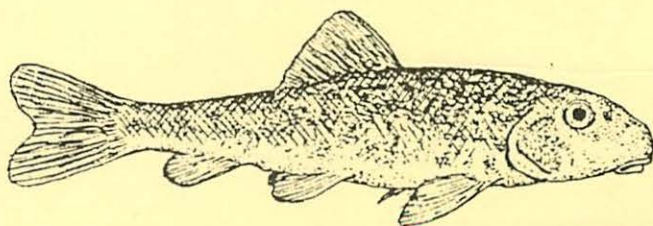


Curatorial Report Number 4⁴₅

Nova Scotia Museum
1747 Summer St.
Halifax, Nova Scotia, Canada
B3H 3A6

Aquatic
Fauna of the
Shubenacadie
Headwater
Lakes.
An Exercise
in Information
Retrieval

By D.S. Davis
March 1981

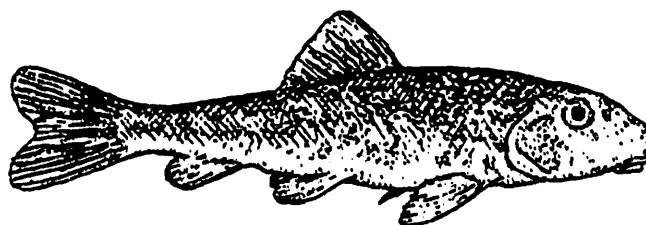


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NOVA SCOTIA MUSEUM

Curatorial Reports

The *Curatorial Reports* of the Nova Scotia Museum contain information on the collections and the preliminary results of research projects carried out under the program of the museum. The reports may be cited in publications but their manuscript status should be clearly indicated.

Abstract

The catalogue of the zoological collections of the Nova Scotia Museum was searched to extract records of aquatic fauna recorded from the Shubenacadie headwater lakes watershed in Nova Scotia. Forty-nine species were recorded although collections had not been made at all of the lakes and streams in the watershed. The usefulness of miscellaneous fauna records and problems of information retrieval are discussed.

INTRODUCTION

The zoological collections of the Nova Scotia Museum were established in the late nineteenth century and have been developed to include representative lots of most species occurring in the province. In some phyla the collections have been further extended to show morphological variation and geographic distribution of species. Research programs have been important in the development of the most useful parts of the collection. This is particularly true for annelids, crustaceans, insects, molluscs, fishes, amphibians, reptiles and small mammals. Other components of the collection have been acquired through donations and incidental collections made as a by-product of research and educational programs carried out by museum staff and others.

Museums usually arrange their collections in systematic order. This practice is followed in the scientific collections of the Nova Scotia Museum. In zoology the collections are arranged systematically, stored either preserved in alcohol or dried. There are approximately 325,000 insects and 100,000 other animal specimens in the collection. In all groups, except insects and arachnids, the collections are catalogued. The manual cataloguing system contains information on the date and locality of collection, name of the collector, number of specimens, habitat and other information (Fig. 1). The insects and arachnids are arranged systematically in glass topped drawers and information is obtained only from the labels attached to each specimen, as is usual with this type of collection.

Such a systematic arrangement and cataloguing of zoological collections has been adequate for retrieval of information on individual species, or groups of species, for the purposes of identifying material brought into the museum by students and the general public, for education programs and for research. However, in recent years an additional use of these collections has been developing through growing interest in environmental protection and land use planning. Often there is a need to retrieve information in order to compile a picture of the fauna of a specific locality, often a particular lake, river system or coastal inlet.

To extract information from the catalogue and collection to meet this requirement is obviously a lengthy process. Up to the present time the computer cataloguing facility, financed by the National Inventory Program of the National Museums of Canada, has not been available for the cataloguing of scientific collections. This system could provide the required service. However, it was immediately necessary to provide some locality cross-referencing system to allow for better access to the information in the systematic catalogue. In view of this, a museum assistant, Janice LeBlanc, carefully went through the zoology accession books from 1803 to 1978 and put the records of animal species from specific localities onto a manual card system. Later, the information for 1979 was also included. The insects which were uncatalogued were not included on the locality file, but the system was extended to include the approximately 22,000 plant specimens in the Nova Scotia Museum herbarium.

The question remained as to whether or not the locality file would be useful as a tool for the compilation of fauna lists for specific localities. During 1980 some information was usefully retrieved through this catalogue. However, the preparation of a list of species for the Eastern Shore Seaside Parks System by persons not fully familiar with biological nomenclature and systematics revealed limitations in accuracy although the resulting list was of some use.

It was decided early in 1980 to carry out a test of the system in order to provide information for a management project and find the limitations of both the systematic cataloguing and locality filing systems for zoology collections.

The Shubenacadie headwater lakes watershed

The proper management of watersheds is of particular concern to environmental protection agencies and to the general public. This concern is especially evident in those watersheds liable to be subjected to industrial and urban development. In a recent, unpublished study carried out by Anne Muecke as part of a degree in Environmental Planning at the Nova Scotia College of Art and Design, the problems of the Shubenacadie headwater lakes watershed, were examined. This watershed lies in the developing suburban area north of the cities of Halifax and Dartmouth and the town of Bedford-Sackville. The impact of urban development and the recreation and service needs of the growing urban community are of concern to residents of the area and to management agencies. A large amount of information on the waters of the Shubenacadie system has been provided in a series of reports prepared for the Shubenacadie-Stewiacke River Basin Board in 1978.

The Shubenacadie headwater lakes watershed is over 400 square kilometers in area and has more than 65 lakes. The streams all drain into Grand Lake which itself is the source of the Shubenacadie River (Fig. 4). The Shubenacadie joins Nine Mile River, Gays River and Stewiacke River as part of a major drainage system flowing into Minas Basin (Hydrometric area IDG). However, the southern end of the watershed lies within 4 km of the Atlantic coast (Bedford Basin). The underlying rocks are mainly late Cambrian and Ordovician slates, greywacke and schists belonging to the Goldenville and Halifax Formations, with granitic intrusions of carboniferous age. Sedimentary rocks of the carboniferous Windsor Group occur only in the northeast part of the watershed area. (Bujak and Donahoe, 1980). The area was subjected to glaciation, and till deposits including drumlins occur, particularly in the south and southwest part of the watershed. The geology provides for mainly acidic soils and as a result the water tends to be largely acidic (pH 5.3 to 7.0) but more alkaline conditions with pH above 7.0 are found in the waters flowing off the Windsor Group sedimentary rocks, to the north. The pH of Grand Lake is 6.6 at the outflow. Conditions in the lakes range from oligotrophic to eutrophic (Johnson, 1978). There is some agricultural land in the northern part of the watershed but the vegetation cover is, in the main, mixed woodland and hardwood. (N. S. Dept. of Lands and Forests, 1977). During the middle of the last century construction of the Shubenacadie Canal created a connection between the Shubenacadie watershed and Dartmouth lakes, draining into the Atlantic Ocean. The connection may still exist at times of highwater at the south end of Lake Charles (Shubie Park) and may be re-opened by proposed renovation of the canal as a canoe route. This connection is important when considering certain aspects of the aquatic fauna.

Notes on the aquatic fauna

All of the records listed were taken from the zoology locality file. They include 49 species from 18 localities. No attempt was made to extract information from the insect collection. The records for each locality are listed on pages seven to ten. The systematic list of species, pages 11 to 12 gives the full scientific name and common name, where known, as well as the localities where each was found. With one exception the species are all well known in Nova Scotia. The most numerous records were made as a result of specialized investigations of leeches, molluscs, fish and amphibians. Miscellaneous records accounted for only four species; Gordius sp., an unidentified cladoceran, Hyaella azteca and Chelydra serpentina.

The leech (Hirudinea) records all come from the specialized study carried out at the Museum by Paul McClung between 1972 and 1975. The results of this work have been made available (LeBlanc and McClung, 1979). In all, 19 species of leeches are known for Nova Scotia and of these, eight of the most common and widely distributed occur in the Shubenacadie headwater lakes. These leeches are all predatory or parasitic animals. The small, easily recognized species Helobdella stagnalis, (Fig. 2) for example, ranges quite widely in its feeding habits, from being predatory on small animals and feeding on carrion to sucking blood of vertebrates. The Medicinal leech, Macrobdella decora (Say) is a true blood sucker, often attaching itself to swimmers. It was not recorded from the collections made in the area by McClung but can be expected as it occurs in adjacent watersheds such as Dartmouth lakes and lower regions of the Shubenacadie watershed.

The records of Cladocera and the ubiquitous amphipod Hyaella azteca, are a poor indication of the diversity of species of crustacea possible in the Shubenacadie headwater lakes. There should also be many other species of Copepoda, Cladocera and Ostracoda, which are normally collected by dip net or plankton net, which were not used in past investigations.

The records of molluscs came mainly from research programs. Firstly, between 1946 and 1954 and again in 1962, collections of freshwater mussels were made in Nova Scotia and reported by Athearn and Clarke, 1962 and by Clarke and Meachem Rick, 1963. These collections provided the records of the five species listed in this report. Ten species are known for the Province of Nova Scotia. Grigg, 1972 included these records in a list of the freshwater mussel specimens held by the Nova Scotia Museum. Some additional records of the same species have been made since that time. The freshwater mussels are of considerable biological interest as their larvae (glochidia) are parasitic on freshwater fish species. Wiles, 1975 has reported studies on this aspect of their biology, carried out in part, in Grand Lake.

Studies of freshwater molluscs currently being undertaken at the Nova Scotia Museum provide most of the records of 11 snail species and two pea clam species. The results of these studies are not yet published. All species are common and widespread in Nova Scotia with one exception, the small ramshorn snail Menetus dilatatus Gould (Fig. 3).

This species was first listed for Nova Scotia by Robert Willis, 1863, but his record seems to have been largely overlooked. It is not, for example, mentioned in the catalogue of recent mollusca of Canada prepared by LaRocque, 1953. During recent molluscan studies M. dilatatus has also been recorded in the Gold River and St. Mary's River watersheds. These records are considered scientifically important as the species occurs nowhere else in Canada.

Practically all of the fish records come from the province-wide study of the distributions of freshwater fishes reported by Livingstone, 1951. Many of these specimens have now been transferred from the Nova Scotia Museum to the National Museum of Natural Sciences in Ottawa. Thirteen species were recorded from the Shubenacadie headwater lakes, but this number is likely quite low as various common sport species, such as trout, and small fish, such as sticklebacks are conspicuously absent from the list. Morantz (1970) has reported 22 species for the Shubenacadie River system. There are 37 species of freshwater fishes reported from Nova Scotia (Gilhen, 1974).

The amphibians are all common and widely distributed species. Many are only found in association with small bodies of water, such as ponds, used for breeding and development of the tadpoles. The only reptile record, the snapping turtle is mentioned for Fish Lake in a field trip report, but this species is probably common in lakes in the area.

Future Work

As previously mentioned, the largest number of records of animals has come from investigations of specific groups. This means that other groups of animals that potentially can occur in the watershed are poorly dealt with. To acquire a more comprehensive census of the fauna, lakes should be subjected to the type of investigation carried out by Davis and Wilson (1979) of lakes in the Cape Breton Highlands National Park. In this case a short visit was made to each lake on one occasion in the summer to make an inventory of the macroscopic plants and animals. Inventories of this type for the lakes and ponds in the watershed would give a more comprehensive view of both fauna and flora that could be used as a basis for more detailed ecological studies that might be required. However, inventories of this type for the Shubenacadie headwater lakes are not planned at the present time.

Coupled to the development of the resource of information on fauna and flora held by the Nova Scotia Museum, is the problem of information retrieval. This particular study was partly carried out as an exercise in information retrieval. Although the zoology collections are catalogued and cross-referenced on a locality file, several problems were encountered which made retrieval difficult. Firstly, the locality file was based upon the accession book records and not on the systematic card catalogue. There are many typographic errors in the spelling of names of places and taxa which need to be corrected. Revisions or more complete identifications are made in the systematics file, but similar revisions have not been made to either the accession books or the locality file. The standardization of place names, normally taken from the gazetteer of Nova Scotia, has not been adhered to in any of the filing systems. The place names should be standardized

to the 1979 gazeteer which is in accordance with the place names on the 1:250,000 scale map of Nova Scotia published by the Province of Nova Scotia in 1979. This map provides 10 km² grid which is useful for locating places. The grid references for localities should be added to both the locality file and systematic catalogue.

With the present size of the collections at the Nova Scotia Museum, a manual search of the records is time consuming, but possible. As the records grow in number such a system will become unmanagable and unused. Systems for computer cataloguing of the scientific collections of the Nova Scotia Museum should be seriously investigated in order to provide a rapid information retrieval system. At present the slow response of the National Inventory Program of the National Museums, to the requirements of natural history collections has been very disappointing and for confident planning some alternative approaches would seem to be desirable. The cataloguing systems should have print-out equipment for the preparation of curatorial reports and distribution maps. At the present time basic information services of this kind are only possible through time-expensive work. With this facility the cataloguing of the insect collection could become feasible.

The provision of a computer cataloguing system would increase the usefulness of the scientific collections and allow staff to devote more time to research on the systematics and occurrence of the rocks, minerals, fossils and living plants and animals of Nova Scotia, and for the application of this growing resource of information to the educational objectives of the Nova Scotia Musuem.

Acknowledgements

The author wishes to thank Anne Muecke for background information on the Shubenacadie headwater lakes, and Pat Hinch of the Nova Scotia Department of Environment for pH and other information. Staff of the Science Section of the Nova Scotia Museum made many helpful comments.

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Records of aquatic animals for individual lakes and streams

The records are taken from the locality reference card index which is itself based upon the zoology accession records. Full information on each species occurrence can be located in the systematic card index and in the field report books. Dates of collection, names of collectors, habitat description and other information are usually included. Full names and English names where available, for each species are given in the systematic list (pages 11 to 12). The number for each lake is plotted on the map (Fig. 4).

1. Barrett Lake,
Hyalella azteca
Amnicola limosa
Helisoma campanulatum
Gyraulus deflectus
Musculium securis

2. Beaverbank Lake ("Beaverbank area")
Ambystoma maculatum
Hyla crucifer
Rana sylvatica

3. Duck Pond
Hyalella azteca
Physa heterostropha
Helisoma campanulatum
Gyraulus deflectus
Musculium securis

4. First Lake
Ictalurus nebulosus
Morone americanus

5. Fish Lake (Oakfield)
Erpobdella punctata
Placobdella ornata
Placobdella phalera
Helobdella stagnalis
Theromyzon tessulatum
Cladocera unidentified
Hyalella azteca
Amnicola limosa
Lyogyrus granum
Campeloma decisum
Lymnaea columella
Physa heterostropha
Helisoma campanulatum
Helisoma anceps
Gyraulus deflectus
Ferrissia parallela

5. Fish Lake (Oakfield) continued

Musculium securis
Elliptio complanatus
Ictalurus nebulosus
Bufo americanus
Hyla crucifer
Rana catesbiana
Rana sylvatica
Chelydra serpentina

6. Grand Lake (Shubenacadie Lake)

Amnicola limosa
Campeloma decisum
Lymnaea catascopium
Lymnaea columella
Physa heterostropha
Helisoma campanulatum
Helisoma anceps
Gyraulus deflectus
Menetus dilatatus
Musculium securis
Anodonta cataracta
Anodonta implicata
Petromyzon marinus
Salmo salar
Chrosomus eos
Rhinichthys atratulus
Hyla crucifer
Rana sylvatica

7. Kinsac Lake (Rawdon River outlet)

Elliptio complanatus
Lampsilis radiata
Alasmidonta undulata

8. Lake Charles

Erpobdella punctata
Ambystoma maculatum
Bufo americanus
Hyla crucifer
Rana palustris

9. Lake Fletcher

Placobdella phalera
Erpobdella punctata
Helobdella stagnalis
Amnicola limosa
Lymnaea columella
Physa heterostropha
Helisoma anceps
Ferrissia parallela

10. Lake Thomas

Helobdella triserialis
Batracobdella picta
Mooreobdella fervida
Helobdella stagnalis
Erpobdella punctata
Placobdella phalera
Amnicola limosa
Lyogyrus granum
Physa heterostropha
Helisoma campanulatum
Helisoma anceps
Gyraulus deflectus
Menetus dilatatus
Ferrissia parallela
Ambystoma maculatum

11. Lake William

Amnicola limosa
Lymnaea columella
Physa heterostropha
Gyraulus deflectus
Menetus dilatatus
Pisidium sp.
Elliptio complanatus
Anodonta cataracta
Anodonta implicata
Alasmidonta undulata
Osmerus mordax
Anguilla rostrata

12. Miller Lake

Erpobdella punctata
Ambystoma maculatum
Bufo americanus
Hyla crucifer
Rana sylvatica

13. Powder Mill Lake (Also known as Fish Lake)

Amnicola limosa
Helisoma campanulatum
Musculium securis
Elliptio complanatus
Anodonta cataracta
Anodonta implicata
Alasmidonta undulata

14. Rocky Brook

Osmerus mordax

15. Rocky Lake

Amnicola limosa
Lymnaea columella
Physa heterostropha
Helisoma campanulatum
Helisoma anceps
Ferrissia parallela
Elliptio complanatus
Anodonta cataracta

16. Second Lake

Gordius sp.
Elliptio complanatus
Ictalurus nebulosus

17. Shubenacadie River (between Grand Lake and Enfield)

Amnicola limosa
Musculium securis
Elliptio complanatus
Anodonta implicata
Alasmidonta undulata
Petromyzon marinus
Alosa pseudoharengus
Chrosomus eos
Couesius plumbeus
Notemigonus crysoleucas
Notropis cornutus
Catostomus commersoni

18. Tucker Lake

Campeloma decisum
Helisoma anceps
Elliptio complanatus
Rana catesbeiana

Systematic list of aquatic animals recorded from the Shubenacadie headwater lakes watershed

Nematomorpha

Gordius sp. Horsehair worm Second Lake

Hirudinea (Leeches)

Batracobdella picta (Verrill), Lake Thomas
Helobdella stagnalis (Linn.), Fish Lake, Lake Fletcher, Lake Thomas
Helobdella triserialis (Blanchard), (includes H. papillata Moore and H. fusca (Castle), Lake Thomas)
Placobdella ornata (Verrill), Fish Lake
Placobdella phalera (Graf), Fish Lake, Lake Fletcher, Lake Thomas
Theromyzon tessulatum (O.F.Muller), Fish Lake
Erpobdella punctata (Leidy), Fish Lake, Lake Charles, Lake Fletcher, Lake Thomas, Miller Lake
Mooreobdella fervida (Verrill), Lake Thomas

Crustacea (water fleas, amphipods)

Cladocera unidentified, Fish Lake
Hyallolella azteca (Saussure), Barrett Lake, Duck Pond, Fish Lake

Mollusca-Gastropoda (Snails)

Campeloma decisum Say, Fish Lake, Grand Lake, Tucker Lake
Amnicola limosa Say, Barrett Lake, Fish Lake, Grand Lake, Lake Fletcher, Lake Thomas, Lake Williams, Powder Mill Lake, Rocky Lake, Shubenacadie River
Lyogyrus granum Say, Fish Lake, Lake Thomas
Lymnaea catascopium, Grand Lake
Lymnaea columella Say, Fish Lake, Grand Lake, Lake Fletcher, Lake Thomas, Lake William, Rocky Lake
Physa heterostropha Say, Duck Pond, Fish Lake, Grand Lake, Lake Fletcher, Lake Thomas, Lake William, Rocky Lake
Helisoma campanulatum (Say) Barrett Lake, Duck Pond, Fish Lake, Grand Lake, Lake Thomas, Powder Mill Lake, Rocky Lake.
Helisoma anceps (Menke), Fish Lake, Grand Lake, Lake Fletcher, Lake Thomas, Rocky Lake, Tucker Lake
Gyraulus deflectus (Say), Barrett Lake, Duck Pond, Fish Lake, Grand Lake, Lake Thomas, Lake William
Menetus dilatatus Gould, Grand Lake, Lake Thomas, Lake William
Ferrissia parallela (Haldeman) Freshwater limpet, Fish Lake, Lake Fletcher, Lake Thomas, Rocky Lake.

Mollusca-Pelecypoda (Mussels and Pea clams)

Musculium securis Prime,

Barrett Lake, Duck Pond, Fish Lake,
Grand Lake, Powder Mill Lake,
Shubenacadie River

Pisidium sp.,

Lake William

Elliptio complanatus (Solander),

Fish Lake, Kinsac Lake, Powder Mill Lake,
Rocky Lake, Second Lake, Shubenacadie
River, Tucker Lake

Anodonta cataracta Say,

Grand Lake, Powder Mill Lake, Rocky Lake

Anodonta implicata Say,

Grand Lake, Powder Mill Lake, Shubenacadie
River

Lampsilis radiata (Gmelin),

Kinsac Lake

Alasmidonta undulata (Say),

Kinsac Lake, Powder Mill Lake,
Shubenacadie River

FISH

Petromyzon marinus Linnaeus,

Sea Lamprey, Grand Lake, Shubenacadie
River

Anguilla rostrata (Lesueur),

American eel, Lake William

Alosa pseudoharengus (Wilson),

Alewife, Shubenacadie River

Salmo salar Linnaeus,

Atlantic salmon, Grand Lake

Osmerus mordax (Mitchill),

Rainbow smelt, Lake William, Rocky
Brook

Chrosomus eos Cope,

Northern redbelly dace, Grand Lake ,
Shubenacadie River

Couesius plumbeus (Agassiz)

Lake Chub, Shubenacadie River

Notemigonus crysoleucas (Mitchill),

Golden shiner, Shubenacadie River

Notropis cornutus (Mitchill),

Common shiner, Shubenacadie River

Rhinichthys atratulus (Herman),

Blacknose dace, Grand Lake

Catostomus commersoni (Lacepede),

White sucker, Shubenacadie River

Ictalurus nebulosus (Lesueur),

Brown bullhead, First Lake, Fish Lake,
Second Lake

Morone americana (Gmelin),

White perch, First Lake.

Amphibia

Ambystoma maculatum ,

Spotted Salamander, Beaverbank Lake,
Lake Thomas, Miller Lake

Bufo americanus Holbrook

American Toad, Fish Lake, Grand Lake,
Lake Charles, Miller Lake

Hyla crucifer Weid,

Spring Peeper, Beaverbank Lake, Fish
Lake, Grand Lake, Lake Charles, Miller
Lake

Rana catesbeiana Shaw,

Bullfrog, Fish Lake, Tucker Lake

Rana palustris LeConte,

Pickerell frog, Lake Charles

Rana sylvatica LeConte,

Woodfrog, Beaverbank Lake, Fish Lake,
Grand Lake, Miller Lake

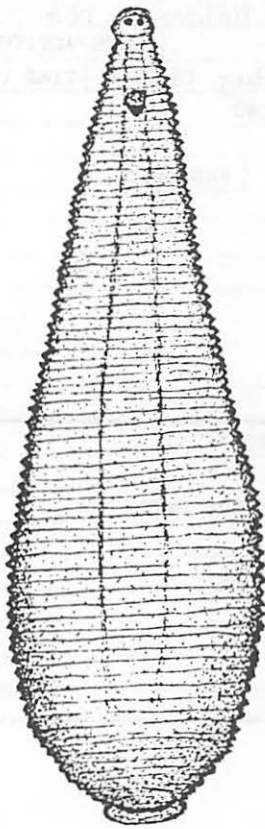
Reptilia

Chelydra serpentina (Linnaeus),

Snapping turtle, Fish Lake

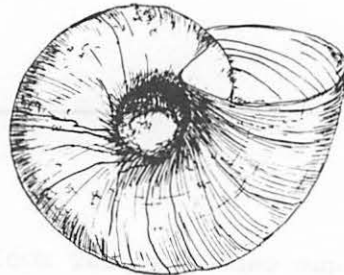
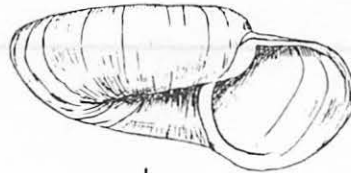
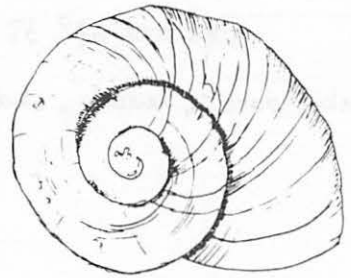
SPECIES <i>Menetus (Micromenetus) dilatatus</i> (Gould)		NOVA SCOTIA MUSEUM ZOOLOGICAL COLLECTIONS	
F. Planorbidae			
MATERIAL	Shells	DET. BY	D.S. Davis
NO. OF SPECIMENS	3	SEX	
ASSOC. MATERIAL		MATURITY	
COLLECTOR	F. McClung	PRESERVATION	Dry
LOCALITY Outlet of Lake Thomas, between Fletcher Lake and Lake Thomas, Halifax Co., N.S.			24-A-3
			DEPTH/ALTITUDE
LATITUDE	44° 49.0' N	LONGITUDE	63° 37.0' W
DATE	6 Aug. 1975	TIME (AST)	
COLL. METHOD	by hand	COLL. CONDITIONS	
HABITAT	Freshwater Lake, outlet, mucky, shallow		
SUBSTRATE	On stones	FREQUENCY	
FOOD/PREY		HOST	
ASSOCIATED FAUNA			
ASSOCIATED FLORA			
NOTES	Collected alive,	PHOTO NO.	
		LOC. OF SPECIMEN	
		REFERENCES	

Fig. 1 Catalogue card used for zoological collections at the Nova Scotia Museum.



0 mm 5

Fig. 2. Helobdella stagnalis (Linné)
(drawing by R. P. McClung)



0 mm 1

Fig. 3. Menetus dilatatus (Gould)
(drawings by D. S. Davis from
photographs by A. Wilson)

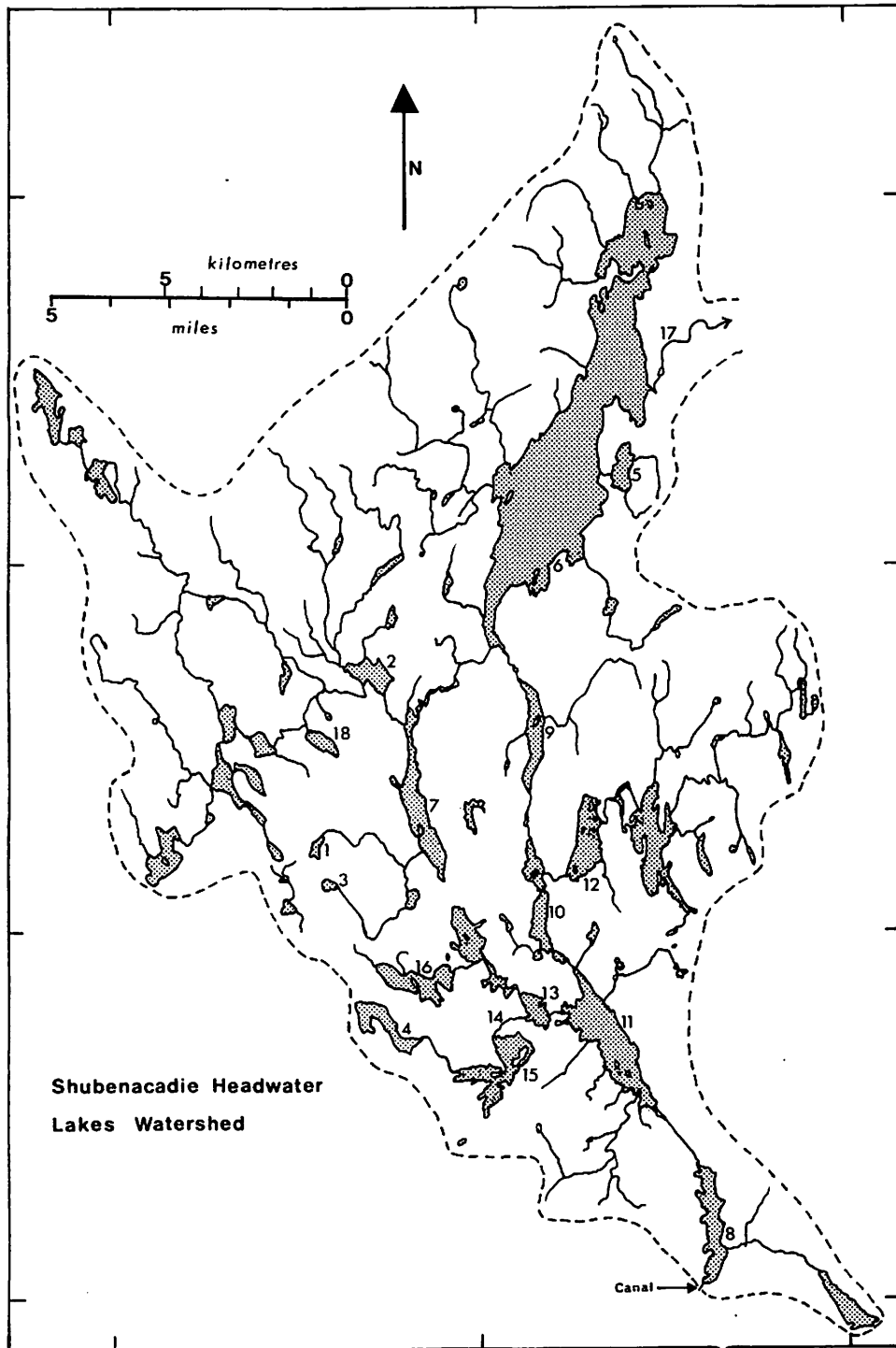


Fig. 4 Map of the Shubenacadie headwater lakes watershed, showing the streams and lakes from which zoological records are available. The numbers refer to the localities listed on pages seven to ten.