0.1205	0.0557

Table 15. Step-wise discriminant analysis of 14 Ohio remnant bog and fen wetlands based on the numerical abundance of five species of Phryganeidae.

Step	Predictor Variable	Wilk's Lambda	Significance
1.	Banksiola dossuaria	0.7264	0.0550
2.	Agrypnia vestita	0.6636	0.1048

Table 16. Step-wise discriminant analysis of 14 Ohio remnant bog and fen wetlands based the presence of eighteen species of Hydropsychidae.

Step	Predictor Variable	Wilk's Lambda	Significance
1.	Cheumatopsyche bifida	0.7273	0.0554
2.	Hydropsyche simulans	0.6097	0.0658
3.	Hydropsyche bidens	0.5031	0.0664
4.	Cheumatopsyche campyla	0.3373	0.0299
5.	Hydropsyche sparna[a]	0.2738	0.0350
6.	Cheumatopsyche cheilonis	0.2344	0.0547
7.	Cheumatopsyche oxa	0.1890	0.0688

[a] Hydropsyche sparna removed

Table 17. Step-wise discriminant analysis of 14 Ohio remnant bog and fen wetlands based the presence of eight species of Limnephilidae.

Step	Predictor Variable	Wilk's Lambda	Significance
1.	*Pycnopscyhe scabripennis*	0.2500	0.0001
2.	*Platycentropus radiatus*	0.1579	0.0000
3.	*Limnephilus moestus*	0.1433	0.0002
4.	*Limnephilus submonilifer*	0.1211	0.0004

Table 18. Step-wise discriminant analysis of 14 Ohio remnant bog and fen wetlands based on the presence of thirteen species of Leptoceridae.

Step	Predictor Variable	Wilk's Lambda	Significance
1.	Triaenodes abus	0.6000	0.0152
2.	Triaenodes tardus	0.4444	0.0116
3.	Nectopsyche albida	0.3258	0.0085
4.	Oecetis nocturna	0.2656	0.0110

Table 19. Step-wise discriminant analysis of 14 Ohio remnant bog and fen wetlands based the presence of eighteen species of Hydroptilidae.

Step	Predictor Variable	Wilk's Lambda	Significance
1.	Hydroptila armata	0.4444	0.0022
2.	Hydroptila amoena	0.2857	0.0010
3.	Hydroptila consimilis	0.1558	0.0002
4.	Hydroptila waubesiana	0.0926	0.0001
5.	Orthotrichia cristata[a]	0.0672	0.0002
6.	Hydroptila hamata	0.0559	0.0005
7.	Hydroptila perdita	0.0429	0.0011
8.	Agraylea multipunctata	0.0239	0.0012

[a] Orthotrichia cristata removed

Table 20. Step-wise discriminant analysis of 14 Ohio remnant bog and fen wetlands based the presence of five species of Phryganeidae.

Step	Predictor Variable	Wilk's Lambda	Significance
1.	*Banksiola dossuaria*	0.8000	0.1089
2.	*Phryganea sayi*	0.4737	0.0164
3.	*Ptilostomis ocellifera*	0.4170	0.0276

DISCUSSION

The use of ultra-violet light traps made it possible to sample the caddisfly fauna in bog and fen wetlands throughout Ohio. Larval collections at bog sites are difficult because of the inaccessiblity of larval habitats due to the presence of a Sphagnum mat. The use of two or three light traps made it possible to collect at more than one wetland during the course of a single evening. The flight behavior of caddisflies is influenced by a number of environmental parameters, i.e., temperature, wind, moonlight, etc. (Fremling 1959, Usis and MacLean 1986a). Operation of several traps per evening minimized the effect of weather upon the resulting collections. Attraction to and capture by light traps is limited to those insects that first fly into the capture radius of the trap and second, are attracted to the light. Ultra violet light traps have been used extensively by various workers (Corbet 1965, Swegman 1981, Usis and MacLean 1986a). McElravy (1976) found that light trap collections included the same Trichoptera species as did collections of larvae and those made by emergence traps. Usis and MacLean (1986a) suggested that preferential attraction of one sex may lead to biased

sex ratios. In this study, females outnumbered males by a ratio of 7 : 5. No attempt was made to record the air temperature of the wetlands overnight, however it was noted that the temperature was often 4 to 10 C cooler than the adjacent areas. Except for some of the larger bodied Limnephilidae and Phryganeidae, flight activity stopped when the temperature dropped below 17 C.

Pielou (1966) suggested that collections taken by means of light traps cannot be considered as random representations of actual populations. Light trap data are considered to be non-random and should be treated as entire populations.

Species diversity is actually a measure of "the degree of uncertainty attached to the specific identity of any randomly selected individual" (Pielou 1966). It follows that the higher the diversity index the greater the uncertainty about the identity of any individual selected at random from the population. Diversity of plant communities is reportedly higher in fens than in bogs (Stuckey and Denny 1981). Brillouin's diversity index (H) calculated for the fourteen wetlands indicated that diversity was approximately the same for bogs and fens (Table 7). These results were influenced by the large collection of Potamyia flava at Betsch Fen on September 7, 1985 (Appendix 1) which considerably lowered the overall index of diversity and by the unusually high number of species recorded for Brown's

Lake and Eagle Creek Bogs.

Andreas (personal communication) states that there are more plant species per m^2 in Springville Marsh, a fen in west central Ohio, than there are in Flat Iron Bog, a kettle hole bog in Portage County. Student T-tests based on Trichoptera data from light trap collections indicated that species richness was also higher at fens than at bogs ($P < 0.05$) (Table 6). More individuals were collected at fen sites than bogs (Figure 2). During week number 36 more individuals were captured than at any other time (Figure 3). As reported by Shuey (1985), Ohio wetlands are not easily classified as either bogs or fens. Instead, many areas exist as environmental mosaics having characters of both. Three sites in west central Ohio, Liberty Fen, Prairie Road Fen and Kiser Lake Fen showed relatively high diversity indices (Table 6) (1.17, 1.07, and 0.98 respectively). The low diversity index calculated for Betsch Fen (0.28) was certainly influenced by the very large collection made there on September 7, 1985. Very low diversity values were recorded for Cranberry Bog (0.61) and Jackson Fen (0.62). Individuals taken at Cranberry Bog were most likely Potamyia flava or Orthotrichia aegerfasciella. Cheumatopsyche pettiti and Hydropsyche betteni were dominant at Jackson Fen. Additional collecting may reveal greater differences in Brillouin's diversity indices and species richness between bog and fen wetlands.

Figure 2. Area of pie chart indicates the number of individuals collected from 123 ultra violet light traps at 14 Ohio remnant bogs and fens during 1984 and 1985. Shaded areas represent bogs and empty areas fens.

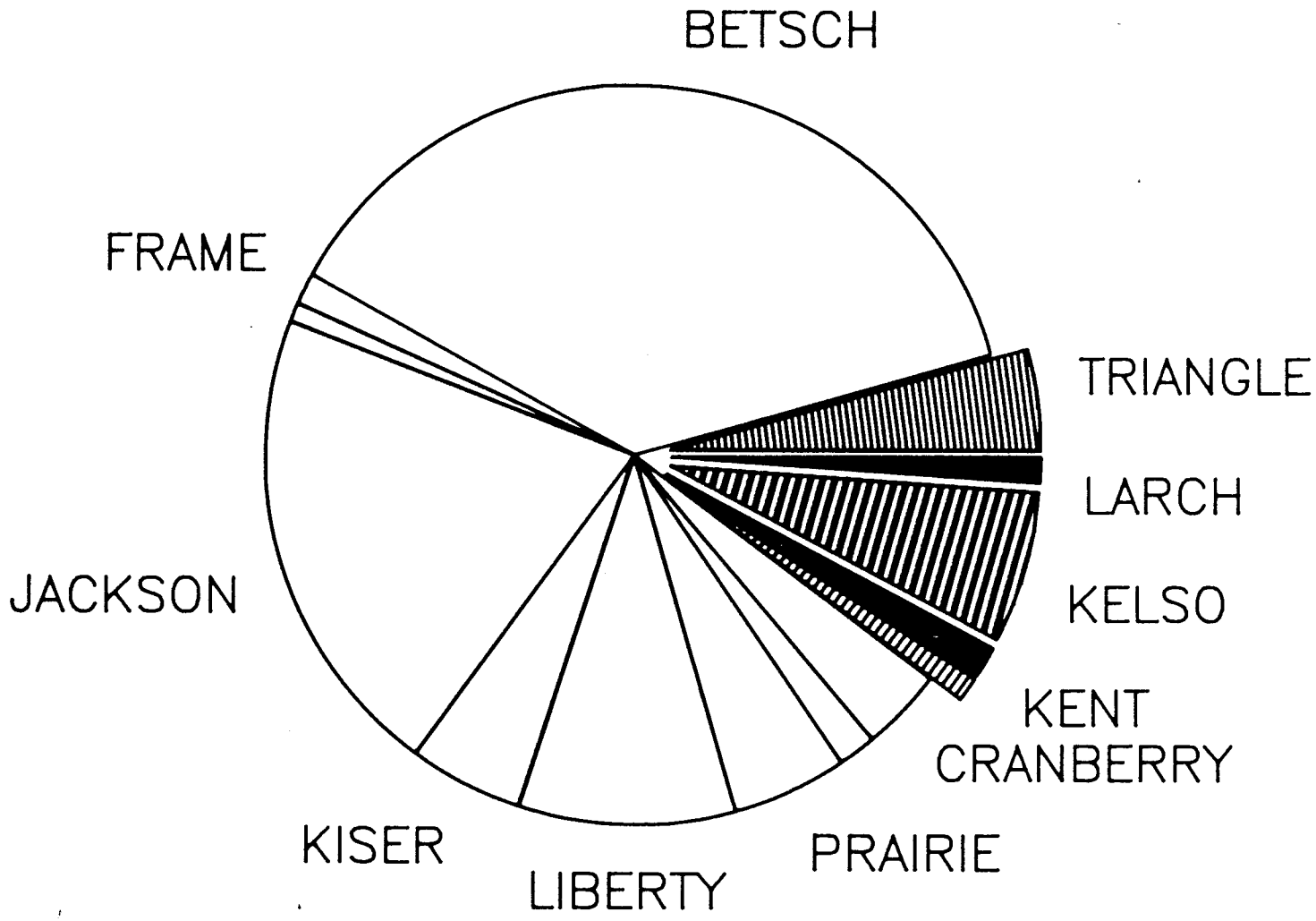
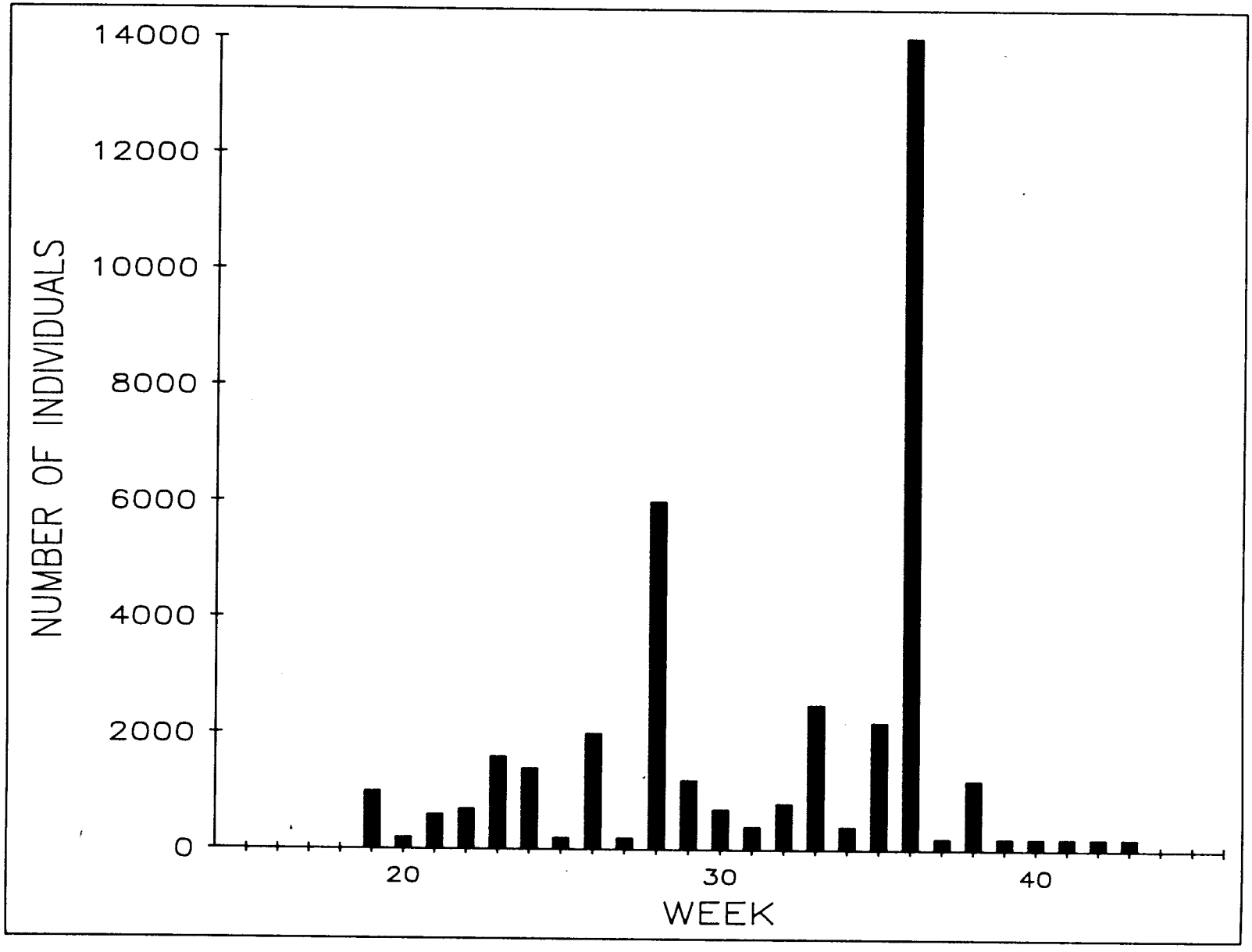

BETSCH
FRAME
TRIANGLE
LARCH
JACKSON
KELSO
KENT
CRANBERRY
KISER
LIBERTY
PRAIRIE

Figure 3. Number of individuals from 123 light trap collections from 14 Ohio remnant bogs and fens in 1984 and 1984. Week numbers follow Lewis and Taylor (1968).


14000
12000
10000
8000
6000
4000
2000
0
NUMBER OF INDIVIDUALS
20
30
40
WEEK

Discriminant Analysis

Discriminant analysis is a statistical procedure by which quantitative characteristics are segregated into qualitative categories on the basis of inherent relationships (Kachigan 1982). To minimize stastical distortion of the discriminant procedure, certain assumptions are made about the data. It is important that the data are random, normally distributed and that discriminant categories be mutually exclusive (Kachigan 1982). Williams (1983), who evaluated the application of discriminant analysis to ecological questions, states "assumptions that distributions must be normal are almost never met by ecological data . . . The statistical robustness of discrimination procedures under such conditions is poorly known at best."

MacLean (1984) used discriminant techniques to differentiate between closely related species of the genus, Catocala, on the basis of five hindwing groups. Results indicated that from seventy to ninety percent of the groups were correctly classified. Misclassifications could be attributed to species which exhibited traits different from those shown by other members of the same group.

Using the definitions provided by Andreas (1985) study sites were designated as either bog or fen habitats. The discriminant analysis procedure attempts to find key

predictors (species of caddisflies) which will minimize the number of classification errors. A discriminant function is generated for each analysis utilizing these selected predictors. In this study, separate discriminant analyses were carried out for five families of Trichoptera: Hydropsychidae, Leptoceridae, Limnephilidae, Hydroptilidae and Phryganeidae, on the basis of (1) species numerical abundance (Figure 4) and (2) the presence or absence of selected species (Figure 5). Presence/absence data were used to minimize the effect of the non-random nature of light trap data. Analyses of the Hydropsychidae, Leptoceridae, Limnephilidae and Hydroptilidae resulted in correct classifications of all sites. Analysis of the Phryganeidae, using presence/absence data, correctly classified 85.7% of the sites (Table 9). Brown's Lake Bog and Frame Lake Fen were incorrectly classified. Frame Lake Fen was frequently misclassified which may be due to its location along the perimeter of a kettle hole lake, a characteristic usually associated with bogs. When species abundance data were used, 71.4% of the sites were classified correctly. Brown's Lake Bog, Cranberry Bog, Frame Lake Fen and Lone Larch Bog were incorrectly classified. These results suggest that the presence of particular species at a site may be more important than actual species abundances for correctly classifying sites.

Relatively small numbers of Phryganeidae compared to

Figure 4. Histogram of factor scores showing the separation of 14 Ohio remnant bogs and fens based on the numerical abundance of species of (A) Limnephilidae, (B) Phryganeidae, (C) Leptoceridae, and (D) Hydroptilidae.

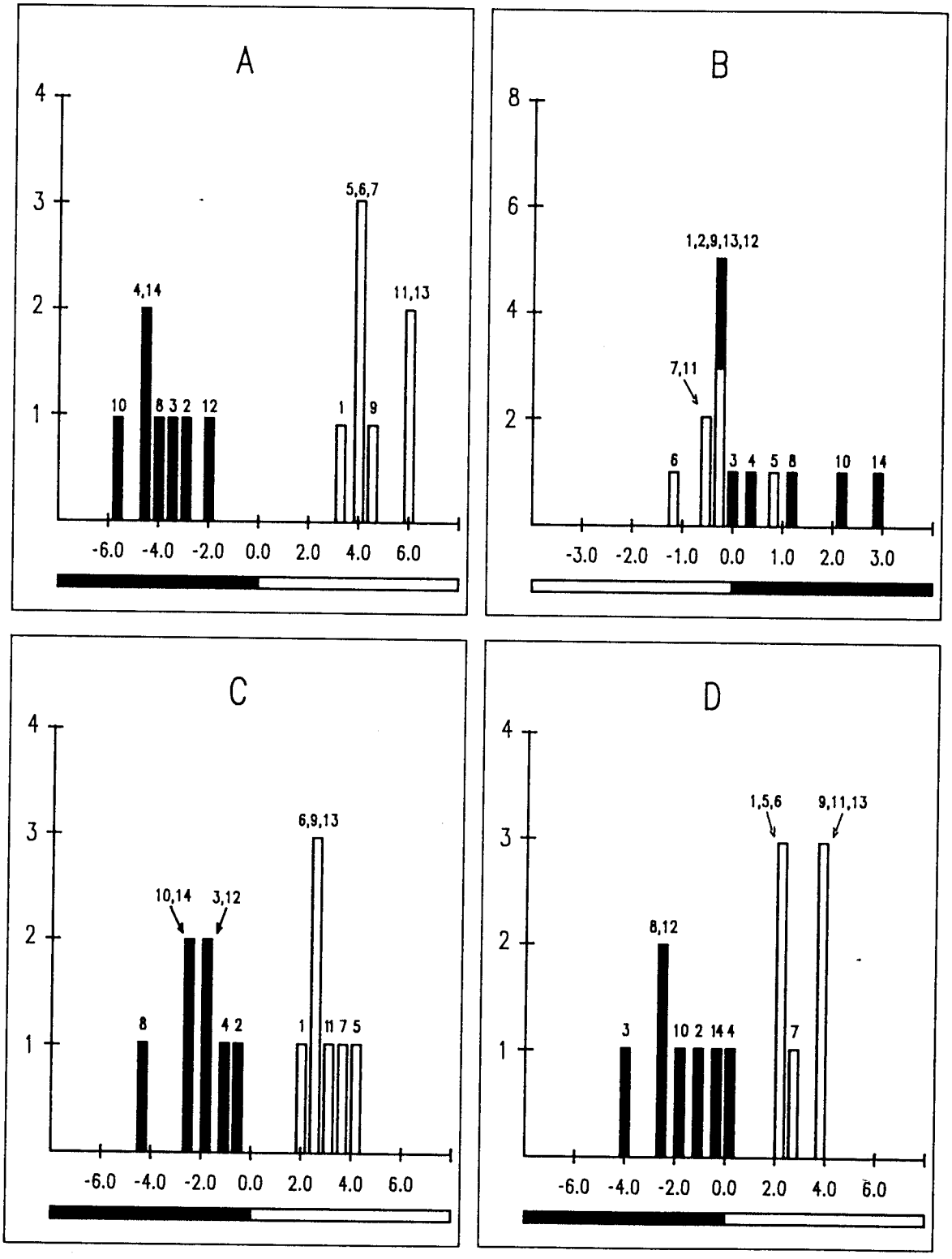
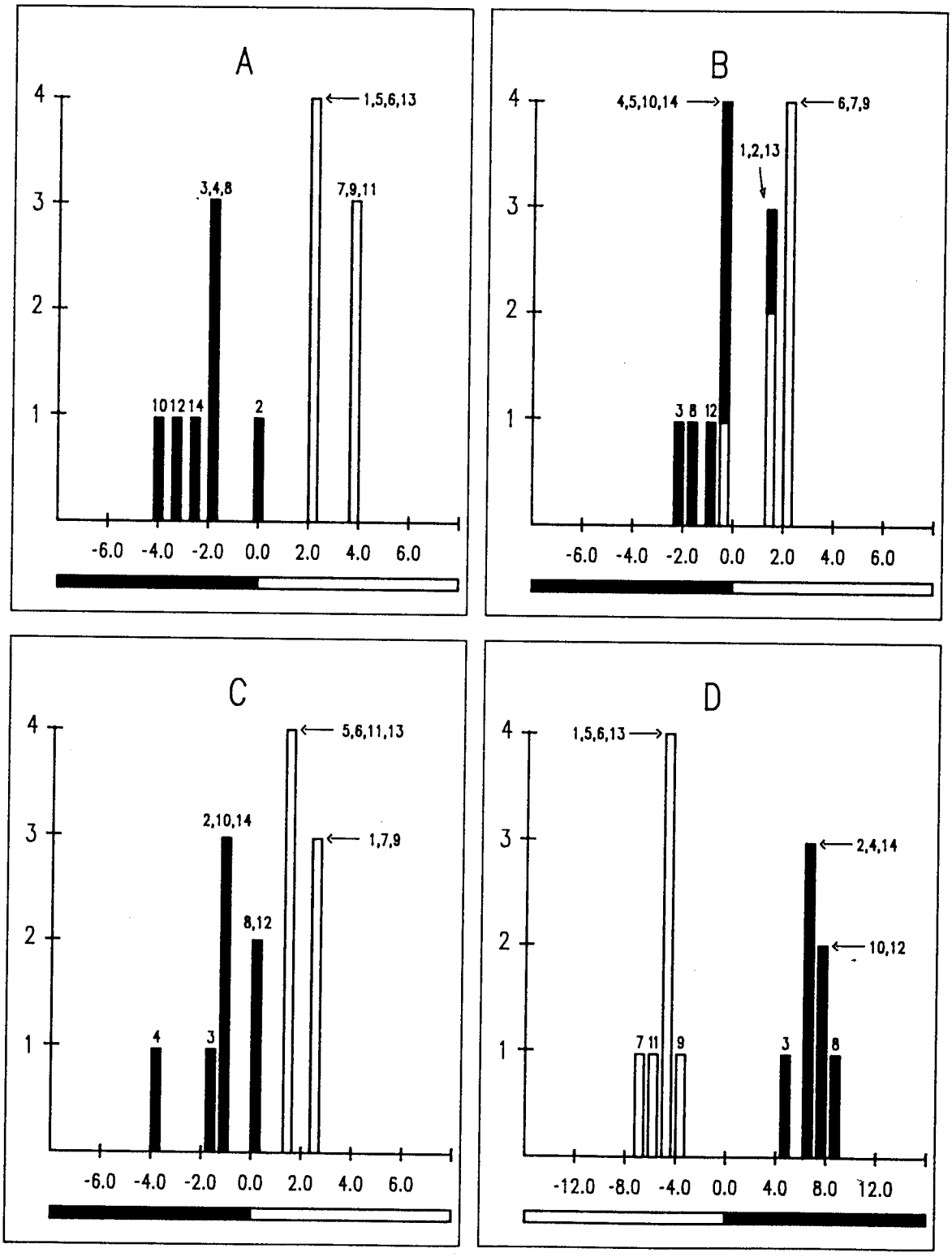

A
4
3
2
1
5,6,7
4,14
11,13
10
8 3 2
12
1
9
-6.0 -4.0 -2.0 0.0 2.0 4.0 6.0
B
8
6
4
2
1,2,9,13,12
7,11
6
3 4 5 8
10 14
-3.0 -2.0 -1.0 0.0 1.0 2.0 3.0
C
4
3
2
1
6,9,13
10,14
3,12
8
4 2
1
11 7 5
-6.0 -4.0 -2.0 0.0 2.0 4.0 6.0
D
4
3
2
1
1,5,6
9,11,13
8,12
3
10 2 14 4
7
-6.0 -4.0 -2.0 0.0 2.0 4.0 6.0

Figure 5. Histogram of factor scores showing the separation of 14 Ohio remnant bogs and fens based on the presence of species of (A) Limnephilidae, (B) Phryganeidae, (C) Leptoceridae, and (D) Hydroptilidae.


A
4
3
2
1
1,5,6,13
3,4,8
7,9,11
10 12 14
2
-6.0 -4.0 -2.0 0.0 2.0 4.0 6.0
B
4,5,10,14
6,7,9
1,2,13
3 8 12
C
5,6,11,13
2,10,14
1,7,9
8,12
4
3
D
1,5,6,13
2,4,14
10,12
7 11
9
3
8
-12.0 -8.0 -4.0 0.0 4.0 8.0 12.0

the more abundant families, may have resulted in misclassified sites. Trophic relationships reported for the Phryganeidae may be more diverse than those of other families (Wiggins 1978). Species of Limnephilidae collected during this study were primarily shredders. Species of Leptoceridae were primarily shredders and herbivores, while the Hydroptilidae were exclusively piercers (Wiggins 1978). Species of Phryganeidae were shredders, herbivores and predators (Wiggins 1984).

To better understand the ecological implications of the discriminant functions, correlations were calculated between the discriminant scores and water chemistry data taken at each of the fourteen sites. Tyrell (1985) reported that bog organisms exhibited adaptations to environmental stresses. Hydrogen ion concentration may greatly influence the kinds of organisms that inhabit Ohio bogs and fens. Correlations of discriminant function scores for the Limnephilidae, Leptoceridae, and Hydroptilidae with maximum pH values were highly significant ($P < 0.001$). In the case of the Phryganeidae, the correlation of discriminant scores with pH was slightly less significant ($P < 0.05$). This would seem to indicate that pH did influence the caddisfly fauna at these fourteen Ohio wetlands. Groundwater conductivity is an indication of available dissolved nutrients (Schwintzer 1982). Correlations were also made between discriminant scores and minimum measured conductivity values at each of

the fourteen sites. Correlations were extremely high for the Limnephilidae, Leptoceridae and Hydroptilidae and less significant for Phryganeidae. The discriminant functions make it possible to evaluate and classify other wetland habitats based on their caddisfly fauna.

Conclusions

Small, isolated aquatic systems with strict environmental characteristics are known to harbor unusual flora and fauna. In his study of the Californian vernal pools, Robinson (1986) attributed hybridization between grasses inhabiting these pools to environmental fluctuations. Populations interbred during times of high water levels (the Small Ice Age some 2000 years B.P.) and were once again isolated when the water level dropped. These pools are also important in that they are the only known location of a species of salamander, Ambystoma macrodactylum croceum. Pointedly, Robinson adds that organisms which are restricted by their habitats are vulnerable to random events which could lead to the elimination of the species' gene pool. Potential development of these habitat islands and their environs can also indirectly harm them and may ultimately lead to their destruction.

Bog and fen wetlands in Ohio are very much like

Robinson's vernal pools, since disjunct populations of rare, threatened, and endangered species are geographically separated from their normal range. Genetically isolated populations should be studied and preserved as they may offer insights into the processes of speciation and adaptation (McCance and Burns 1984).

Though most of the sites included in this study are of limited access, many signs of human actions are evident in visiting these areas, i.e., campfire scars, motorcycle tracks, litter, etc. Though the effects of human actions have existed for some time, studies to identify and quantify the effects of these activities on specific preserve environments have just begun, e.g., effects of trampling at Cranberry Bog, prairie burns at Quail Hollow State Park, etc.

In her study to determine the extent of environmental impact of visitors, Bright (1986) observed that the occurrence of invading plant species was higher along park trails which ran through Texas woodlands. Many bog and fen preserves in Ohio have had wooden boardwalks constructed through them, i.e., Brown's Lake Bog, Cranberry Bog, Frame Lake Fen, Jackson Fen, Lone Larch Bog and Triangle Lake Bog. The possible effects that these structures have on the biota are now being considered.

In many cases the presence or absence of certain species is helpful in assessing habitat quality. Recently,

a stream monitoring program was initiated in Ohio by the Ohio Department of Natural Resources. By training volunteers in the identification of aquatic macroinvertebrates, the quality of several Ohio Scenic Waterways is being assessed. The initiation of this continuous "grass roots" project may lead ultimately to the accumulation of a large database that will closely track environmental changes at these waterways.

Over the years, large amounts of information have been collected on certain species and habitats. Early work in Ohio has provided modern ecologists with lists of extirpated species that occurred at sites in the past. Dachnowski (1912) provided valuable descriptions and locations of former Ohio peatlands and Dexter (1950) provided information on the mollusk population of a bog lake in the 1950's.

The role of certain plant species as biological indicators in the classification of bogs and fens is well documented (Andreas 1985, Stuckey and Denny 1981). Descriptions from past studies make it possible to evaluate changes that have occurred at these sites during past decades. Descriptive studies such as these provide comparative base-line information concerning the present condition of our nature preserves.

This study has provided information concerning the composition of the Trichoptera fauna of Ohio remnant bog and

fen wetlands. It may be possible to evaluate future changes in the caddisfly fauna from the data presented in this study.

REFERENCES CITED

Aldrich, John W. 1937. The ecology of northeastern Ohio swamps and bogs. Ph.D. Disseratation, Western Reserve University, Cleveland, Ohio. 170 p.

Andreas, Barbara K. 1982. The flora of Portage, Stark, Summit and Wayne counties, Ohio. Ph.D. Dissertation, Kent State University, Kent, Ohio. 680p.

_____.1985. The Relationship Between Ohio Peatland Distribution and Buried River Valleys. Ohio Journal of Science, 85 : 116-125.

Betten, C. 1950. The genus Pycnopsyche (Trichoptera). Ann. Entomol. Soc. Amer. 43: 508-522.

Blickle, R. L. 1963. New species of Hydroptilidae (Trichoptera). Bull. Brooklyn Entomol. Soc. 58: 17-22.

-----. 1979. Hydroptilidae (Trichoptera) of America north of Mexico. New Hampshire Ag. Exp. Sta. Bull. 509: 1-97.

Bright, Julie A. 1986. Hiker impact on herbaceous vegetation along trails in an evergreen woodland of central Texas. Biological Conservation 36: 53-69.

Cooperrider, T.S., (ed.) 1982. Endangered and threatened plants of Ohio. Ohio Biological Survey Biological Notes No. 16, Columbus. 92 p.

Dachnowski, A. 1912. Peat deposits of Ohio: Their origin, formation and uses. Bull. Geol. Surv. Ohio, 4th Ser., Bull. 16 Div. Geol. Surv., Columbus, Ohio. 424 p.

Delcourt, Paul A. and Hazel R. Delcourt. 1980. Vegetation Maps for Eastern North America: 40,000 yr B.P. to the Present. Geobotany II. Plenum Press, New York. 124-159.

Dexter, Ralph W. 1950. Distribution of the mollusks in a basic bog lake and its margins. The Nautilus. 64: 19-26.

Elfring, Chris. 1986. US parks at a crossroads. Bioscience 36:301-304.

Flint, O. S. 1960. Taxonomy and biology of Nearctic limnephilid larvae (Trichoptera), with special reference to species in eastern United States. Entomologica Amer. 40: 1-117.

Fremling, Calvin R. 1959. Biology and possible control of economically important Trichoptera and Ephemeroptera of the upper Mississippi River. Ph.D. dissertation, Iowa State University.

Gleason, H.A. and A. Conquist. 1963. Manual of Vascular Plants of Northeastern United States and Adjacent Canada. Van Nostrand Company, Inc. 810 p.

Gordon, A. E. 1974. A synopsis and phylogenetic outline of the Nearctic members of the Cheumatopsyche. Proc. Acad. Nat. Sci. Phil. 126: 117-160.

Heinselman, M. L. 1970. Landscape evolution, peatland types and the environment in the Lake Agassiz Peatlands Natural Area, Minnesota. Ecological Monographs 40 : 235-261.

Huryn, Alexander D. and Benjamin A. Foote. 1983. An Annotated List of the Caddisflies (Trichoptera) of Ohio. Proceedings of the Entomological Society of Washington. 85 : 783-796.

Kachigan, Sam K. 1982. Multivariate statistical analysis: a conceptual introduction. Radius Press, New York. 297 p.

Lewis, T. and L.R. Taylor. 1967. Introduction to experimental ecology. Academic Press, Inc. New York, New York. 371 p.

McCance, Robert M. and James F. Burns (eds). 1984. Ohio endangered and threatened vascular plants: abstracts of state-listed taxa. Division of Natural Areas and Preserves, Department of Natural Resources, Columbus, Ohio. 635 p.

Mackay, Rosemary J. and Glenn B. Wiggins. 1979. Ecological diversity in Trichoptera. Ann. Rev. Entomol 24 : 185-208.

MacLean, David M. and Bonnie K. MacLean. 1984. Trichoptera (caddisflies) of Watercress Marsh, Columbiana County, Ohio. Ohio Journal of Science 84: 54-62.

-----. 1984. Evaluation of population attributes and life history traits of Catocala (Lepidoptera: Noctuidae) by means of multivariate analysis. The American Midland Naturalist 112: 67-75.

Marrs, R.H., M.J. Hicks and R.M. Fuller. 1986. Losses of Lowland Heath through Succession at Four Sites in Breckland, East Anglia, England. Biological Conservation. 36: 19-38.

McElravy, E.P. 1976. The caddisflies (Trichoptera) along the upper portion of the west branch of the Mahoning River, Portage County, Ohio. M.S. thesis, Kent State University, Kent, Ohio.

McKnight, Diane et al. 1985. Biogeochemistry of aquatic humic substances in Thoreau's Bog, Concord, Massachusetts. Ecology 66: 1339-1352.

Merritt, R. W. and K. W. Cummins (eds). 1984. An Introduction to the Aquatic Insects of North America.

2nd Ed. Kendall/Hunt Publishing Co. 722 pp.

Morse, J.C. 1972. The genus Nyctiophylax in North America. J. Kans. Entomol. Soc. 45: 172-181.

-----. 1975. A phylogeny and revision of the caddisfly genus Ceraclea (Trichoptera: Leptoceridae. Contr. Amer. Entomol. Inst. 11: 1-97.

Platt, Carolyn V. 1985. Bogs & Fens Ohio's Glacial Wetlands. Timeline (Ohio Historical Society) Oct-nov. 52-63.

Pielou, E. C. 1966. The measurement of diversity in different types of biological collections. J. Theoret. Biol. 13 : 131-144.

Poole, Robert W. 1970. Temporal variations in the species diversity of a woodland caddisfly fauna from central Illinois. Tran. Ill. Acad. Sci. 383-385.

Robinson, Robert. 1986. Rings of flowers. Bioscience. 36: 363-365.

Ross, Herbert H. 1938a. Descriptions of Nearctic caddisflies (Trichoptera). Bull. Ill. Nat. Hist. Surv. 21: 101-183.

-----. 1944. The caddisflies, or Trichoptera, of Illinois. Bull. Ill. Nat. Hist. Surv. 23:1-326.

-----., and D. R. Merkley. 1950. An annotated key to the

Nearctic males of Limnephilus (Trichoptera: Limnephilidae). Amer. Midl. Nat. 47: 435-455.

-----. 1956. Evolution and classification of the Mountain caddisflies. The University of Illinois Press, Urbana, Illinois. 203 p.

Schmid, F. 1951. Le genre Ironoquia Bks. (Trichopt. Limnophilid.) Mitt. Schweiz. Ent. Ges. 24: 317-328.

------. 1955. Contribution a l'etude des LImnophilidae (Trichoptera). Mitt. Schweiz. Ent. Ges. 28: 1-243.

------. 1970. Le genre Rhyacophilia et la famille des Rhyacophilidae (Trichoptera) Mem. Entomol. Soc. Can. 66: 1-230.

------. 1983. Revision des Trichopteres Canadiens. III. Les Hyalopsychidae, Psychomyiidae, Goeridae, Brachycentridae, Sericostomatidae, Helicopsychidae, Beraeidae, Odontoceridae, Calamoceratidae, et Molannidae. Mem. Soc. Entomol. Can. 25: 1-109.

Schwaegerle, Kent E. 1983. Population growth of the pitcher plant, Sarracenia purpurea L., at Cranberry Bog, Licking county, Ohio. Ohio Journal of Science 83 : 19-22.

Schwintzer, Christa R. 1977. Nutrient and Water Levels in a Small Michigan Bog with High Tree Mortality. The

American Midland Naturalist. 100 (2): 441-451

-----. 1974. Vegetation changes in a small Michigan bog from 1917 to 1972. American Midland Naturalist 92: 447-459.

---- and Thomas J. Tomberlin. 1982. Chemical and physical characteristics of shallow ground waters in northern Michigan bogs, swamps, and fens. American Journal of Botany 69 : 1231-1239.

Shane, Linda C. 1974. Palynology and Radiocarbon Chronology of Battaglia Bog, Portage County, Ohio. M.S. Thesis, Kent State University, Kent Ohio.

Shuey, John A. 1985. Habitat Associations of Wetland Butterflies Near the Glacial maxima in Ohio, Indiana, and Michigan. Journal of Research on the Lepidoptera. 24(2): 176-186.

Stein, Carol B. 1974. Evaluation of Frame Glacial Bog, Ohio as a national natural landmark. Evaluation prepared for the U.S. Department of the Interior, National Park Service. 11 pp.

Stuckey, Ronald L. and Guy L. Denny. 1981 Prairie Fens and Bog Fens in Ohio: Floristic Similarities, Differences, and Geographical Affinities. Geobotany 1980. 1-34.

Swegman, Bernard G., W. Walker, and J.L. Sydora. 1981. The

adult Trichoptera of LInesville Creek, Crawford County, Pennsylvania with notes on their flight activity. Trans. Am. Entomol. Soc. 107 : 125-146.

Thiele, Hans-Ulrich. 1977. Carabid Beetles in Their Environments: A study on habitat selection by adaptations in physiology and behaviour. Springer-Verlag, New York. 369 p.

Tyrrell, Lucy E. 1985. Larix laricina and Picea mariana in a Wisconsin Bog: the effect of leaf lifespan on foliar nutrient patterns, nutrient conservation, and growth efficiency. Master's Thesis, The Ohio State University, Columbus, Ohio. 51 p.

Usis, J. D. and D. B. MacLean. 1986a. The caddisflies (Trichoptera) of Stillfork Swamp Nature Preserve, Carroll County, Ohio. Ohio Journal of Science 86: 33-40.

----- and D.B. MacLean. 1986b. Comparison of the caddisfly fauna (Trichoptera) of glaciated and nonglaciated lentic sites in eastern Ohio. Ohio Journal of Science 86: 41-44.

Utter, Wesley E. 1971. Birds of a glacial bog in northeastern Ohio. Master's Thesis. Kent State

University, Kent, Ohio. 147 pp.

White, George W. 1951. Illinoian and Wisconsin drift of the southern part of the Grand River Lobe in eastern Ohio. Bulletin of the Geological Society of America. Vol 62: 957-978.

Wiggins, G. B. 1977. Larvae of the North American Caddisfly Genera. University of Toronto Press, Toronto, Ont. xi + 401 pp.

-----. 1978. Trichoptera. pp. 147-185. In R.W. Merrit, and K.W. Cummins, eds., An Introduction to the Aquatic Insects of North America. Kendall/Hunt Publ. Co., Dubuque, Iowa.

Wiggins, G.B. and Rosemary J. MacKay. 1978. Some relationships between systematics and trophic ecology in nearctic aquatic insects, with special reference to trichoptera. Ecology 59: 1211-1220.

Williams, Byron K. 1983. Some observations on the use of discriminant analysis in ecology. Ecology 64 : 1283-1291.

Zar, Jerrold H. 1974. Biostatistical Analysis. Prentice-Hall, Inc. Englewood Cliffs, N.J. 620 p.

APPENDIX I

Appendix I-A

Aerial photograph of Betsch Fen (1984). 1 inch = 1600 feet. Black diamond indicates collection site.

Listing of adult Trichoptera from eight light trap collections made at Betsch Fen from May 1985 through October 1985.

Site 1. Betsch Fen

Philopotamidae

Chimarra aterrima (Hagen). 24-VIII-85 (2 females).

Chimarra obscura (Walker). 7-IX-85 (5 males, 5 females).

Polycentropodidae

*Cyrnellus marginalis. 7-IX-85 (1 male).

Nyctiophylax sp. 7-IX-85 (2 females).

Hydropsychidae

Ceratopsyche bronta (Ross). 27-VII-85 (1 female), 9-VIII-85 (1 male), 24-VIII-85 (1 male, 3 females), 7-IX-85 (12 males, 10 females).

Ceratopsyche cheilonis (Ross). 25-V-85 (1 male, 1 female), 7-VI-85 (2 females), 6-VII-85 (1 female), 9-VIII-85 (1 male, 13 females), 24-VIII-85 (5 females), 7-IX-85 (25 males, 106 females).

Ceratopsyche morosa (Hagen). 6-VII-85 (1 female), 9-VIII-85 (6 females), 24-VIII-85 (2 females), 7-IX-85 (3 females).

Cheumatopsyche campyla Ross. 6-VII-85 (1 male, 12 females),

9-VIII-85 (12 males, 10 females), 24-VIII-85 (5 males, 10 females), 7-IX-85 (747 males, 660 females).

Cheumatopsyche oxa Ross. 7-VI-85 (2 females), 7-IX-85 (7 males, 16 females).

Cheumatopsyche pettiti (Banks). 25-V-85 (1 female), 6-VII-85 (1 male, 2 females), 27-VII-85 (1 female), 9-VIII-85 (3 males, 4 females), 24-VIII-85 (2 females), 7-IX-85 (10 males, 13 females).

Cheumatopsyche speciosa (Banks). 27-VII-85 (2 males)

Hydropsyche betteni Ross 7-VI-85 (2 males), 24-VIII-85 (3 females), 7-IX-85 (12 males, 10 females).

Hydropsyche orris Ross. 7-VI-85 (1 female), 6-VII-85 (1 male), 9-VIII-85 (25 males, 2 females), 7-IX-85 (63 males, 40 females).

Hydropsyche simulans Ross. 6-VII-85 (1 male), 7-IX-85 (27 males, 35 females).

Hydropsyche valanis Ross. 7-IX-85 (1 female).

Potamyia flava (Hagen). 25-V-85 (2 females), 6-VII-85 (1 male), 27-VII-85 (30 males), 9-VIII-85 (445 males, 25 females), 24-VIII-85 (23 males, 125 females), 7-IX-85 (5334 males, 5774 females).

Rhyacophilidae

Rhyacophila ledra Ross. 7-IX-85 (9 males).

Glossosomatidae

Prototila maculata (Hagen). 7-IX-85 (1 male, 1 female).

Hydroptilidae

Hydroptila amoena Ross. 9-VIII-85 (1 female).

Hydroptila armata Ross. 9-VIII-85 (1 male), 7-IX-85 (1 male, 1 female).

Hydroptila consimilis Morton. 24-VIII-85 (1 male, 1 female), 7-IX-85 (6 females).

Hydroptila perdita Morton. 9-VIII-85 (1 male, 2 females), 24-VIII-85 (4 female), 7-IX-85 (5 females).

Hydroptila waubesiana Betten. 24-VIII-85 (1 female), 7-IX-85 (1 female).

Ochrotrichia tarsalis (Hagen). 7-IX-85 (2 males).

Orthotrichia cristata Morton. 25-V-85 (1 male), 24-VIII-85 (1 male), 7-IX-85 (1 female).

Oxyethira pallida (Banks). 9-VIII-85 (1 male, 1 female), 7-IX-85 (4 males, 2 females).

Phryganeidae

Agrypnia vestita (Walker). 7-IX-85 (1 male, 2 females).

Phryganea sayi Milne. 9-VIII-85 (1 male).

Limnephilidae

Pycnopsyche scabripennis Rambur. 24-VIII-85 (1 male), 7-IX-85 (11 males).

Leptoceridae

Ceraclea cancellata (Betten). 27-VII-85 (1 male), 9-VIII-85 (4 males), 7-IX-85 (7 males, 11 females).

Nectopsyche albida (Walker). 9-VIII-85 (1 female), 7-IX-85 (1 female).

Nectopsyche candida (Hagen). 6-VII-85 (1 female).

Nectopsyche exquisita (Walker). 9-VIII-85 (1 male, 2 females).

Oecetis ditissa Ross. 6-VII-85 (1 female), 7-IX-85 (1 female).

Oecetis inconspicua (Walker). 9-VIII-85 (6 males), 24-VIII-85 (1 male), 7-IX-85 (6 males, 12 females).

Oecetis nocturna Ross. 27-VII-85 (1 male), 9-VIII-85 (5 males), 7-IX-85 (1 female).

Triaenodes marginatus Sibly. 7-IX-85 (1 female).

Triaenodes tardus Milne. 9-VIII-85 (4 males, 1 female), 24-VIII-85 (9 females), 7-IX-85 (2 males, 19 females).

Appendix I-B

Aerial photograph of Brown's Lake Bog (1981). 1 inch = 600 feet. Black diamond indicates collection site.

Listing of adult Trichoptera from eight light trap collections made at Brown's Lake Bog from May 1985 through October 1985.

Site 2. Brown's Lake Bog

Psychomyiidae

Psychomyia flavida Hagen. 12-VII-85 (1 female).

Polycentropodidae

Neureclipsis crepusclaris (Walker). 18-VIII-85 (1 female).

Nyctiophylax affinis (Banks). 18-VIII-85 (8 males).

Nyctiophylax sp. 18-VIII-85 (19 females).

Polycentropus cinereus Hagen. 1-VI-85 (1 female).

Phylocentropus lucidus (Hagen). 12-VII-85 (5 females).

Hydropsychidae

Ceratopsyche bronta (Ross). 12-VII-85 (1 male, 1 female), 18-VIII-85 (3 males, 9 females), 1-IX-85 (2 females).

Ceratopsyche cheilonis (Ross). 1-VI-85 (1 female), 18-VIII-85 (1 female).

Ceratopsyche morosa (Hagen). 18-VIII-85 (3 females) 1-IX-85 (1 female).

Ceratopsyche slossonae (Banks). 1-VI-85 (2 females), 28-VI-85 (2 males, 2 females), 12-VII-85 (1 female), 18-VIII-85 (3 males, 14 females), 1-IX-85 (2 females).

Cheumatopsyche campyla Ross. 1-VI-85 (2 males, 5 females), 12-VII-85 (2 males), 18-VIII-85 (3 females).

Cheumatopsyche oxa Ross. 18-VIII-85 (1 female).

Cheumatopsyche pettiti (Banks). 1-VI-85 (1 female), 28-VI-85 (7 females), 12-VII-85 (4 males, 2 females), 1-IX-85 (1 female)

Hydropsyche betteni Ross. 28-VI-85 (5 females), 12-VII-85 (1 male), 18-VIII-85 (2 females).

Hydropsyche orris Ross. 18-VIII-85 (2 males, 1 female).

Hydropsyche valanis Ross. 18-VIII-85 (1 female).

Potamyia flava (Hagen). 18-VIII-85 (30 males, 179 females).

Hydroptilidae

Agraylea multipunctata Curtis. 28-VI-85 (1 male), 18-VIII-85 (1 male).

Hydroptila ajax Ross. 12-VII-85 (1 male, 1 female).

Hydroptila consimilis Morton. 18-VIII-85 (3 males, 5 females), 1-IX-85 (1 female).

Hydroptila perdita Morton. 18-VIII-85 (5 males, 9 females).

Hydroptila waubesiana Betten. 12-VII-85 (1 female).

Orthotrichia agerfascielle (Chambers). 28-VI-85 (8 males, 3 females), 18-VIII-85 (6 males, 10 females).

Orthotrichia cristata Morton. 1-VI-85 (1 male, 1 female), 18-VIII-85 (1 male), 1-IX-85 (2 males).

Oxyethira pallida (Banks). 28-VI-85 (2 males, 2 females), 18-VIII-85 (1 male, 5 females).

Phryganeidae

Agrypnia vestita (Walker). 1-IX-85 (3 males, 1 female).

Phryganea sayi Milne. 12-VII-85 (1 male), 18-VIII-85 (4 males, 6 females), 1-IX-85 (1 male).

Limnephilidae

Pycnopsyche scabripennis Rambur. 2-VIII-85 (1 male).

Limnephilus indivisus Walker. 1-VI-85 (1 male), 18-VIII-85 (2 males).

Limnephilus moestus Banks. 1-VI-85 (1 male).

Platycentropus radiatus (Say). 2-VIII-85 (1 female).

Molannidae

Molanna blenda Sibley. 12-VII-85 (1 male).

Leptoceridae

Ceraclea cancellata (Betten). 18-VIII-85 (4 males).

Ceraclea tarsipunctata (Vorhies). 28-VI-85 (1 female).

Ceraclea transversa (Hagen). 18-VIII-85 (1 female).

Leptocerus americanus (Banks). 12-VII-85 (1 male, 5 females).

Nectopsyche albida (Walker). 1-VI-85 (1 female).

Oecetis cinerascens (Hagen). 12-VII-85 (1 male), 2-VIII-85 (1 male), 18-VIII-85 (2 males, 1 female), 1-IX-85 (1 male).

Oecetis ditissa Ross. 18-VIII-85 (1 male).

Oecetis inconspicua (Walker). 1-VI-85 (6 males, 4 females), 28-VI-85 (4 males), 12-VII-85 (3 males, 5 females), 2-VIII-85 (3 males), 18-VIII-85 (14 males, 11 females), 1-IX-85 (1 male).

Oecetis nocturna Ross. 18-VIII-85 (2 males).

*Oecetis ochraceae. 18-VIII-85 (1 female).

Triaenodes abus Milne. 18-VIII-85 (1 female).

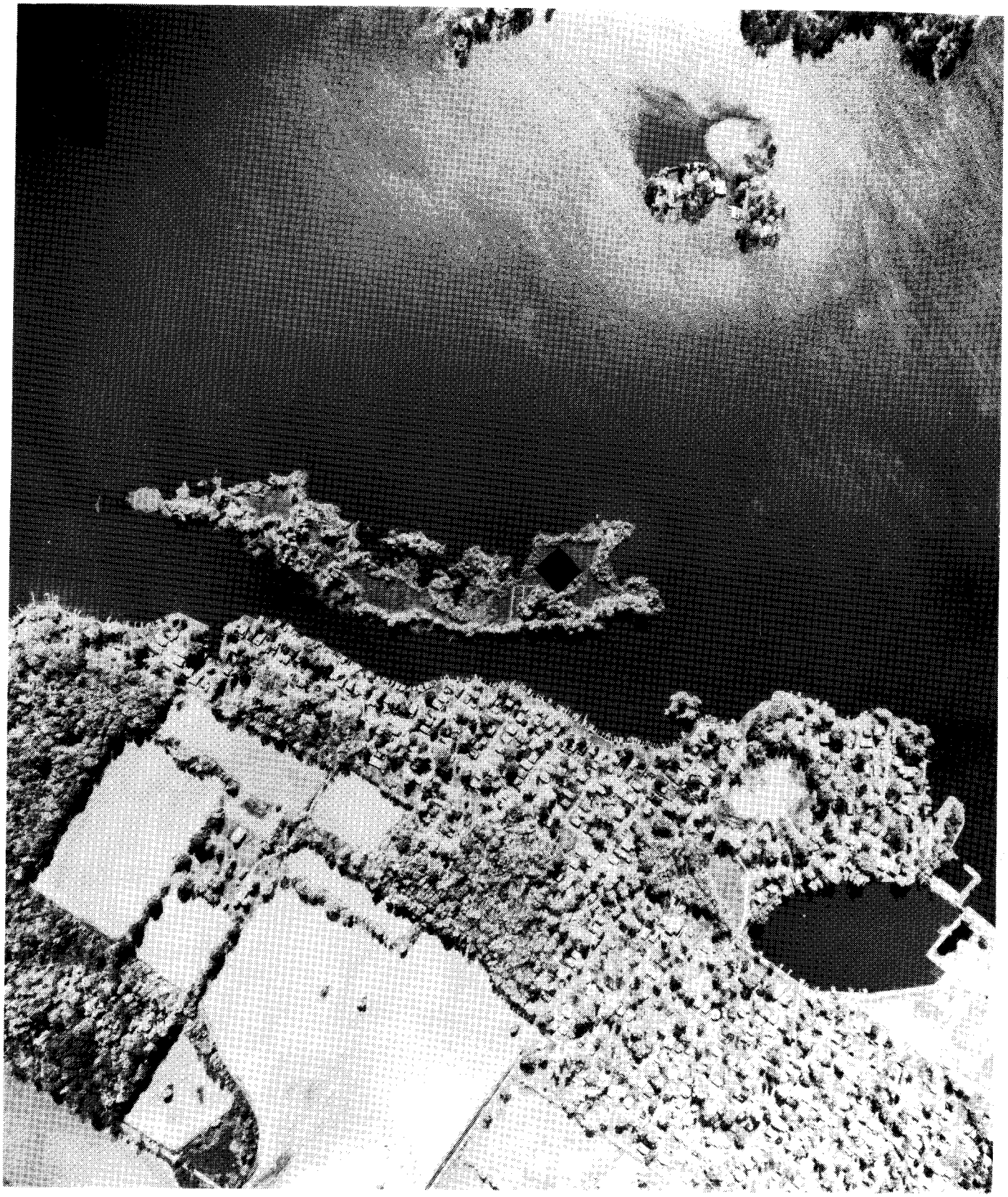
Triaenodes injustus (Hagen). 2-VIII-85 (1 male).

Triaenodes marginatus Sibly. 18-VIII-85 (2 females).

Triaenodes tardus Milne. 12-VII-85 (3 females), 2-VIII-85 (3 males), 18-VIII-85 (3 males, 7 females), 1-IX-85 (1 male, 5 females).

Appendix I-C

Aerial photograph of Cranberry Bog (1985). 1 inch = 600 feet. Black diamond indicates collection site.



Listing of adult Trichoptera from eight light trap collections made at Cranberry Bog from 1984 and 1985.

Site 3. Cranberry Bog

Hydropsychidae

Cheumatopsyche campyla Ross. 13-VII-84 (1 male).

Cheumatopsyche oxa Ross. 13-VII-84 (1 female).

Cheumatopsyche pettiti (Banks). 13-VII-84 (2 females), 9-VIII-85 (1 male).

Hydropsyche bidens Ross. 13-VII-84 (4 females).

Hydropsyche incommoda. 13-VII-84 (2 females).

Hydropsyche orris Ross. 13-VII-84 (2 males, 6 females), 6-VII-85 (1 female), 27-VII-85 (2 females), 9-VIII-85 (3 males, 17 females), 7-IX-85 (1 male, 3 females).

Hydropsyche simulans Ross. 13-VII-84 (1 male).

Hydropsyche valanis Ross. 13-VII-84 (3 females).

Potamyia flava (Hagen). 13-VII-84 (13 males, 89 females), 6-VII-85 (8 females), 27-VII-85 (1 male, 8 females), 9-VIII-85 (3 males, 123 females), 24-VIII-85 (2 females), 7-IX-85 (2 males, 285 females).

Hydroptilidae

Hydroptila ajax Ross. 6-VII-85 (1 male).

Hydroptila amoena Ross. 9-VIII-85 (1 female).

Hydroptila angusta Ross. 7-IX-85 (1 female).

Hydroptila hamata Morton. 6-VII-85 (1 male).

Hydroptila perdita Morton. 7-IX-85 (1 male).

Orthotrichia agerfascielle (Chambers). 13-VII-84 (1 male, 1 female), 6-VII-85 (2 males, 3 females), 27-VII-85 (6 males, 2 females), 9-VIII-85 (4 males, 9 females), 24-VIII-85 (34 males,17 females), 7-IX-85 (58 males, 383 females).

Orthotrichia cristata Morton. 13-VII-84 (1 male), 7-IX-85 (1 female).

Oxyethira pallida (Banks). 13-VII-84 (2 females), 27-VII-85 (1 male), 7-IX-85 (4 females).

Leptoceridae

Ceraclea cancellata (Betten). 7-IX-85 (2 males).

Ceraclea transversa (Hagen). 13-VII-84 (1 female).

Nectopsyche albida (Walker). 13-VII-84 (1 female), 9-VIII-85 (4 females).

Oecetis cinerascens (Hagen). 13-VII-84 (8 males, 3 females), 6-VII-85 (3 males, 3 females), 9-VIII-85 (30 males, 8 females), 24-VIII-85 (9 males, 1 females), 7-IX-85 (9 males, 5 females).

Oecetis ditissa Ross. 9-VIII-85 (1 male), 7-IX-85 (1 female).

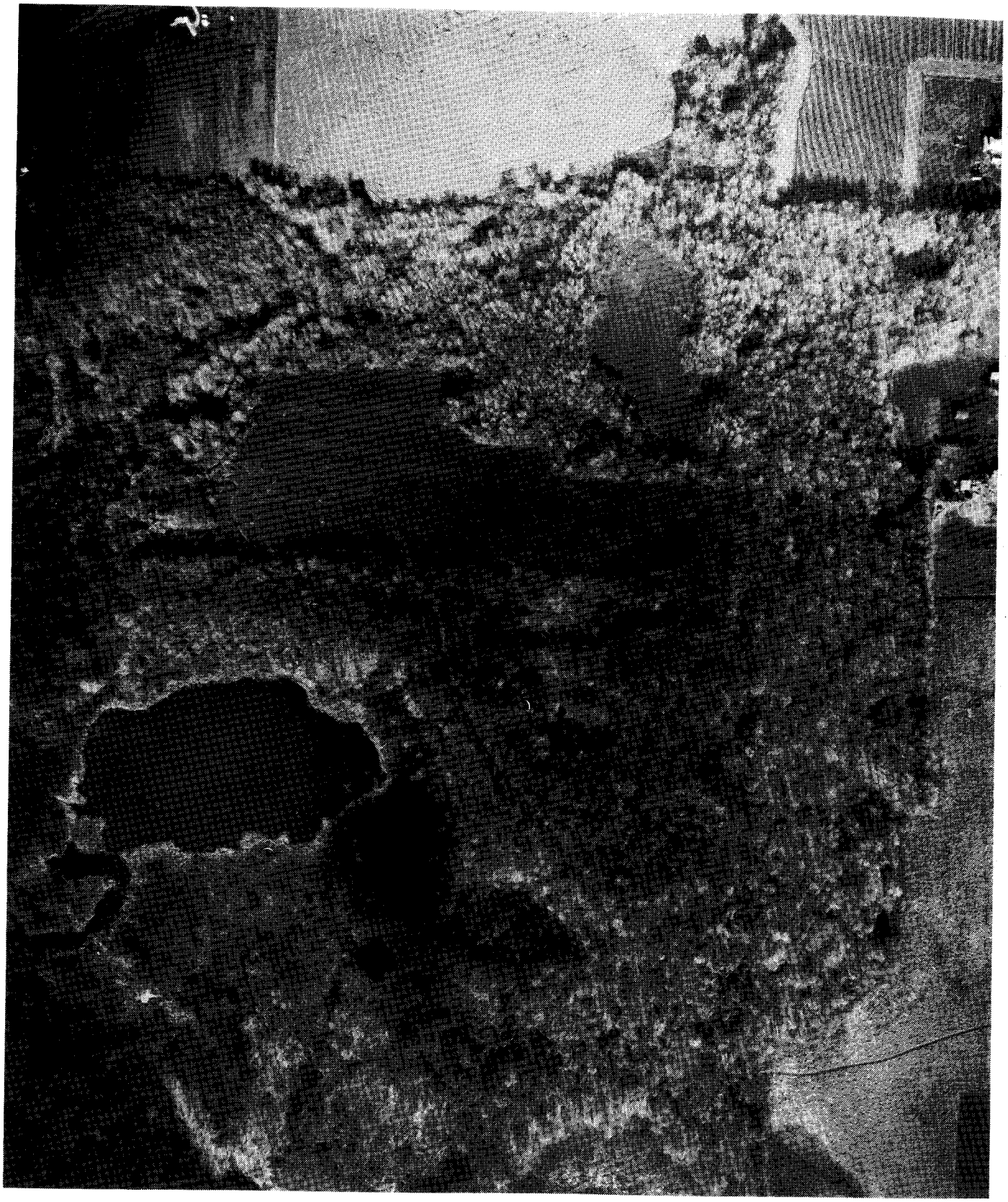
Oecetis inconspicua (Walker). 13-VII-84 (5 males, 18 females), 6-VII-85 (4 males, 4 females), 27-VII-85 (3 males, 2 females), 9-VIII-85 (7 males, 11 females), 24-VIII-85 (4 females), 7-IX-85 (6 males, 29 females).

Oecetis nocturna Ross. 9-VIII-85 (4 males).

*Oecetis ochraceae. 7-IX-85 (12 females).

Appendix I-D

Aerial photograph of Eagle Creek Bog (1984). 1 inch = 400 feet. Black diamond indicates collection site.



Listing of adult Trichoptera from eight light trap collections made at Eagle Creek Bog from 1984 and 1985.

Site 4. Eagle Creek

Philopotamidae

Chimarra obscura(Walker). 18-VIII-84 (1 male).

Psychomyiidae

Lype diversa (Banks). 30-VIII-85 (1 male).

Psychomyia flavida Hagen. 21-VII-85 (1 male).

Polycentropodidae

Polycentropus confusus Hagen. 18-VIII-84 (1 male).

Hydropsychidae

Ceratopsyche bronta (Ross). 18-VIII-84 (1 female), 21-VII-85 (1 female),30-VIII-85 (1 female).

Ceratopsyche cheilonis (Ross). 21-VII-85 (1 female).

Ceratopsyche morosa. 21-VII-85 (1 female).

Ceratopsyche slossonae (Banks). 30-VII-84 (4 females), 18-VIII-84 (5 females), 21-VII-85 (8 females), 3-VII-85 (1 female).

Cheumatopsyche oxa Ross. 18-VIII-84 (2 females), 30-VIII-85 (1 female).

Cheumatopsyche pettiti (Banks). 18-VIII-84 (1 male, 4 females), 21-VII-85 (2 males, 1 female)

NR Cheumatopsyche speciosa. 18-VIII-84 (1 female)

Hydropsyche betteni Ross.30-VII-84 (1 female), 18-VIII-84 (1 female).

Hydropsyche simulans Ross. 18-VIII-84 (1 female).

Hydropsyche sparna Ross. 30-VII-84 (2 females), 18-VIII-84 (6 females),21-VII-85 (1 male, 2 females).

Hydroptilidae

Agraylea multipunctata Curtis. 18-VIII-84 (2 females), 21-VII-85 (1 male).

Hydroptila ajax Ross. 21-VII-85 (5 females).

Hydroptila amoena Ross. 21-VII-85 (1 female).

Hydroptila consimilis Morton. 30-VII-84 (1 female), 21-VII-85 (1 female).

Hydroptila waubesiana. 30-VII-84 (1 female), 21-VII-85 (1 female), 30-VIII-85 (1 female).

Ithytrichia clavata Morton. 21-VII-85 (1 female).

Orthotrichia agerfascielle (Chambers). 30-VII-84 (1 female), 3-VII-85 (1 female), 21-VII-85 (2 females).

Oxyethira pallida (Banks). 21-VII-85 (1 female), 30-VIII-85 (1 female).

Phryganeidae

Agrypnia vestita (Walker). 30-VII-84 (1 male), 18-VIII-84 (33 males, 13 females), 21-VII-85 (1 female), 30-VIII-85 (1 male).

Banksiola dossuaria (Say). 21-VII-85 (3 males, 1 female).

Phryganea sayi Milne. 30-VIII-85 (2 males).

Ptilostomis ocellifera (Walker). 21-VII-85 (1 female).

Ptilostomis semifasciata. 30-VII-84 (1 male).

Limnephilidae

Anabolia consocius (Walker). 18-VIII-84 (4 males), 30-VIII-85 (1 female).

*Goera calcarata Banks. 30-VII-84 (1 female), 21-VII-85 (1 female).

Ironoquoia punctatissima (Walker). 20-IX-84 (7 males, 3 females), 30-VIII-85 (1 male, 1 female).

*Limnephilus hyalinus Hagen. 20-IX-84 (1 female).

Limnephilus indivisus Walker. 18-VIII-84 (3 males, 1 female), 20-IX-84 (9 males, 29 females).

Pycnopsyche guttifer (Walker). 20-IX-84 (4 males).

Pycnopsyche lepida Hagen. 18-VIII-84 (1 male), 30-VIII-85 (1 male, 2 females).

Lepidostomatidae

Lepidostoma sp. 20-IX-84 (1 female).

Molannidae

Molanna blenda Sibley. 18-VIII-84 (1 male).

Leptoceridae

Leptocerus americanus (Banks). 3-VII-85 (1 female), 21-VII-85 (6 males,15 females).

Oecetis cinerascens (Hagen). 30-VIII-84 (1 female), 21-VII-85 (3 males, 2 females).

Oecetis ditissa Ross. 21-VII-85 (1 female).

Oecetis inconspicua (Walker). 18-VIII-84 (1 female),3-VII-85 (1 male), 21-VII-85 (5 males, 9 females), 30-VIII-85

(2 males, 1 female).

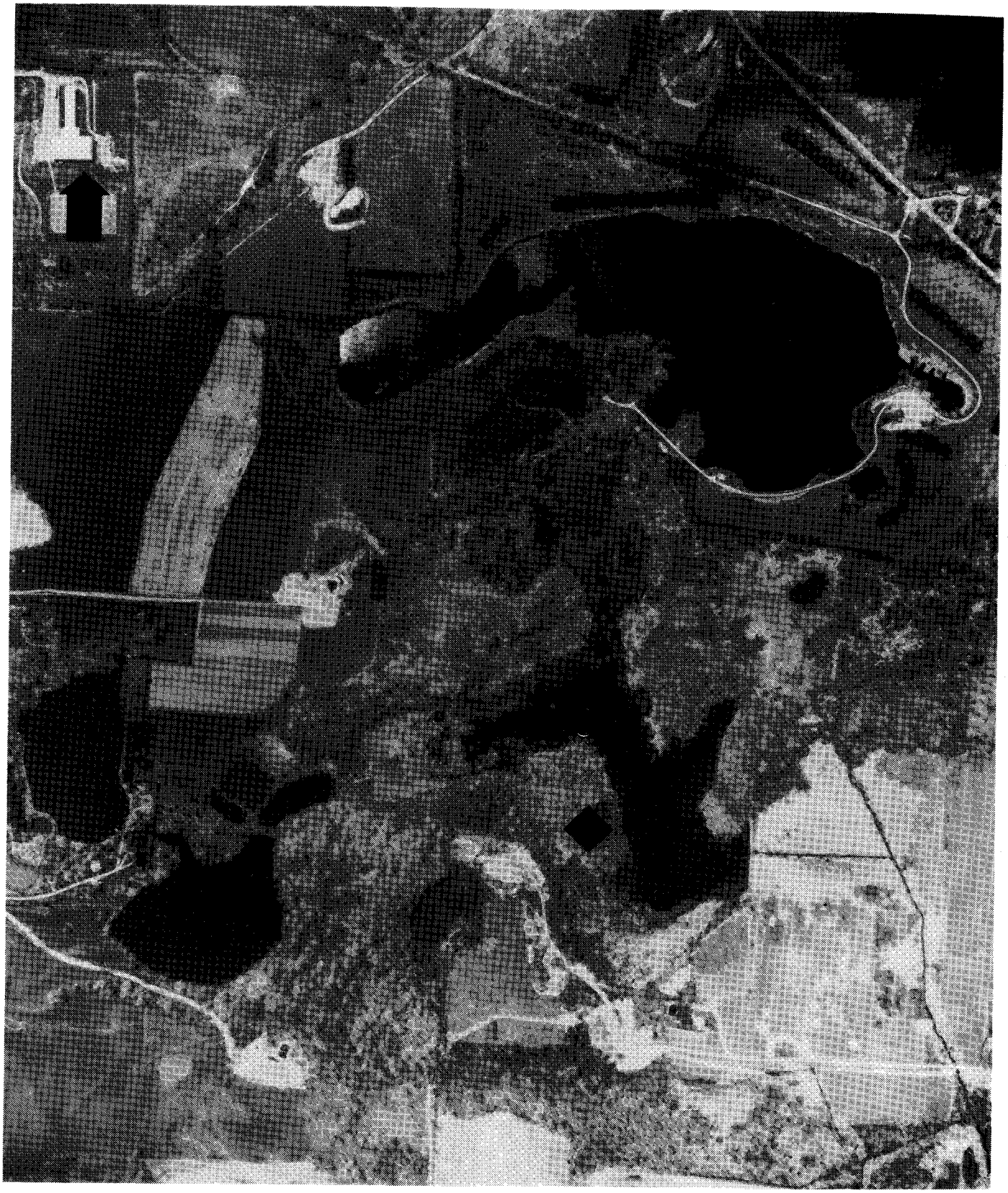
Triaenodes abus Milne. 21-VII-84 (1 male).

Triaenodes marginatus Sibly. 30-VII-84 (1 male), 21-VII-85 (2 females).

Triaenodes tardus Milne. 18-VIII-84 (1 female), 21-VII-85 (6 males, 18 females),30-VIII-85 (7 males,2 females).

Appendix I-E

Aerial photograph of Frame Lake Fen (1979). 1 inch = 600 feet. Black diamond indicates collection site.



Listing of adult Trichoptera from ten light trap collections made at Frame Lake Fen from 1984 and 1985.

Site 5. Frame Lake Fen

Philopotamidae

Chimarra obscura (Walker). 18-VI-84 (4 males, 3 females).

Polycentropodidae

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

Hydropsychidae

Ceratopsyche bronta (Ross). 18-VI-84 (1 male).

Ceratopsyche slossonae (Banks). 22-VII-84 (1 male), 8-IX-84 (1 female).

Cheumatopsyche campyla Ross. 18-VI-84 (5 females), 22-VII-84 (1 female).

Cheumatopsyche oxa Ross. 18-VI-84 (1 male), 25-VIII-84 (1 female).

Cheumatopsyche pettiti (Banks). 18-VI-84 (6 females), 22-VII-84 (4 females), 8-IX-84 (1 female).

Hydropsyche betteni Ross. 18-VI-84 (3 females), 22-VII-84 (1 female).

Potamyia flava (Hagen). 18-VI-84 (1 female).

Hydroptilidae

Agraylea multipunctata Curtis. 22-VII-84 (1 male, 12 females),

3-VIII-84 (1 female).

Hydroptila spatulata Morton. 22-VII-84 (1 female).

Hydroptila virgata Ross. 3-VIII-84 (1 female).

Hydroptila waubesiana Betten. 18-VI-84 (1 female).

Orthotrichia agerfascielle (Chambers). 18-VI-84 (1 female), 22-VII-84 (7 males, 11 females), 3-VIII-84 (1 male, 8 females), 25-VIII-84 (1 male, 3 females).

Oxyethira pallida (Banks). 22-VII-84 (1 male), 4-X-85 (6 females).

Phryganeidae

Agrypnia vestita (Walker). 25-VIII-84 (1 male, 1 female), 8-IX-84 (1 male).

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

Phryganea sayi Milne. 22-VII-84 (1 male).

Ptilostomis postica (Walker). 8-IX-84 (2 males).

Limnephilidae

Anabolia consocius (Walker). 8-IX-84 (1 male).

Pycnopsyche guttifer (Walker). 4-X-85 (6 males).

Pycnopsyche lepida Hagen. 8-IX-84 (2 males, 1 female), 4-X-85 (1 male).

Pycnopsyche scabripennis Rambur. 25-VIII-84 (1 male), 4-X-85 (1 male).

Ironoquoia punctatissima (Walker). 25-VIII-84 (1 male), 8-IX-84 (1 male, 1 female).

Limnephilus moestus Banks. 18-VI-84 (2 male), 6-VII-84 (11 males), 22-VII-84 (10 males, 2 females).

Limnephilus submonilifer Walker. 4-X-85 (3 males, 1 female).

Neophylax concinnus McLachlan. 4-X-85 (1 female).

Molannidae

Molanna blenda Sibley. 22-VII-84 (1 male).

Leptoceridae

Leptocerus americanus (Banks). 18-VI-84 (1 male, 12 females), 22-VII-84 (21 males, 62 females).

Oecetis cinerascens (Hagen). 22-VII-84 (2 males), 8-IX-84 (2 males).

Oecetis immobilis (Hagen). 6-VII-84 (1 female).

Oecetis inconspicua (Walker). 18-VI-84 (1 female), 22-VII-84 (1 male, 1 female).

Oecetis nocturna Ross. 3-VIII-84 (6 females).

*Oecetis ochraceae. 18-VI-84 (1 female).

Oecetis osteni Milne. 18-VI-84 (1 male).

Triaenodes tardus. Milne 22-VII-84 (3 females).

Appendix I-F

Aerial photograph of Gott Fen (1984). 1 inch = 300 feet. Black diamond indicates collection site.

Listing of adult Trichoptera from ten light trap collections made at Gott Fen from 1984 and 1985.

Site 6. Gott Fen

Psychomyidae

Lype diversa (Banks). 9-VII-84 (9 females).

Polycentropodidae

Polycentropus cinereus Hagen. 9-VII-84 (7 females), 8-IX-84 (2 females).

Hydropsychidae

Ceratopsyche bronta (Ross). 9-VII-84 (1 male, 2 females), 22-VII-84 (4 males), 3-VIII-84 (7 females), 8-IX-84 (1 male, 1 female).

Ceratopsyche morosa (Hagen). 27-V-84 (1 female), 9-VII-84 (4 females), 22-VII-84 (5 females), 3-VIII-84 (4 females), 25-VIII-84 (3 females).

Ceratopsyche slossonae (Banks). 9-VII-84 (4 male, 4 females), 3-VIII-84 (7 females), 25-VIII-84 (4 females), 8-IX-84 (5 males, 5 females).

Cheumatopsyche campyla Ross. 22-VII-84 (1 female).

Cheumatopsyche pettiti (Banks). 27-V-84 (3 females), 9-VII-84 (7 females), 22-VII-84 (1 male, 1 female), 8-IX-84 (1 male).

Hydropsyche betteni Ross. 9-VII-84 (1male, 3 females),

3-VIII-84 (24 females), 8-IX-84 (1 female).

Hydropsyche dicantha Ross. 8-IX-84 (1 female).

Hydropsyche simulans Ross. 8-IX-84 (1 male).

Hydropsyche sparna Ross. 22-VII-84 (1 female).

Hydroptilidae

Agraylea multipunctata Curtis. 9-VII-84 (13 females), 22-VII-84 (1 male, 2 females), 3-VIII-84 (1 female).

Hydroptila ajax Ross. 9-VII-84 (1 female).

Hydroptila waubesiana. 3-VIII-84 (1 female), 8-IX-84 (4 females).

Orthotrichia agerfascielle (Chambers). 9-VII-84 (17 females), 3-VIII-84 (2 females), 25-VIII-84 (1 female), 8-IX-84 (1 female).

Orthotrichia cristata Morton. 9-VII-84 (10 males).

Oxyethira pallida (Banks). 9-VII-84 (1 female), 22-VII-84 (1 female), 3-VIII-84 (2 females), 8-IX-84 (1 female).

Phyrganeidae

Agrypnia straminea Hagen. 8-IX-84 (2 females).

Agrypnia vestita (Walker). 25-VIII-84 (1 male), 8-IX-84 (27 males).

Banksiola crotchi Banks. 9-VII-84 (1 male).

Phryganea sayi Milne. 3-VIII-84 (1 male).

Ptilostomis ocellifera (Walker). 15-VI-84 (1 male), 9-VII-84 (1 male, 2 females), 22-VII-84 (1 female).

Limnephilidae

Anabolia consocius (Walker). 8-IX-84 (1 male).

Ironoquoia punctatissima (Walker). 8-IX-84 (1 male).

Limnephilus indivisus Walker. 9-VII-84 (1 male), 22-VII-84 (1 female), 3-VIII-84 (2 males, 1 female), 8-IX-84 (22 males, 6 females).

Limnephilus moestus Banks. 9-VII-84 (5 males, 5 females).

Limnephilus ornatus Banks. 3-VIII-84 (1 female).

Limnephilus submonilifer Walker. 27-V-84 (1 female), 8-IX-84 (1 male, 2 females).

NR Pycnopsyche auggipennis. 1-VI-84 (2 females).

Pycnopsyche lepida Hagen. 8-IX-84 (1 male).

Pycnopsyche scabripennis Rambur. 3-VIII-84 (1 female), 25-VIII-84 (9 males), 8-IX-84 (1 male).

Leptoceridae

Ceraclea tarsipunctata (Vorhies). 9-VII-84 (1 male).

Leptocerus americanus (Banks) 9-VII-84 (3 males, 13 females), 22-VII-84 (1 male), 3-VIII-84 (1 male, 3 females).

Oecetis cinerascens (Hagen). 3-VIII-84 (1 female), 8-IX-84 (2 males).

Oecetis ditissa Ross. 9-VII-84 (1 female).

Oecetis inconspicua (Walker). 9-VII-84 (2 males, 5 females), 22-VII-84 (1 male), 3-VIII-84 (6 females), 8-IX-84 (2 females).

Triaenodes marginatus Sibly. 9-VII-84 (4 females), 22-VII-84 (1 male), 3-VIII-84 (1 female), 8-IX-84 (1 male).

Triaenodes tardus Milne. 3-VIII-84 (5 females), 8-IX-84 (3 females).

Appendix I-G

Aerial photograph of Jackson Fen (1984). 1 inch = 200 feet. Black diamond indicates collection site.

Listing of adult Trichoptera from eleven light trap collections made at Jackson Fen from 1984 and 1985.

Site 7. Jackson Fen

Philopotamidae

Chimarra aterrima (Hagen). 12-V-85 (12 females), 13-VII-85 (1 male).

Chimarra obscura (Walker). 1-VI-85 (1 male), 13-VII-85 (19 males, 62 females), 18-VIII-85 (20 males, 16 females).

Psychomyiidae

Lype diversa (Banks). 12-V-85 (5 males), 13-VII-85 (2 males, 9 females), 18-VIII-85 (33 females).

Polycentropodidae

Neureclipsis crepusclaris (Walker). 24-IX-84 (1 female).

Polycentropus carloinensis Banks. 13-VII-85 (6 males).

Polycentropus cinereus Hagen. 24-IX-84 (1 female).

Polycentropus pentus Ross. 12-V-85 (1 female).

Polycentropus sp. 13-VII-85 (1 female).

Hydropsychidae

Ceratopsyche bronta (Ross). 1-VI-85 (1 female), 13-VII-85 (7 males, 10 females), 18-VIII-85 (1 male, 3 females).

Ceratopsyche cheilonis (Ross). 13-VII-85 (4 males), 18-VIII-85 (22 males, 2 females).

Ceratopsyche morosa (Hagen). 1-VI-85 (2 females).

Ceratopsyche slossonae (Banks). 24-IX-84 (1 male, 1 female), 12-V-85 (1 male, 4 females), 1-VI-85 (3 males, 1 female), 13-VII-85 (1 male), 18-VIII-85 (2 males, 3 females), 1-IX-85 (1 female), 21-IX-85 (1 male, 2 females).

Cheumatopsyche aphanta Ross. 13-VII-85 (7 females), 1-IX-85 (2 females).

Cheumatopsyche campyla Ross. 24-IX-84 (2 females), 12-V-85 (4 females), 13-VII-85 (10 males, 20 females), 18-VIII-85 (6 males, 17 females), 21-IX-85 (1 female).

Cheumatopsyche gracilis (Banks). 12-V-85 (1 female).

Cheumatopsyche oxa Ross. 13-VII-85 (3 males, 7 females), 18-VIII-85 (2 males).

Cheumatopsyche pettiti (Banks). 24-IX-84 (41 males, 43 females), 12-V-85 (203 males, 650 females), 1-VI-85 (129 males, 395 females), 28-VI-85 (1 female), 13-VII-85 (1949 males, 1169 females), 2-VIII-85 (15 males, 14 females), 18-VIII-85 (239 males, 455 females), 1-IX-85 (92 males, 100 females), 21-IX-85 (11 males, 21 females).

Diplectrona modesta. 13-VII-85 (2 males) 24-IX-84 (2 females).

Hydropsyche betteni Ross. 24-IX-84 (1 female), 12-V-85 (4 males, 29 females), 1-VI-85 (22 females), 28-VI-85 (1 female), 13-VII-85 (191 males, 379 females), 18-VIII-85 (28 females), 1-IX-85 (1 female), 21-IX-85 (2 females).

Hydropsyche dicantha Ross. 12-V-85 (1 male), 18-VIII-85 (1 female).

Hydropsyche orris Ross. 24-IX-84 (5 females).

Hydropsyche simulans Ross. 13-VII-85 (1 male, 6 females).

Hydropsyche sparna Ross. 12-V-85 (5 females), 1-VI-85 (1 female), 13-VII-85 (4 males, 10 females), 18-VIII-85 (1 male, 2 females), 21-IX-85 (1 female).

Hydropsyche valanis Ross. 24-IX-84 (3 males, 1 female), 18-VIII-85 (5 females).

Macrostemum zebratum (Hagen). 13-VII-85 (1 male).

Potamyia flava (Hagen). 24-IX-84 (2 females), 13-VII-85 (3 females), 18-VIII-85 (14 females).

Hydroptilidae

Agraylea multipunctata Curtis. 24-IX-84 (2 females), 13-VII-85 (22 females).

Hydroptila ajax Ross. 1-VI-85 (1 female), 13-VII-85 (65 females).

Hydroptila albicornis Hagen. 13-VII-85 (3 females).

Hydroptila amoena Ross. 24-IX-84 (2 males), 12-V-85 (3 males), 1-VI-85 (1 male, 1 female), 13-VII-85 (19 males), 1-IX-85 (1 male).

Hydroptila armata Ross. 13-VII-85 (1 female).

Hydroptila consimilis Morton. 1-VI-85 (6 males, 24 females), 13-VII-85 (21 males, 42 females).

Hydroptila waubesiana Betten. 12-V-85 (2 males, 9 females), 28-VI-85 (1 female), 13-VII-85 (12 males, 11 females), 21-IX-85 (1 male, 1 female).

Orthotrichia agerfascielle (Chambers). 1-VI-85 (1 male,

1 female), 13-VII-85 (1 male, 1 female), 21-IX-85 (1 female).

Orthotrichia cristata Morton. 13-VII-85 (5 males, 5 females)

Oxyethira forcipata Mosley. 21-IX-85 (1 male).

Oxyethira pallida (Banks). 24-IX-84 (1 male, 4 females), 1-VI-85 (3 females), 13-VII-85 (42 males, 132 females).

Phryganeidae

Agrypnia vestita (Walker). 18-VIII-85 (5 males, 1 female), 21-IX-85 (1 male, 1 female).

Banksiola crotchi Banks. 13-VII-85 (21 males, 4 females).

Phryganea sayi Milne. 13-VII-85 (1 male), 18-VIII-85 (2 males).

Ptilostomis ocellifera (Walker). 13-VII-85 (2 females).

Limnephilidae

Anabolia consocius (Walker). 24-IX-84 (1 male), 18-VIII-85 (3 males), 21-IX-85 (1 male).

*Goera calcarata Banks. 12-V-84 (1 male), 13-VII-84 (3 females), 14-VIII-84 (1 male),

Pycnopsyche divergens (Walker). 24-IX-84 (1 male), 2-VIII-85 (1 male), 18-VIII-85 (3 males).

Pycnopsyche guttifer (Walker). 24-IX-84 (1 female), 1-IX-85 (13 males, 1 female), 21-IX-85 (15 males, 1 female).

Pycnopsyche lepida Hagen. 21-IX-85 (1 female).

Pycnopsyche luculenta (Betten). 24-IX-84 (39 males,

6 females), 21-IX-85 (4 males, 1 female).

Pycnopsyche scabripennis Rambur. 7-VII-84 (1 male), 24-IX-84 (1 male), 13-VII-85 (1 male), 18-VIII-85 (3 males, 1 female), 1-IX-85 (2 males), 21-IX-85 (2 males, 1 female).

Ironoquoia punctatissima (Walker). 24-IX-84 (3 males, 1 female).

Limnephilus indivisus Walker. 24-IX-84 (1 male, 1 female), 21-IX-85 (2 males).

Limnephilus ornatus Banks. 12-V-85 (1 male).

Limnephilus submonilifer Walker. 12-V-85 (1 female).

Lepidostomatidae

Lepidostoma griseum (Banks). 24-IX-84 (1 male).

Lepidostoma sp. 14-VIII-84 (2 females), 18-VIII-85 (7 males, 8 females).

Molannidae

Molanna blenda Sibley. 13-VII-85 (3 males).

Leptoceridae

Ceraclea alagma (Ross). 13-VII-85 (1 male).

Ceraclea resurgens (Walker). 1-VI-85 (5 males).

Ceraclea sp. 1-VI-85 (1 female).

Ceraclea tarsipunctata (Vorhies). 13-VII-85 (3 males, 8 females).

Ceraclea transversa (Hagen). 1-VI-85 (13 males, 8 females), 1-VI-85 (13 males, 8 females), 28-VI-85 (2 males), 13-VII-85 (96 males, 94 females), 2-VIII-85 (1 male), 18-VIII-85 (15 males, 50 females), 21-IX-85 (1 male, 1 female).

Leptocerus americanus (Banks). 13-VII-85 (11 males, 35 females).

Nectopsyche albida (Walker). 1-VI-85 (8 females).

Oecetis cinerascens (Hagen). 1-VI-85 (1 male), 13-VII-85 (3 males, 2 females), 18-VIII-85 (2 males, 2 females).

Oecetis ditissa Ross. 21-IX-85 (1 male).

Oecetis inconspicua (Walker). 24-IX-84 (1 male, 2 females), 12-V-85 (5 females), 1-VI-85 (8 males, 1 female), 13-VII-85 (32 males, 52 females), 2-VIII-85 (6 males), 18-VIII-85 (31 males, 28 females), 1-IX-85 (1 female), 21-IX-85 (2 males).

Oecetis nocturna Ross. 13-VII-85 (1 female), 18-VIII-85 (2 males).

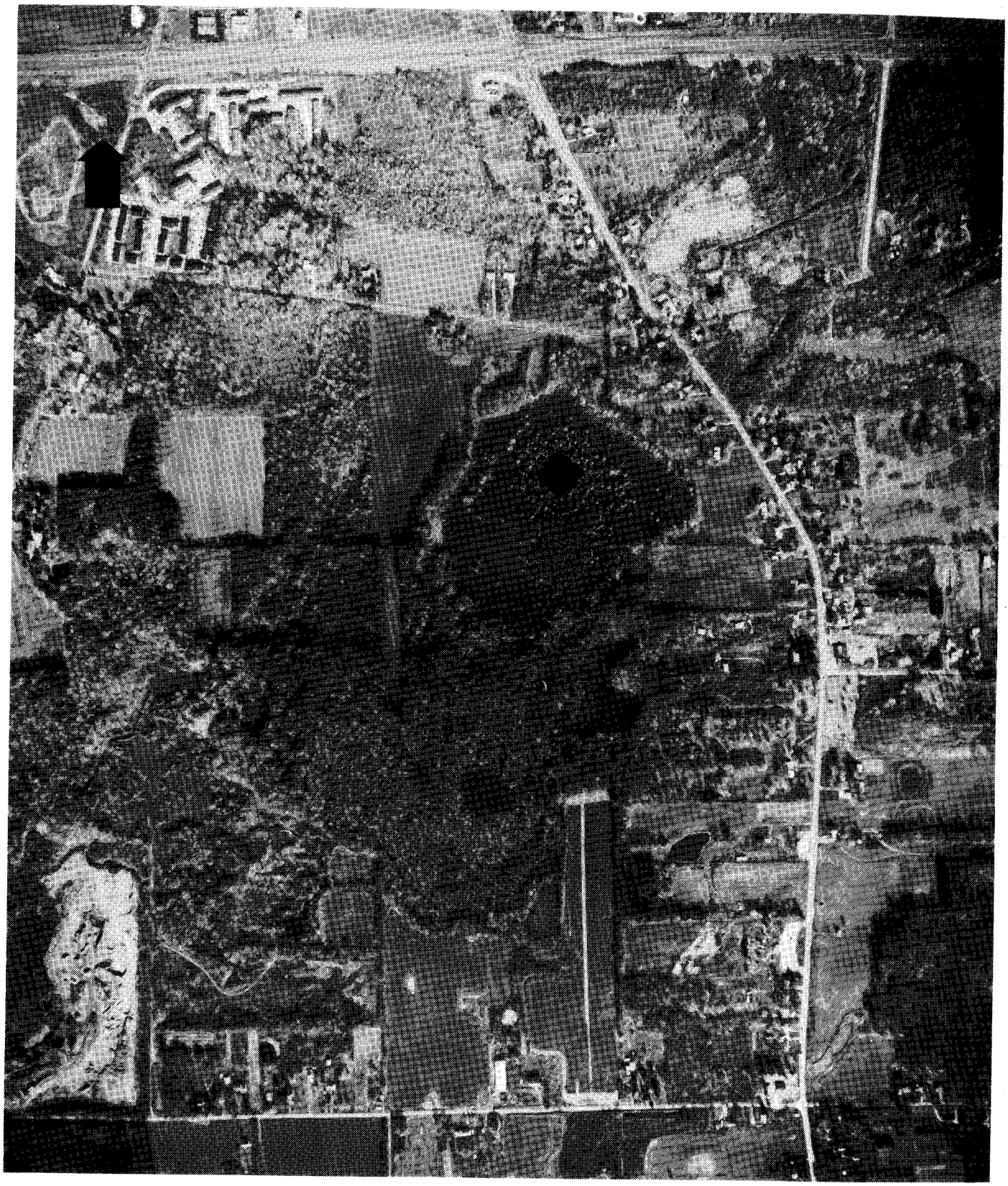
Triaenodes ignita (Walker). 1-VI-85 (3 males, 1 female), 13-VII-85 (2 males, 1 female).

Triaenodes marginatus Sibly. 1-VI-85 (13 females), 28-VI-85 (1 female), 13-VII-85 (11 males, 25 females), 18-VIII-85 (1 male, 10 females), 21-IX-85 (3 females).

Triaenodes tardus Milne. 24-IX-84 (1 male, 1 female), 13-VII-85 (2 females), 18-VIII-85 (1 male, 10 females), 1-IX-85 (1 male), 21-IX-85 (1 male).

Appendix I-H

Aerial photograph of Kent Bog (1984). 1 inch = 800 feet. Black diamond indicates collection site.



Listing of adult Trichoptera from eight light trap collections made at Kent Bog Fen 1985.

Site 8. Kent Bog

Polycentropodidae

Nyctiophylax sp. 25-VII-85 (1 female).

Hydropsychidae

Ceratopsyche bronta (Ross). 25-VII-85 (4 males, 1 female), 13-VIII-85 (1 male).

Ceratopsyche cheilonis (Ross). 25-VII-85 (1 female).

Ceratopsyche slossonae (Banks). 25-VII-85 (3 males, 1 female), 13-VIII-85 (2 females), 30-VIII-85 (1 female).

Cheumatopsyche aphanta Ross. 25-VII-85 (2 males).

Cheumatopsyche campyla Ross. 25-VII-85 (6 males, 11 females), 13-VIII-85 (1 male), 30-VIII-85 (1 female).

Cheumatopsyche oxa Ross. 13-VIII-85 (1 female).

Cheumatopsyche pettiti (Banks). 9-VI-85 (1 male), 25-VII-85 (11 males, 13 females), 13-VIII-85 (12 males, 4 females), 30-VIII-85 (1 female).

Hydropsyche betteni Ross. 25-VII-85 (2 males).

Hydropsyche dicantha Ross. 25-VII-85 (1 male), 13-VIII-85 (1 female).

Hydropsyche sparna Ross. 13-VIII-85 (1 female).

Potamyia flava (Hagen). 25-VII-85 (3 females).

Hydroptilidae

Agraylea multipunctata Curtis. 27-VI-85 (1 female), 25-VII-85 (3 females), 13-VIII-85 (4 females).

Hydroptila ajax Ross. 25-VII-85 (2 females).

Hydroptila amoena Ross. 13-VIII-85 (1 male).

Ochrotrichia tarsalis (Hagen).

Orthotrichia agerfascielle (Chambers). 9-VI-85 (1 female), 25-VII-85 (2 males, 2 females), 13-VIII-85 (6 females), 15-IX-85 (1 female).

Orthotrichia cristata Morton. 13-VIII-85 (1 female).

Oxyethira forcipata Mosley. 25-VII-85 (1 male).

Oxyethira pallida (Banks). 27-VI-85 (1 male, 2 females), 25-VII-85 (1 male, 9 females), 13-VIII-85 (2 males), 23-X-85 (1 female).

Phryganeidae

Banksiola crotchi Banks. 25-VII-85 (1 male).

Banksiola dossuaria (Say). 27-VI-85 (1 female).

Phryganea sayi Milne. 25-VII-85 (1 male), 13-VIII-85 (1 male, 1 female).

Limnephilidae

Anabolia consocius (Walker). 25-VII-85 (1 female).

Limnephilus moestus Banks. 9-VI-85 (1 male), 27-VI-85 (1 male), 25-VII-85 (53 males, 86 females), 13-VIII-85 (9 males, 7 females).

Limnephilus submonilifer Walker. 23-X-85 (1 male).

Leptoceridae

Leptocerus americanus (Banks). 25-VII-85 (7 males, 33 females).

Oecetis cinerascens (Hagen). 25-VII-85 (1 female).

Oecetis inconspicua (Walker). 9-VI-85 (1 male), 25-VII-85 (6 males, 3 females), 13-VIII-85 (10 males, 8 females), 30-VIII-85 (2 males).

Triaenodes tardus Milne. 25-VII-85 (5 males, 8 females), 13-VIII-85 (1 male, 5 females).

Appendix I-I

Aerial photograph of Kiser Lake Fen (1984). 1 inch = 400 feet. Black diamond indicates collection site.

Listing of adult Trichoptera from eight light trap collections made at Kiser Lake Fen in 1984.

Site 9. Kiser Lake Fen

Psychomyiidae

Lype diversa (Banks). 9-VI-84 (1 female), 22-IX-84 (1 female).

Polycentropodidae

*Cyrnellus marginalis. 30-VI-84 (6 males, 5 females), 14-VII-84 (11 males), 28-VII-84 (6 males), 16-VIII-84 (12 males, 4 females), 1-IX-84 (15 males, 6 females), 22-IX-84 (2 females).

Nyctiophylax affinis (Banks). 16-VIII-84 (7 males), 1-IX-84 (4 males), 22-IX-84 (1 male).

Nyctiophylax moestus Banks. 22-IX-84 (3 males).

Nyctiophylax sp. 30-VI-84 (8 females), 14-VII-84 (7 females), 28-VII-84 (4 females), 16-VIII-84 (3 females), 1-IX-84 (7 females), 22-IX-84 (1 female).

Polycentropus cinereus Hagen. 30-VI-84 (1 female).

Polycentropus pentus Ross. 30-VI-84 (1 male).

Hydropsychidae

Ceratopsyche bifida (Banks). 16-VIII-84 (1 female).

Ceratopsyche bronta (Ross). 14-VII-84 (1 male), 16-VIII-84 (1 female), 1-IX-84 (1 female), 22-IX-84 (1 female).

Ceratopsyche cheilonis (Ross). 1-IX-84 (2 females).

Ceratopsyche slossonae (Banks). 9-VI-84 (2 females), 30-VI-84 (1 female).

Cheumatopsyche campyla Ross. 9-VI-84 (1 female), 14-VIII-84 (1 male, 5 females), 16-VIII-84 (2 males, 1 female), 1-IX-84 (1 female).

Cheumatopsyche oxa Ross. 9-VI-84 (1 male, 2 females), 1-IX-84 (1 male).

Cheumatopsyche pettiti (Banks). 9-VI-84 (3 males), 30-VI-84 (1 male), 16-VIII-84 (1 male, 1 female).

Hydropsyche betteni Ross. 9-VI-84 (1 female), 22-IX-84 (1 male).

Hydropsyche bidens Ross. 30-VI-84 (2 females), 16-VIII-84 (2 males, 1 female).

Hydropsyche incommoda . 9-VI-84 (1 female), 14-VII-84 (2 females), 22-IX-84 (1 female).

Hydropsyche orris Ross. 14-VII-84 (2 females), 22-IX-84 (2 females).

Hydropsyche scalanis . 1-IX-84 (1 male).

Hydropsyche simulans Ross. 14-VII-84 (2 females), 1-IX-84 (1 male, 2 females).

Hydropsyche valanis Ross. 14-VII-84 (56 females), 1-IX-84 (5 females).

Potamyia flava (Hagen). 9-VI-84 (1 male, 3 females), 14-VII-84 (13 males, 45 females), 16-VIII-84 (2 males, 5 females), 1-IX-84 (89 males, 822 females), 22-IX-84 (23 males, 27 females).

Rhyacophilidae

Rhyacophila fenestra . 30-VI-84 (2 males).

Hydroptilidae

Hydroptila ajax Ross. 9-VI-84 (3 males, 2 females), 14-VII-84 (1 female).

Hydroptila albicornis Hagen. 9-VI-84 (1 male).

Hydroptila amoena Ross. 14-VII-84 (1 male), 16-VIII-84 (1 male).

Hydroptila angusta Ross. 14-VII-84 (1 male).

Hydroptila armata Ross. 9-VI-84 (1 female), 14-VII-84 (2 males, 8 females), 1-IX-84 (1 female), 22-IX-84 (2 males, 10 females).

Hydroptila consimilis Morton. 9-VI-84 (1 male), 14-VII-84 (2 females), 28-VII-84 (1 male, 1 female), 1-IX-84 (2 males, 1 female), 22-IX-84 (2 females).

Hydroptila hamata Morton. 14-VII-84 (1 female).

Hydroptila perdita Morton. 9-VI-84 (1 male), 14-VII-84 (1 male, 1 female), 16-VIII-84 (1 male), 1-IX-84 (1 female), 22-IX-84 (1 female).

Orthotrichia agerfascielle (Chambers). 14-VII-84 (2 males, 1 female), 28-VII-84 (2 males, 11 females), 16-VIII-84 (9 males, 16 females), 1-IX-84 (7 males, 10 females), 22-IX-84 (5 males, 17 females).

Orthotrichia cristata Morton. 14-VII-84 (1 female), 16-VIII-84 (1 male, 1 female).

Oxyethira pallida (Banks). 14-VII-84 (2 males, 6 females), 28-VII-84 (8 females), 16-VIII-84 (2 males, 14 females), 1-IX-84 (3 females), 22-IX-84 (3 males, 57 females).

Phryganeidae

Agrypnia straminea Hagen. 1-IX-84 (1 female).

Agrypnia vestita (Walker). 1-IX-84 (2 females), 22-IX-84 (2 females).

Phryganea sayi Milne. 16-VIII-84 (3 males), 1-IX-84 (1 male, 2 females), 22-IX-84 (1 male).

Ptilostomis ocellifera (Walker). 28-VII-84 (1 female).

Ptilostomis postica (Walker). 16-VIII-84 (1 female).

Ptilostomis semifasciata . 28-VII-84 (1 male).

Limnephilidae

Neophylax sp. 14-X-84 (2 females).

Pycnopsyche scabripennis Rambur. 16-VIII-84 (1 male), 1-IX-84 (3 males).

Ironoquoia punctatissima (Walker). 22-IX-84 (1 male).

Leptoceridae

Ceraclea cancellata (Betten). 14-VII-84 (1 female).

Leptocerus americanus (Banks). 30-VI-84 (1 female).

Nectopsyche albida (Walker). 30-VI-84 (6 females).

Oecetis cinerascens (Hagen). 30-VI-84 (6 males), 14-VII-84 (14 males, 2 females), 28-VII-84 (22 males, 1 female), 16-VIII-84 (38 males, 1 female), 1-IX-84 (86 males, 5 females), 22-IX-84 (47 males, 10 females).

Oecetis ditissa Ross. 30-VI-84 (1 male), 14-VII-84 (1 male, 2 females), 16-VIII-84 (9 males, 1 female), 22-IX-84 (2 males, 1 female).

Oecetis inconspicua (Walker). 9-VI-84 (1 male), 30-VI-84

(2 males, 3 females), 14-VII-84 (6 males, 4 females), 28-VII-84 (1 male), 16-VIII-84 (10 males, 5 females), 1-IX-84 (10 males, 3 females), 22-IX-84 (20 males, 12 females).

Oecetis nocturna Ross. 30-VI-84 (2 females), 14-VII-84 (1 male), 1-IX-84 (3 males).

Triaenodes flavescens Banks. 22-IX-84 (3 females).

Triaenodes tardus Milne. 28-VII-84 (2 females), 1-IX-84 (1 female), 22-IX-84 (3 females).

Appendix I-J

Aerial photograph of Lake Kelso Bog (1984). 1 inch = 400 feet. Black diamond indicates collection site.

Listing of adult Trichoptera from six light trap collections made at Lake Kelso Bog in 1985.

Site 10. Lake Kelso Bog

Psychomyiidae

Lype diversa (Banks). 19-VII-85 (1 female).

Polycentropodidae

*Cyrnellus marginalis. 19-VII-85 (1 female).

Polycentropus cinereus Hagen. 27-V-85 (1 male, 6 females).

Polycentropus crassicornis Walker. 27-V-85 (1 male).

Polycentropus interruptus (Banks). 27-V-85 (5 males, 53 females).

NR Polycentropus maculata. 27-V-85 (1 male).

Polycentropus remotus Banks. 27-V-85 (14 males, 22 females), 30-VI-85 (1 female), 19-VII-85 (1 male, 1 female), 17-VIII-85 (2 females).

Polycentropus sp. 30-VI-85 (1 female).

Phylocentropus lucidus (Hagen). 19-VII-85 (2 males).

Hydropsychidae

Ceratopsyche bronta (Ross). 19-VII-85 (1 male).

Ceratopsyche morosa (Hagen). 19-VII-85 (1 female).

Ceratopsyche slossonae (Banks). 27-V-85 (1 female), 19-VII-85 (1 female).

Cheumatopsyche aphanta Ross. 19-VII-85 (1 male).

Cheumatopsyche campyla Ross. 27-V-85 (2 females), 19-VII-85 (1 female).

Cheumatopsyche gracilis (Banks). 27-V-85 (2 females).

Cheumatopsyche pettiti (Banks). 27-V-85 (8 males, 18 females), 19-VII-85 (2 males, 1 female).

Hydropsyche betteni Ross. 27-V-85 (15 females), 30-VI-85 (1 female), 19-VII-85 (1 female).

Hydropsyche sparna Ross. 27-V-85 (3 females).

Potamyia flava (Hagen). 17-VIII-85 (1 female).

Hydroptilidae

Agraylea multipunctata Curtis. 27-V-85 (1 male, 20 females), 30-VI-85 (10 males, 35 females), 19-VII-85 (20 males, 161 females), 17-VIII-85 (1 female).

Hydroptila ajax Ross. 19-VII-85 (1 male, 5 females).

Hydroptila amoena Ross. 27-V-85 (2 males, 22 females), 30-VI-85 (1 male, 4 females), 19-VII-85 (4 males, 3 females).

Hydroptila angusta Ross. 19-VII-85 (2 females).

Hydroptila consimilis Morton. 19-VII-85 (1 male, 5 females).

Hydroptila hamata Morton. 19-VII-85 (9 females).

Hydroptila perdita Morton. 19-VII-85 (1 male, 3 females).

Hydroptila spatulata Morton. 30-VI-85 (1 female).

Hydroptila waubesiana Betten. 27-V-85 (5 females), 30-VI-85 (1 male, 7 females), 19-VII-85 (2 males, 25 females), 31-VIII-85 (1 female).

Orthotrichia agerfascielle (Chambers). 27-V-85 (15 males, 146 females), 30-VI-85 (8 males, 12 females), 19-VII-85

(10 males, 12 females), 17-VIII-85 (4 females), 31-VIII-85 (2 females), 17-IX-85 (1 female).

Orthotrichia cristata Morton. 27-V-85 (3 females), 19-VII-85 (7 females).

NR Oxyethira dualis Morton. 19-VII-85 (1 male).

Oxyethira forcipata Mosley. 27-V-85 (1 male), 30-VI-85 (48 males),19-VII-85 (8 males), 31-VIII-85 (5 males).

Oxyethira pallida (Banks). 30-VI-85 (1 male), 19-VII-85 (2 males, 21 females), 17-VIII-85 (1 male, 2 females).

Phryganeidae

Agrypnia vestita (Walker). 17-VIII-85 (2 males).

Banksiola crotchi Banks. 30-VI-85 (2 males, 1 female), 19-VII-85 (23 males, 1 female).

Banksiola dossuaria (Say). 19-VII-85 (1 male).

Phryganea sayi Milne. 17-VIII-85 (12 males, 3 females).

Ptilostomis ocellifera (Walker). 30-VI-85 (1 female).

Limnephilidae

Limnephilus moestus Banks. 27-V-85 (1 male), 19-VII-85 (1 male).

Platycentropus radiatus (Say). 30-VI-85 (4 females), 19-VII-85 (4 females).

Leptoceridae

Ceraclea alagma (Ross). 30-VI-85 (28 males).

Ceraclea cancellata (Betten). 30-VI-85 (5 males), 19-VII-85 (1 male, 2 females), 17-VIII-85 (4 males, 3 females).

Ceraclea tarsipunctata (Vorhies). 27-V-85 (5 males, 2 females), 30-VI-85 (8 males, 4 females), 19-VII-85 (1 female).

Leptocerus americanus (Banks). 27-V-85 (68 males, 16 females), 30-VI-85 (310 males, 396 females), 19-VII-85 (70 males, 263 females).

Nectopsyche albida (Walker). 27-V-85 (3 females), 19-VII-85 (1 female).

Oecetis cinerascens (Hagen). 27-V-85 (8 males, 3 females), 30-VI-85 (5 males, 1 female), 19-VII-85 (48 males, 2 females), 17-VIII-85 (14 males, 1 female).

Oecetis ditissa Ross. 19-VII-85 (2 females).

Oecetis inconspicua (Walker). 27-V-85 (2 males, 11 females), 30-VI-85 (21 males, 5 females), 19-VII-85 (86 males, 33 females), 17-VIII-85 (8 males, 3 females).

Oecetis nocturna Ross. 30-VI-85 (4 males), 19-VII-85 (12 males).

Triaenodes abus Milne. 30-VI-85 (21 females), 19-VII-85 (8 females).

Triaenodes flavescens Banks. 27-V-85 (1 female).

Triaenodes ignita (Walker). 27-V-85 (1 male).

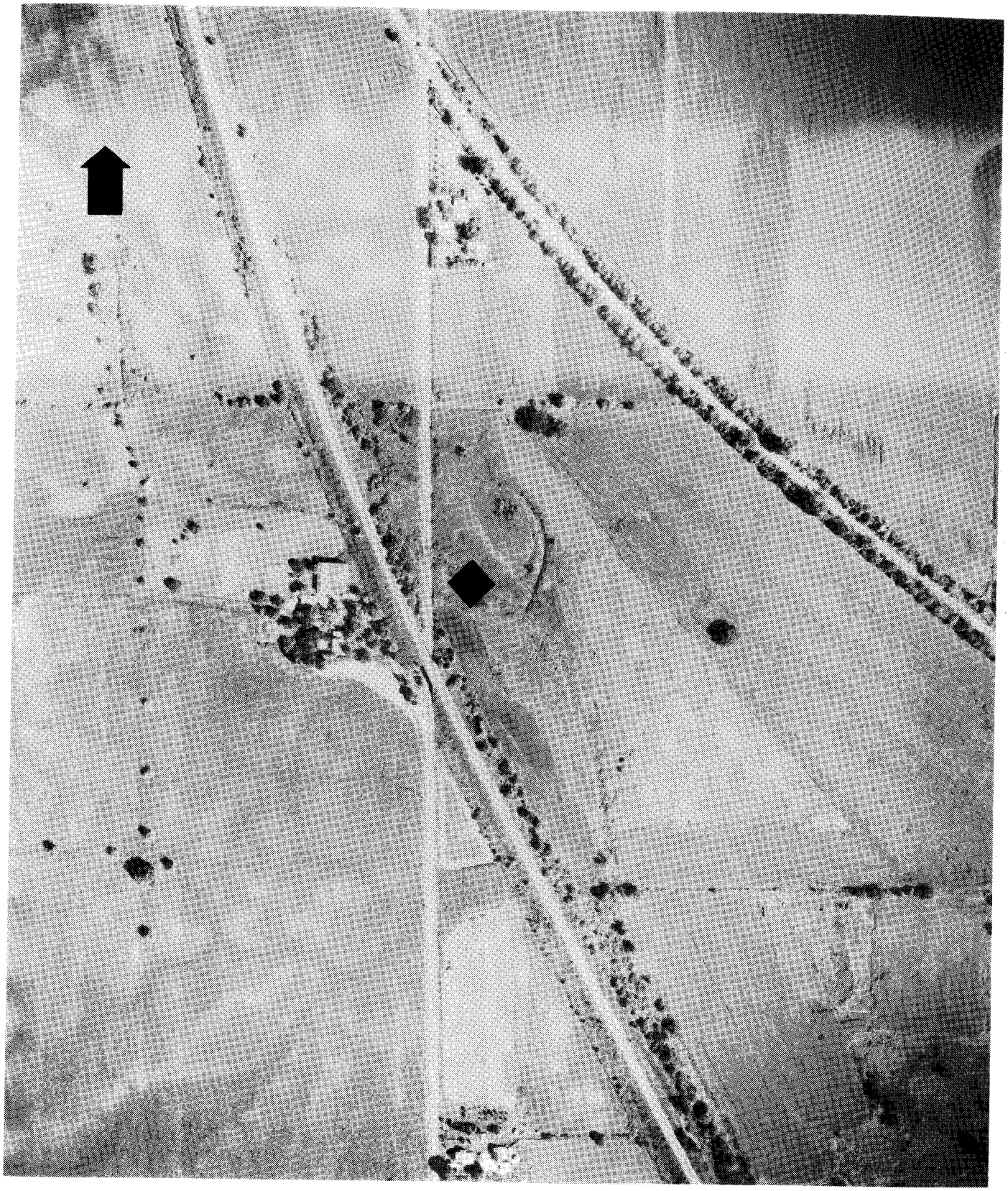
Triaenodes injustus (Hagen). 27-V-85 (1 female), 19-VII-85 (1 male, 1 female).

Triaenodes marginatus Sibly. 27-V-85 (5 females), 19-VII-85 (3 females), 17-VIII-85 (1 female).

Triaenodes tardus Milne. 27-V-85 (10 males, 7 females), 30-VI-85 (1 male, 22 females), 19-VII-85 (41 males, 55 females), 17-VIII-85 (1 male, 12 females).

Appendix I-K

Aerial photograph of Liberty Fen (1984). 1 inch = 400 feet. Black diamond indicates collection site.



Listing of adult Trichoptera from eleven light trap collections made at Liberty Fen from 1984 and 1985.

Site 11. Liberty Fen

Philopotamidae

Chimarra aterrima (Hagen). 16-VIII-84 (1 female), 22-IX-84 (3 females).

Chimarra obscura (Walker). 22-IX-84 (1 male, 1 female).

Psychomyiidae

Psychomyia flavida Hagen. 16-VI-84 (3 females), 22-IX-84 (1 male, 1 female).

Polycentropodidae

*Cyrnellus marginalis. 22-IX-84 (4 males, 4 females).

Nyctiophylax affinis. (Banks) 30-VI-84 (1 male).

Nyctiophylax sp. 16-VIII-84 (2 females).

Polycentropus cinereus Hagen. 9-VI-84 (1 female), 16-VI-84 (1 male, 3 females), 16-VIII-84 (1 female), 1-IX-84 (1 female).

Polycentropus confusus Hagen. 16-VI-84 (1 female).

Polycentropus interruptus (Banks). 16-VI-84 (1 male, 4 females).

Polycentropus remotus Banks. 9-VI-84 (1 female), 16-VI-84 (1 female).

Polycentropus sp. 1-IX-84 (1 female).

Phylocentropus placidus (Banks). 16-VIII-84 (1 female).

Hydropsychidae

Ceratopsyche bifida (Banks). 9-VI-84 (2 females), 16-VI-84 (9 females).

Ceratopsyche bronta (Ross). 9-VI-84 (49 males, 123 females), 16-VI-84 (27 males, 281 females), 30-VI-84 (30 males, 73 females), 28-VII-84 (1 female), 16-VIII-84 (5 males, 8 females), 1-IX-84 (1 male, 15 females), 22-IX-84 (158 males, 68 females), 25-V-85 (19 females).

Ceratopsyche cheilonis (Ross). 9-VI-84 (3 females), 16-VI-84 (9 females), 16-VIII-84 (1 female), 1-IX-84 (4 females), 22-IX-84 (2 males, 1 female).

Ceratopsyche morosa (Hagen). 9-VI-84 (11 females), 16-VI-84 (55 females), 16-VIII-84 (1 female), 1-IX-84 (7 females), 22-IX-84 (7 females), 25-V-85 (6 females).

Ceratopsyche slossonae (Banks). 9-VI-84 (30 males, 73 females), 16-VI-84 (47 males, 354 females), 30-VI-84 (19 males, 56 females), 28-VII-84 (3 females), 16-VIII-84 (4 males, 3 females), 1-IX-84 (4 females), 22-IX-84 (50 males, 36 females), 25-V-85 (2 males, 5 females).

Ceratopsyche walkeri (Betten). 16-VI-84 (1 female).

Cheumatopsyche aphanta Ross. 9-VI-84 (8 males), 16-VI-84 (1 male), 30-VI-84 (1 male), 16-VIII-84 (1 female), 22-IX-84 (1 male).

Cheumatopsyche campyla Ross. 9-VI-84 (30 males, 74 females), 16-VI-84 (1 male), 16-VIII-84 (4 female), 22-IX-84 (2 females).

Cheumatopsyche gracilis (Banks). 16-VI-84 (1 male).

Cheumatopsyche oxa Ross. 9-VI-84 (1 male, 6 females), 16-VI-84 (3 males, 41 females), 30-VI-84 (1 male, 18 females), 16-VIII-84 (1 female), 1-IX-84 (1 male), 22-IX-84 (2 females).

Cheumatopsyche pascella . 9-VI-84 (1 male).

Cheumatopsyche pettiti (Banks). 9-VI-84 (15 males, 8 females), 16-VI-84 (2 males, 16 females), 30-VI-84 (8 males, 6 females), 16-VIII-84 (3 female).

Hydropsyche betteni Ross. 9-VI-84 (1 male, 8 females), 16-VI-84 (3 males, 9 females), 30-VI-84 (1 male, 2 females), 16-VIII-84 (1 female), 22-IX-84 (1 female).

Hydropsyche bidens Ross. 9-VI-84 (6 females), 14-VII-84 (2 females).

NR Hydropsyche cuanis. 16-VI-84 (1 female).

Hydropsyche depravata Hagen. 16-VI-84 (1 male).

Hydropsyche dicantha Ross. 9-VI-84 (1 male, 3 females), 16-VIII-84 (1 female).

Hydropsyche incommoda . 9-VI-84 (1 male), 16-VI-84 (1 female).

Hydropsyche orris Ross. 9-VI-84 (1 female).

NR Hydropsyche placoda. 9-VI-84 (1 female).

Hydropsyche scalaris Hagen. 9-VI-84 (2 males).

Hydropsyche sparna Ross. 9-VI-84 (17 males, 37 females), 16-VI-84 (4 males, 92 females), 30-VI-84 (4 males, 5 females), 28-VII-84 (1 female), 16-VIII-84 (4 females), 1-IX-84 (1 male, 6 females), 22-IX-84 (80 males,

70 females), 25-V-85 (4 females).

Hydropsyche valanis Ross 9-VI-84 (3 females), 16-VI-84 (1 female).

Potamyia flava (Hagen). 9-VI-84 (2 males, 7 females), 16-VI-84 (6 females), 14-VII-84 (3 males, 33 females), 16-VIII-84 (1 male, 4 females), 1-IX-84 (7 males, 72 females), 22-IX-84 (9 males, 24 females), 25-V-85 (1 female).

Glossosomatidae

Glossosoma sp. 9-VI-84 (8 males, 39 females), 16-VI-84 (3 males, 13 females), 30-VI-84 (3 females), 16-VIII-84 (1 female), 22-IX-84 (1 male, 1 female).

Glossosoma nigor. 9-VI-84 (1 male, 3 females), 30-VI-84 (1 male).

*Glossosoma intermedium Banks. 9-VI-84 (1 female).

Hydroptilidae

Agraylea multipunctata Curtis. 30-VI-84 (2 females), 16-VIII-84 (1 female).

Hydroptila ajax Ross. 9-VI-84 (2 females), 30-VI-84 (1 male, 3 females).

Hydroptila albicornis Hagen. 16-VI-84 (54 females), 30-VI-84 (15 females), 28-VII-84 (1 female).

Hydroptila amoena Ross. 1-IX-84 (1 male), 22-IX-84 (1 female).

Hydroptila angusta Ross. 16-VI-84 (1 male, 2 females), 30-VI-84 (1 male).

Hydroptila armata Ross. 9-VI-84 (1 female), 30-VI-84 (4 females), 22-IX-84 (3 females), 25-V-85 (2 females).

Hydroptila consimilis Morton. 16-VI-84 (9 males, 4 females), 30-VI-84 (2 males, 4 females), 16-VIII-84 (2 males, 7 females), 1-IX-84 (1 female), 22-IX-84 (1 female), 25-V-85 (1 male).

Hydroptila hamata Morton. 30-VI-84 (1 female), 25-V-85 (1 male).

Hydroptila jackmanii Blickle. 16-VI-84 (17 males), 30-VI-84 (8 males).

Hydroptila perdita Morton. 16-VI-84 (2 males), 30-VI-84 (1 male, 7 females), 16-VIII-84 (2 females), 22-IX-84 (1 female).

Hydroptila virgata Ross. 16-VIII-84 (2 males, 3 females).

Hydroptila waubesiana Betten. 16-VI-84 (1 female).

Orthotrichia agerfascielle (Chambers). 16-VI-84 (3 males), 30-VI-84 (2 females), 16-VIII-84 (6 females).

Orthotrichia cristata Morton. 16-VI-84 (1 female), 30-VI-84 (2 females), 16-VIII-84 (3 males, 4 females), 22-IX-84 (1 female).

Orthotrichia sp. 16-VI-84 (5 females).

Oxyethira pallida (Banks). 16-VI-84 (1 female), 30-VI-84 (1 female), 16-VIII-84 (3 females), 22-IX-84 (1 male, 8 females), 25-V-85 (3 males, 3 females).

Phryganeidae

Agrypnia straminea Hagen. 22-IX-84 (1 female).

Agrypnia vestita (Walker). 9-VI-84 (2 males, 1 female), 1-IX-84 (1 male, 1 female), 22-IX-84 (3 males).

Phryganea sayi Milne. 9-VI-84 (1 male), 16-VIII-84 (8 males, 43 females).

Ptilostomis ocellifera (Walker). 30-VI-84 (2 females), 1-IX-84 (1 female).

Ptilostomis semifasciata (Say). 9-VI-84 (2 males).

Limnephilidae

Anabolia consocius (Walker). 22-IX-84 (10 males).

Neophylax fuscus Banks. 14-X-84 (1 female).

Pycnopsyche guttifer (Walker). 22-IX-84 (1 male).

Pycnopsyche lepida Hagen. 16-VIII-84 (1 female), 22-IX-84 (2 males).

Pycnopsyche scabripennis Rambur. 16-VIII-84 (9 males, 2 females), 1-IX-84 (1 male), 22-IX-84 (3 males).

Ironoquoia punctatissima (Walker). 22-IX-84 (4 males).

Limnephilus indivisus Walker. 30-VI-84 (1 male), 22-IX-84 (3 males).

Limnephilus ornatus Banks. 30-VI-84 (1 female).

Limnephilus submonilifer Walker. 22-IX-84 (6 males, 1 female).

Lepidostomatidae

Lepidostoma sp. 30-VI-84 (3 females), 28-VII-84 (4 females).

Molannidae

Molanna blenda Sibley. 16-VI-84 (2 males), 30-VI-84 (2 females).

Helipsychidae

Helicopsyche sp. 16-VI-84 (1 female), 30-VI-84 (1 female).

Leptoceridae

Ceraclea resurgens (Walker). 16-VI-84 (17 males), 30-VI-84 (1 male).

Leptocerus americanus (Banks). 16-VI-84 (1 male, 5 females), 30-VI-84 (3 males, 29 females).

Nectopsyche albida (Walker). 9-VI-84 (1 female), 16-VI-84 (12 females), 30-VI-84 (13 females), 16-VIII-84 (1 female).

Oecetis cinerascens (Hagen). 9-VI-84 (1 male), 14-VII-84 (2 males, 1 female), 28-VII-84 (1 male), 16-VIII-84 (1 male, 4 females), 22-IX-84 (1 male, 1 female).

Oecetis ditissa Ross. 14-VII-84 (1 male), 16-VIII-84 (1 female), 22-IX-84 (3 males, 3 females).

Oecetis inconspicua (Walker). 9-VI-84 (1 male, 8 females), 16-VI-84 (2 males, 22 females), 30-VI-84 (8 males, 20 females), 14-VII-84 (1 male), 28-VII-84 (3 males), 16-VIII-84 (9 males, 23 females), 1-IX-84 (1 male, 1 female), 22-IX-84 (11 males, 16 females), 25-V-85 (2 males, 1 female).

*Oecetis ochraceae. 16-VIII-84 (1 female).

Triaenodes flavescens Banks. 30-VI-84 (1 female).

Triaenodes injustus (Hagen). 16-VIII-84 (1 male).

Triaenodes marginatus Sibly. 9-VI-84 (3 females), 16-VI-84 (1 male, 1 female), 30-VI-84 (9 females), 16-VIII-84 (2 females), 1-IX-84 (3 males, 6 females), 22-IX-84 (5 males, 26 females).

Triaenodes tardus Milne. 9-VI-84 (2 males, 7 females), 16-VI-84 (1 male, 2 females), 30-VI-84 (62 males, 182

females), 28-VII-84 (9 males, 1 female), 16-VIII-84 (5 males, 30 females), 1-IX-84 (4 females), 22-IX-84 (12 males, 19 females), 25-V-85 (1 male).

Appendix I-L

Aerial photograph of Lone Larch Bog (1984). 1 inch = 400 feet. Black diamond indicates collection site.

Listing of adult Trichoptera from eight light trap collecitons made at Lone Larch Bog from 1985.

Site 12. Lone Larch Bog

Polycentropodidae

Cernotina ohio Ross. 1-VI-85 (2 males).

Polycentropus cinereus Hagen. 2-IX-85 (1 female).

Polycentropus sp. 13-VIII-85 (1 female).

Hydropsychidae

Ceratopsyche bronta (Ross). 13-VII-85 (1 female), 29-VII-85 (1 male), 2-IX-85 (1 female).

Ceratopsyche cheilonis (Ross). 13-VII-85 (1 male), 13-VIII-85 (3 males), 2-IX-85 (2 males).

Ceratopsyche morosa (Hagen). 1-VI-85 (1 female), 13-VII-85 (1 female).

Ceratopsyche slossonae (Banks). 1-VI-85 (2 females), 13-VIII-85 (1 male), 2-IX-85 (1 male).

Cheumatopsyche campyla Ross. 13-VII-85 (1 male).

Cheumatopsyche pettiti (Banks). 13-VII-85 (1 male, 3 females), 29-VII-85 (1 female), 13-VIII-85 (2 males, 5 females), 2-IX-85 (1 female).

Hydropsyche betteni Ross. 13-VII-85 (1 male), 13-VIII-85 (3 females), 2-IX-85 (1 female).

Hydropsyche sparna Ross. 1-VI-85 (1 female), 13-VIII-85

(1 female).

Potamyia flava (Hagen). 13-VIII-85 (6 males, 3 females), 2-IX-85 (2 females).

Hydroptilidae

Agraylea multipunctata Curtis. 13-VII-85 (2 males, 43 females), 13-VIII-85 (1 female), 2-IX-85 (3 females).

Hydroptila ajax Ross 13-VII-85 (22 females), 13-VIII-85 (2 females).

Hydroptila amoena Ross. 13-VII-85 (1 female).

Hydroptila consimilis Morton. 13-VII-85 (4 females), 2-IX-85 (1 female).

Hydroptila hamata Morton. 13-VII-85 (1 female), 13-VIII-85 (1 female).

Hydroptila perdita Morton. 2-IX-85 (3 females).

Hydroptila vala Ross. 13-VII-85 (2 females).

Hydroptila waubesiana Betten. 13-VII-85 (4 females), 2-IX-85 (5 females).

Orthotrichia agerfascielle (Chambers). 1-VI-85 (3 females), 13-VII-85 (2 females), 29-VII-85 (1 male), 13-VIII-85 (5 males, 17 females), 2-IX-85 (1 male, 9 females).

NR Oxyethira novasota. 2-IX-85 (1 female).

Oxyethira pallida (Banks). 1-VI-85 (1 female), 13-VII-85 (2 males, 8 females), 2-IX-85 (6 males, 43 females).

Phryganeidae

Agrypnia vestita (Walker). 13-VIII-85 (1 female), 2-IX-85 (1 female).

Banksiola crotchi Banks. 13-VII-85 (1 male).

Ptilostomis ocellifera (Walker). 13-VII-85 (2 males, 2 females), 29-VII-85 (1 male, 2 females), 13-VIII-85 (1 female).

Limnephilidae

Ironoquoia punctatissima (Walker). 2-IX-85 (2 males).

Limnephilus indivisus Walker. 1-VI-85 (1 male), 13-VII-85 (1 male), 2-IX-85 (1 female).

Platycentropus radiatus (Say). 13-VII-85 (2 females), 29-VII-85 (2 females).

Leptoceridae

Ceraclea sp. 13-VII-85 (1 female).

Leptocerus americanus (Banks). 13-VII-85 (4 males, 11 females), 29-VII-85 (1 female), 13-VIII-85 (1 female).

Nectopsyche candida (Hagen). 13-VIII-85 (1 male).

Oecetis cinerascens (Hagen). 29-VII-85 (1 male), 2-IX-85 (1 male, 3 females).

Oecetis ditissa Ross. 13-VIII-85 (1 female), 2-IX-85 (4 males, 1 female).

Oecetis inconspicua (Walker). 1-VI-85 (2 males), 13-VII-85 (3 males, 13 females), 29-VII-85 (1 male, 1 female), 13-VIII-85 (4 males, 7 females), 2-IX-85 (12 males, 22 females).

*Oecetis ochraceae. 13-VIII-85 (1 female).

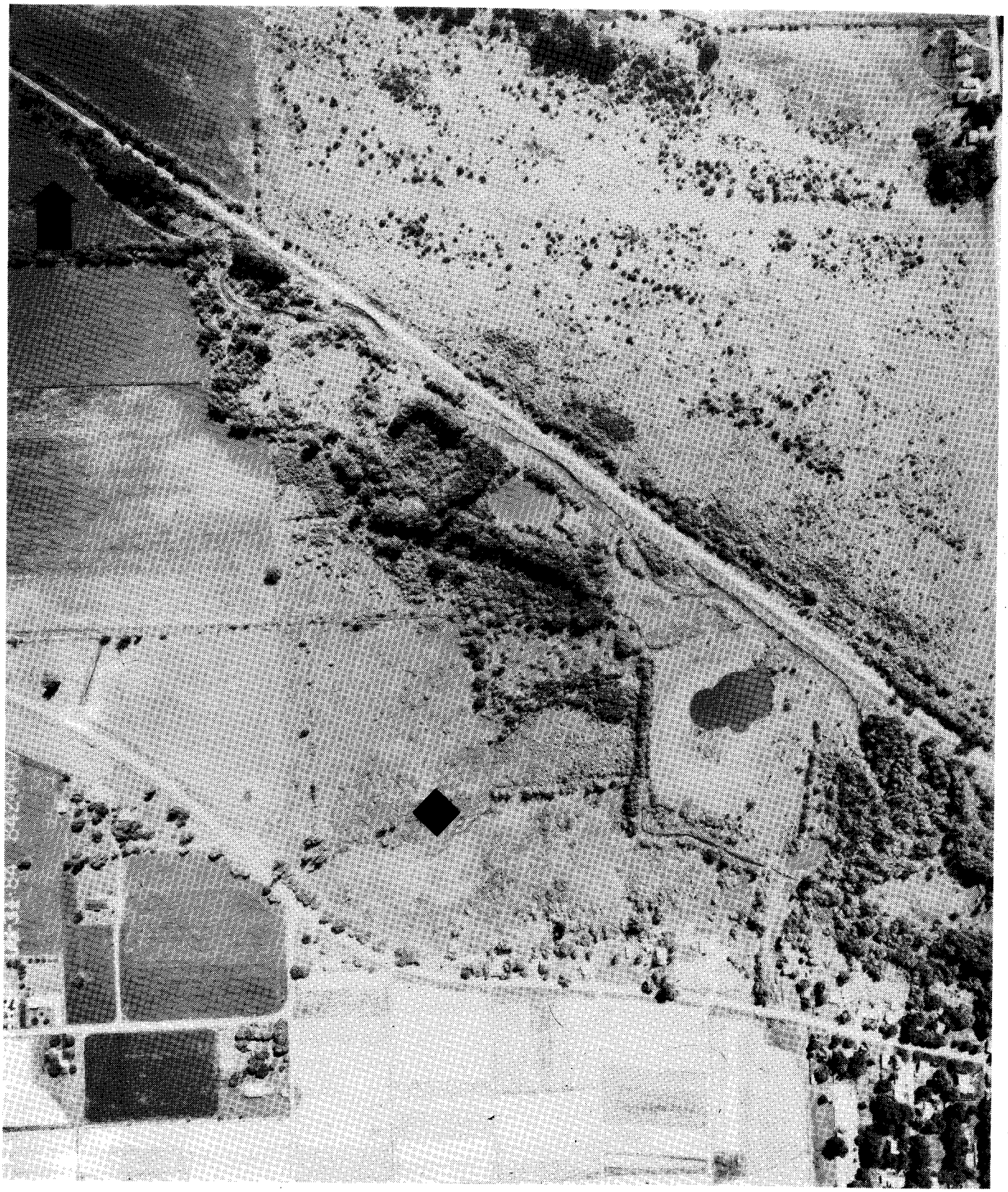
Triaenodes marginatus Sibly. 13-VIII-85 (1 female).

Triaenodes tardus Milne. 13-VII-85 (2 females), 29-VII-85 (2 males), 13-VIII-85 (1 female), 2-IX-85 (3 males,

11 females).

Appendix I-M

Aerial photograph of Prairie Road Fen (1984). 1 inch = 500 feet. Black diamond indicates collection site.



Listing of adult Trichoptera from nine light trap collections made at Prairie Road Fen Fen from 1984 and 1985.

Site 13. Prairie Road Fen

Polycentropodidae

*Cyrnellus marginalis. 16-VIII-84 (1 female).

Nyctiophylax sp. 16-VIII-84 (1 female).

Polycentropus cinereus Hagen. 16-VI-84 (1 female), 30-VI-84 (1 male), 16-VIII-84 (1 female), 1-IX-84 (1 female).

Polycentropus remotus Banks. 16-VI-84 (1 male).

Hydropsychidae

Ceratopsyche bifida (Banks). 14-VII-84 (1 female).

Ceratopsyche bronta (Ross). 16-VI-84 (20 males, 28 females), 30-VI-84 (4 females), 14-VII-84 (1 male, 10 females), 16-VIII-84 (5 males, 71 females), 1-IX-84 (7 males, 50 females), 22-IX-84 (7 males).

Ceratopsyche cheilonis (Ross). 16-VI-84 (7 females), 30-VI-84 (5 females), 14-VII-84 (6 females), 16-VIII-84 (12 females), 1-IX-84 (25 females).

Ceratopsyche morosa (Hagen). 16-VI-84 (2 females), 30-VI-84 (1 female), 14-VII-84 (10 females), 16-VIII-84 (56 females), 1-IX-84 (14 females), 22-IX-84 (2 females).

Ceratopsyche recurvata (Banks). 1-IX-84 (1 female).

Ceratopsyche slossonae (Banks). 16-VI-84 (10 males, 24 females), 30-VI-84 (2 males, 11 females), 14-VII-84 (4 females), 16-VIII-84 (2 males, 10 females), 1-IX-84 (1 male, 4 females), 22-IX-84 (2 males, 3 females).

Cheumatopsyche aphanta Ross. 16-VI-84 (4 males).

Cheumatopsyche campyla Ross. 16-VI-84 (3 males, 4 females), 14-VII-84 (3 females), 16-VIII-84 (3 males, 7 females), 1-IX-84 (3 males, 7 females).

Cheumatopsyche gracilis (Banks). 16-VI-84 (1 male).

Cheumatopsyche oxa Ross. 16-VI-84 (7 females), 30-VI-84 (2 females), 14-VII-84 (2 females), 16-VIII-84 (1 male, 8 females), 1-IX-84 (1 male, 3 females).

Cheumatopsyche pettiti (Banks). 16-VI-84 (8 males, 6 females), 16-VIII-84 (2 males, 3 females), 1-IX-84 (1 male, 3 females).

Diplectrona modesta. 1-IX-84 (1 male).

Hydropsyche betteni Ross. 16-VI-84 (1 male, 5 females), 30-VI-84 (3 females), 14-VII-84 (2 females), 16-VIII-84 (3 females), 1-IX-84 (1 male, 3 females).

Hydropsyche bidens Ross. 16-VI-84 (5 females), 16-VIII-84 (1 male, 1 female).

Hydropsyche dicantha Ross. 16-VI-84 (1 female), 14-VII-84 (1 male, 2 females), 1-IX-84 (1 male, 1 female).

Nr Hydropsyche incommoda . 16-VI-84 (4 females).

Hydropsyche orris Ross. 16-VI-84 (1 female).

Hydropsyche simulans Ross. 1-IX-84 (1 female).

Hydropsyche sparna Ross. 16-VI-84 (7 males, 3 females), 30-VI-84

(1 female), 16-VIII-84 (1 male, 48 females), 1-IX-84 (14 females), 22-IX-84 (1 male, 4 females), 4-V-85 (1 female).

Hydropsyche valanis Ross. 16-VI-84 (1 female), 1-IX-84 (3 females).

Potamyia flava (Hagen). 16-VI-84 (19 females), 14-VII-84 (9 males, 3 females), 1-IX-84 (90 males, 320 females).

Hydroptilidae

Hydroptila amoena Ross. 30-VI-84 (99 males), 14-VII-84 (373 males, 28 females), 28-VII-84 (16 males), 16-VIII-84 (74 males, 15 females), 1-IX-84 (1 male).

Hydroptila angusta Ross. 14-VII-84 (1 female), 16-VIII-84 (1 female).

Hydroptila armata Ross. 16-VI-84 (1 female).

Hydroptila consimilis Morton. 16-VI-84 (4 males, 14 females), 30-VI-84 (6 females), 16-VIII-84 (1 male, 2 females), 1-IX-84 (2 females).

Hydroptila perdita Morton. 16-VIII-84 (1 male, 1 female), 1-IX-84 (1 female).

Hydroptila sp. 16-VI-84 (1 male), 30-VI-84 (1 female).

Hydroptila spatulata Morton. 16-VIII-84 (11 females).

Hydroptila vala Ross. 16-VIII-84 (1 female).

Hydroptila virgata Ross. 4-VII-84 (25 females), 16-VIII-84 (1 female).

Hydroptila waubesiana Betten. 16-VIII-84 (1 female), 22-IX-84 (1 female).

Ochrotrichia confusa (Ross). 16-VI-84 (4 females).

Ochrotrichia tarsalis (Hagen). 16-VI-84 (6 males), 30-VI-84 (8 males), 14-VII-84 (1 male, 1 female).

Orthotrichia agerfascielle (Chambers). 16-VI-84 (5 females), 16-VIII-84 (2 females).

Orthotrichia cristata Morton. 30-VI-84 (1 female), 14-VII-84 (1 male).

NR Oxyethira dualis Morton. 16-VIII-84 (1 female).

Oxyethira pallida (Banks). 16-VI-84 (1 female), 30-VI-84 (1 male, 1 female), 14-VII-84 (2 males, 8 females), 16-VIII-84 (4 females), 1-IX-84 (1 female).

Phryganeidae

Agrypnia vestita (Walker). 1-IX-84 (2 males, 1 female).

Phryganea sayi Milne. 16-VIII-84 (1 male).

Limnephilidae

Pycnopsyche scabripennis Rambur. 14-VII-84 (2 males), 28-VII-84 (2 males), 16-VIII-84 (13 males, 2 females), 1-IX-84 (9 males, 1 female), 22-IX-84 (1 male).

Lepidostomatidae

*Lepidostoma costele (Banks). 1-IX-84 (3 males).

Lepidostoma sp. 30-VI-84 (3 females).

Molannidae

Molanna blenda Sibley. 30-VI-84 (1 male).

Molanna sp. 16-VIII-84 (2 females).

Leptoceridae

Ceraclea cancellata (Betten). 16-VI-84 (2 males, 1 female).

Ceraclea tarsipunctata (Vorhies). 14-VII-84 (1 male, 1 female).

Ceraclea transversa (Hagen). 30-VI-84 (1 male), 14-VII-84 (1 male).

Leptocerus americanus (Banks). 16-VI-84 (5 females).

Nectopsyche albida (Walker). 16-VI-84 (6 males, 18 females), 16-VIII-84 (1 male).

Nectopsyche candida (Hagen). 16-VI-84 (1 female).

Nectopsyche diarina (Ross). 16-VIII-84 (1 female).

Nectopsyche pavida (Hagen). 1-IX-84 (1 male).

Oecetis cinerascens (Hagen). 1-IX-84 (2 males).

Oecetis immobilis (Hagen). 16-VIII-84 (1 female).

Oecetis inconspicua (Walker). 16-VI-84 (2 males, 10 females), 30-VI-84 (2 males, 1 female), 14-VII-84 (2 males, 1 female), 28-VII-84 (1 male), 16-VIII-84 (1 male, 11 females), 1-IX-84 (2 males).

*Oecetis ochraceae. 1-IX-84 (2 females).

Triaenodes flavescens Banks. 14-VII-84 (1 female).

Triaenodes marginatus Sibly. 16-VI-84 (2 females), 30-VI-84 (12 females), 14-VII-84 (17 females), 16-VIII-84 (8 females), 1-IX-84 (1 female).

Triaenodes tardus Milne. 16-VI-84 (1 male), 28-VII-84 (1 female), 16-VIII-84 (1 female).

Appendix I-N

Aerial photograph of Triangle Lake Bog (1984). 1 inch = 400 feet. Black diamond indicates collection site.

Listing of adult Trichoptera from ten light trap collections made at Triangle Lake Bog in 1984 and 1985.

Site 14. Triangle Bog

Philopotamidae

Chimarra obscura (Walker). 23-VII-84 (1 female).

Psychomyiidae

Lype diversa (Banks). 9-VI-85 (10 males).

Polycentropodidae

Nyctiophylax affinis (Banks). 23-VII-84 (6 males).

Nyctiophylax sp. 23-VII-84 (4 females), 27-VI-85 (4 females).

Polycentropus interruptus (Banks). 9-VI-85 (3 males, 4 females).

Polycentropus remotus Banks. 9-VI-85 (5 females).

Hydropsychidae

Ceratopsyche bronta (Ross). 23-VII-84 (1 female), 5-VIII-84 (3 females), 9-X-84 (2 males).

Ceratopsyche slossonae (Banks). 5-VIII-84 (1 female), 9-X-84 (2 males).

Cheumatopsyche campyla Ross. 9-VI-85 (1 male), 27-VI-85 (2 males, 1 female).

Cheumatopsyche pettiti (Banks). 23-VII-84 (7 males, 5 females), 5-VIII-84 (2 males, 5 females), 9-VI-85 (4 males, 3 females), 27-VI-85 (14 males, 2 females), 23-VIII-85 (39 males).

Hydropsyche betteni Ross. 23-VII-84 (1 male).

Hydropsyche dicantha Ross. 23-VII-84 (1 male), 27-VI-85 (1 female).

Hydropsyche sparna Ross. 5-VIII-84 (1 female).

Hydroptilidae

Agraylea multipunctata Curtis. 23-VII-84 (1 female), 5-VIII-84 (1 female), 27-VI-85 (1 female).

Hydroptila ajax Ross. 23-VII-84 (1 female), 5-VIII-84 (1 female).

Hydroptila consimilis Morton. 23-VII-84 (2 females), 9-X-84 (1 female), 9-VI-85 (1 male).

Hydroptila perdita Morton. 23-VII-84 (1 male).

Hydroptila waubesiana Betten. 23-VII-84 (1 female), 5-VIII-84 (1 female).

Orthotrichia agerfascielle (Chambers). 23-VII-84 (3 males, 6 females), 5-VIII-84 (13 males, 47 females), 9-VI-85 (7 males, 19 females), 27-VI-85 (3 males, 5 females), 23-VIII-85 (1 male).

Orthotrichia cristata Morton. 23-VII-84 (3 females), 5-VIII-84 (3 male, 6 females), 9-VI-85 (2 males).

Oxyethira pallida (Banks). 23-VII-84 (1 male, 15 females), 5-VIII-84 (2 males, 27 females), 9-X-84 (1 female), 27-VI-85 (1 female), 23-VIII-85 (1 female).

Phryganeidae

Agrypnia vestita (Walker). 23-VIII-85 (1 male).

Banksiola crotchi Banks. 23-VII-84 (11 males, 4 females), 9-VI-85 (1 male, 16 female), 27-VI-85 (4 males,

15 females).

Banksiola dossuaria (Say). 9-VI-85 (1 male, 5 females), 27-VI-85 (1 female).

Phryganea sayi Milne. 5-VIII-84 (1 male, 3 females), 23-VIII-85 (4 males, 6 females).

Ptilostomis ocellifera (Walker). 23-VIII-85 (1 female).

Ptilostomis postica (Walker). 23-VII-84 (1 female), 5-VIII-84 (1 female).

Limnephilidae

Pycnopsyche guttifer (Walker). 9-X-84 (21 males, 12 females).

Pycnopsyche lepida Hagen. 9-X-84 (5 males).

Ironoquoia parvula (Banks). 9-X-84 (4 males, 1 female).

Limnephilus ornatus Banks. 27-VI-85 (1 female).

Limnephilus submonilifer Walker. 9-X-84 (2 males).

Platycentropus radiatus (Say). 27-VI-85 (12 females).

Leptoceridae

Ceraclea cancellata (Betten). 9-VI-85 (1 male).

Ceraclea diluta (Hagen). 24-V-85 (1 male).

Ceraclea transversa (Hagen). 9-VI-85 (1 female).

Leptocerus americanus (Banks). 23-VII-84 (8 males, 34 females), 5-VIII-84 (2 males, 27 females), 9-VI-85 (45 males, 47 females), 27-VI-85 (4 females).

Nectopsyche albida (Walker). 9-VI-85 (11 females).

Oecetis cinerascens (Hagen). 23-VII-84 (5 males, 1 female), 5-VIII-84 (2 males), 27-VI-85 (1 male).

Oecetis ditissa Ross. 23-VII-84 (3 males, 2 females), 5-VIII-84

(2 males, 4 females), 9-VI-85 (8 males), 27-VI-85 (3 males).

Oecetis inconspicua (Walker). 23-VII-84 (35 males, 30 females), 5-VIII-84 (6 males, 17 females), 9-VI-85 (211 males, 558 females), 27-VI-85 15 males, 66 females), 23-VIII-85 (2 females).

Oecetis nocturna Ross. 9-VI-85 (7 males, 1 female).

*Oecetis ochraceae. 5-VIII-84 (1 female), 9-VI-85 (1 female), 27-VI-85 (6 females).

Triaenodes abus Milne. 9-VI-85 (3 females), 27-VI-85 (2 females).

Triaenodes injustus (Hagen). 9-VI-85 (1 male).

Triaenodes marginatus Sibly. 23-VII-84 (1 female), 5-VIII-84 (2 females).

Triaenodes tardus Milne. 23-VII-84 (3 females), 5-VIII-84 (3 females), 9-VI-85 (4 males, 5 females).