

Curatorial Report Number 45

Nova Scotia Museum
1747 Summer St.
Halifax, Nova Scotia, Canada

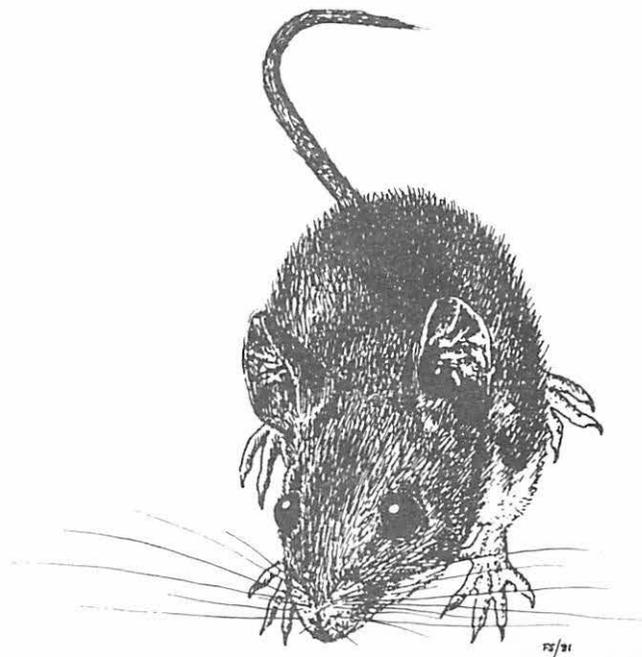
Distributions, Habitats and Vulnerability of Amphibians, Reptiles, and Small Native Mammals in Nova Scotia

By John Gilhen and Fred Scott
January 1981



Distributions, Habitats and Vulnerability of Amphibians, Reptiles, and Small Native Mammals in Nova Scotia

By John Gilhen and Fred Scott
January 1981



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.

INTRODUCTION

In recent years the Science Section of the Nova Scotia Museum has received increasingly frequent requests from government and private agencies, and from individuals, for information on plant and animal species or communities which are of exceptional scientific value or interest and which may be affected by various kinds of proposed development. These requests fall into two categories: information on species or communities occurring at a particular location, and information on the distribution and vulnerability of a species or group of species throughout the province as a whole.

Requests in the first category generally cannot be anticipated, and the Science Section responds to each one, using a Locality File listing its biological collections by county and location, supplemented by special knowledge of the staff when possible. The second category of requests can be anticipated to a great extent, and this report is intended to provide the most recent information available on amphibians, reptiles and three groups of mammals. For each species the information is based on data available from specimens collected in this province.

The species accounts are arranged as follows:

Distribution The Nova Scotian distribution, and the type locality if the taxon involved was described from a Nova Scotian population.

Habitat The habitat(s) the species is known to occupy in Nova Scotia. The omission of a habitat it is known to occur in elsewhere indicates only that more field work needs to be done in this province.

Biology Where pertinent, a brief description of the general role of the species and mention of aspects of its biology which may be relevant to its vulnerability (hibernation sites, for example).

Vulnerability A description of the species' vulnerability, insofar as it can be assessed. For some species such an assessment is not possible at present.

There are large portions of Nova Scotia which have never been trapped at all, as can be seen on the map (Fig. 1). The amphibians and reptiles of many of these areas are also inadequately known. Parts of the mainland east of Halifax and north of the Minas Basin particularly need investigation, as do virtually all the inshore and offshore islands along the coast.

A comprehensive publication on the amphibians and reptiles of Nova Scotia is currently being prepared by John Gilhen.

ADDENDUM

The common and scientific names used for the amphibians and reptiles in this report are taken from an advance copy of the most recent list, *Checklist of the Amphibians and Reptiles of Canada* (Canadian Amphibian and Reptile Conservation Society Bulletin, in press), compiled by Francis R. Cook, curator, Herpetology Section, National Museum of Natural Sciences, Ottawa.

AMPHIBIANS AND REPTILES

SALAMANDERS

Ambystoma laterale Hallowell. Blue-spotted Salamander.

Distribution The Nova Scotia mainland north of Kentville and Halifax; a few widely separated localities on Cape Breton Island. The triploid form is known only from Cumberland County, notably the Shinimicas River watershed (Gilhen, 1974).

Habitat Woodlands adjacent to aquatic breeding sites, which include alder swamps, ponds (particularly shallow roadside ponds) and slow vegetated streams. Primarily on red soils overlying sandstone, conglomerate and shale.

Vulnerability None at present.

Ambystoma maculatum (Shaw). Yellow-spotted Salamander.

Distribution Throughout the province.

Habitat Woodlands adjacent to aquatic breeding sites, which include bogs, ponds (particularly roadside ponds) and vegetated coves of lakes and boggy streams.

Vulnerability None.

Notophthalmus viridescens viridescens (Rafinesque). Red-spotted Newt.

Distribution Common throughout the province.

Habitat Larvae and adults inhabit vegetated ponds, coves of lakes and sluggish portions of streams. Juveniles (red efts) inhabit woodlands adjacent to aquatic sites but may venture a considerable distance from water.

Vulnerability None.

Plethodon cinereus (Green). Eastern Redback Salamander.

Distribution Three colour phases are recognized: the red-backed phase is dominant and is common throughout the province; the lead-backed phase is common in the coastal spruce-fir and mixed woodlands; it becomes less common in the highlands and seems to be replaced by an all-red (erythristic) phase in mature deciduous woods, notably stands of sugar maple on North Mountain, the Cobequid Highlands and the Pictou-Antigonish Highlands.

Habitat Common in a variety of woodland habitats but may venture a short distance away from woods in blueberry fields, gravel pits and other types of clearings.

Vulnerability The erythristic phase could suffer if hardwoods are destroyed. In the past decade many acres of forest have been cleared to establish blueberry fields.

Hemidactylium scutatum (Schlegel). Four-toed Salamander.

Distribution There are scattered records throughout the province. This species seems to be difficult to find and is probably more common and widespread than present records indicate. Most known localities are represented by a single specimen.

Habitat During the spring adults inhabit sphagnum bogs and sphagnaceous margins of slow moving streams. Following the breeding season they inhabit the adjacent woodlands.

Vulnerability None at present.

TOAD, TREE FROG AND TRUE FROGS

Bufo americanus americanus Holbrook. Eastern American Toad.

Distribution Throughout the province.

Habitat A variety of terrestrial habitats. Adults migrate in spring to the shallows of ponds (particularly roadside ponds), lakes and streams to breed.

Vulnerability None.

Hyla crucifer crucifer Wied. Northern Spring Peeper.

Distribution Widespread throughout the province.

Habitat Woodlands adjacent to aquatic breeding sites, which include ponds (particularly roadside ponds), lakes and streams.

Vulnerability None.

Rana catesbeiana Shaw. Bullfrog.

Distribution Mainland Nova Scotia, local in the northeastern portions.

Habitat Usually the larger vegetated ponds, coves of lakes and slow boggy streams.

Vulnerability Not vulnerable at present in the south-western mainland.

Rana clamitans melanota (Rafinesque). Green Frog.

Distribution Widespread throughout the province.

Habitat Practically any temporary or permanent body of freshwater and a variety of wet places such as meadows and grassy woodland roads adjacent to water.

Vulnerability None.

Rana septentrionalis Baird. Mink Frog.

Distribution Throughout the province.

Habitat Vegetated shallows of lakes and sluggish streams, particularly among water lilies and pickerel weed.

Vulnerability None at present.

Rana sylvatica Le Conte. Wood Frog.

Distribution Throughout the province.

Habitat Moist woodlands. Migrates in early spring to aquatic breeding sites such as bogs, ponds (particularly roadside ponds) and coves of lakes.

Vulnerability None.

Rana pipiens Schreber. Northern Leopard Frog.

Distribution Throughout the province.

Habitat Grassy places, particularly meadows, oldfields and grassy woodland roads adjacent to aquatic breeding sites such as detritus ponds and sphagnaceous portions of streams. They often invade fields a considerable distance from water in agricultural areas.

Vulnerability None.

Rana palustris Le Conte. Pickerel Frog.

Distribution Throughout the province.

Habitat Often found associated with mink frogs in aquatic situations and with leopard frogs in terrestrial habitats.

Vulnerability None.

TURTLES

Chelydra serpentina serpentina (Linnaeus). Common Snapping Turtle.

Distribution Mainland Nova Scotia. The few records from Cape Breton Island are considered to be introductions.

Habitat Large ponds, lakes and streams. Nests are dug in moist sand or gravel on beaches but some individuals will move a considerable distance on woodland roads or along gravel road banks to dig a nest. Old sawdust piles are also used as nesting sites.

Vulnerability Human predation. Unfortunately they are killed by persons who think they are dangerous.

Clemmys insculpta (Le Conte). Wood Turtle.

Distribution The northern mainland and southern Cape Breton Island, notably the River Inhabitants watershed.

Habitat Slow moving meandering streams through fertile valleys. Wood Turtles nest on sloping sand or gravel river banks. During the day they may move away from stream banks to meadows, fields or along roadsides, returning to the stream at night.

Vulnerability Nesting sites are few on each stream and easily destroyed by gravel removal. Adults and juveniles are frequently taken from natural sites, kept for a time in captivity, and released far removed from the breeding population.

Emydoidea blandingi (Holbrook). Blanding's Turtle.

Distribution Kejimikujik National Park, especially West River, Little River, Kejimikujik Lake and Grafton Lake.

Habitat Slow boggy streams near lakes and boggy lake coves. Nests on sandy beaches of lake shores.

Vulnerability Protected within park.

Chrysemys picta picta (Schneider). Eastern Painted Turtle.

Distribution Common in the south-western mainland, locally common in north-eastern mainland. Absent from Cape Breton Island.

Habitat Ponds, lakes and slow moving streams. Some individuals move a considerable distance from the lake shore to dig a nest on woodland roads, along roadside banks or in fields and gardens.

Vulnerability None at present.

MARINE TURTLES

Lepidochelys kempfi (Gorman). Atlantic Ridley.

Caretta caretta caretta (Linnaeus). Atlantic Loggerhead.

Dermochelys coriacea coriacea (Linnaeus). Atlantic Leatherback.

Distribution and habitat Tropical and warm-temperate Atlantic Ocean, extending into cool temperate waters of Canada during summer months.

Vulnerability Nesting sites and adults protected in south, but adults entering Canadian waters should be protected. Turtles caught in fishing gear in Atlantic Canada are usually brought to shore as curiosities, and not released.

SNAKES

Storeria occipitomaculata occipitomaculata (Storer). Northern Redbelly Snake.

Distribution Common throughout the province.

Habitat Grassy-heath areas along the shores of ponds, lakes and streams and also along roadsides, at the edge of barrens, oldfields, railway cuttings, and other disturbed habitats.

Vulnerability None.

Thamnophis sauritus septentrionalis Rossman. Northern Ribbon Snake.

Distribution Only in Queens and Lunenburg Counties.

Habitat Vegetated shallows of ponds, lakes and streams.

Vulnerability Cottage development exposes them to human predation.

Thamnophis sirtalis pallidula Allen. Maritime Garter Snake.

Distribution Throughout the province, including the larger coastal islands.

Habitat A variety of woodlands, open areas and agricultural situations
Often seems to overpopulate islands.

Vulnerability None.

Diadophis punctatus edwardsi (Merrem). Northern Ringneck Snake.

Distribution Mostly in granite, quartzite and slate regions of the Atlantic
uplands, with one locality in Cape Breton Highlands National Park.

Habitat Deciduous and mixed woods, particularly adjacent to ponds, lakes and
streams. They are most often observed at the edge of woods but may move
a short distance into oldfields, gravel pits and other open areas.

Vulnerability None at present.

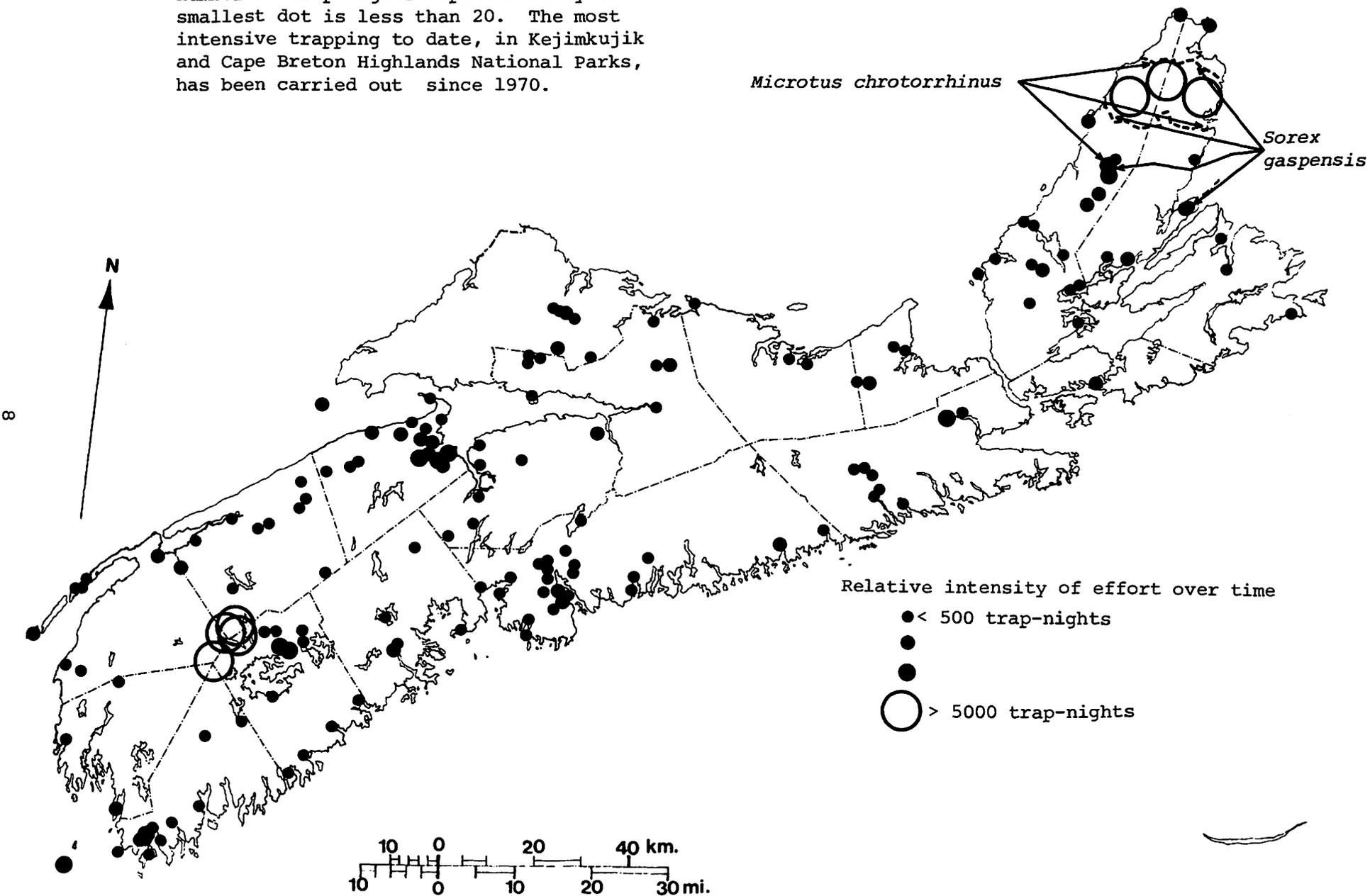
Opheodrys vernalis vernalis (Harlan). Eastern Smooth Green Snake.

Distribution Throughout the province.

Habitat Grassy places along the shores of ponds, lakes, streams. Particularly
common along roadsides, in oldfields and at the edges of heath barrons.

Vulnerability None.

Fig. 1. Recorded Nova Scotia localities where insectivores or small rodents have been trapped, 1900 to 1979. In many cases the number of trap-nights represented by the smallest dot is less than 20. The most intensive trapping to date, in Kejimkujik and Cape Breton Highlands National Parks, has been carried out since 1970.



SMALL NATIVE MAMMALS

There are three groups of mammals which are relatively poorly known in Nova Scotia, and concerning which it is difficult to gather up-to-date information: the bats, insectivores and small rodents. The other mammals are important as game-species, fur-bearers or as species of economic importance, and relevant information about them is readily available from other sources (the Nova Scotia Department of Lands and Forests, for example). For this reason the large rodents (woodchuck, muskrat, beaver and porcupine) have been excluded, as well as the small mustelids, which are fur-bearers. Introduced rodents (brown and black rats, house mouse) have also been excluded, as they are generally associated with human habitation and are important for economic and health reasons. The purpose of this report is to present up-to-date information on the native species, with special reference to their vulnerability. Nova Scotian distributions of many species are not completely known, and habitat information was not always recorded for specimens collected before 1960, so the information base is barely adequate. What is available has been gathered mostly by the Biology Department of Acadia University in Wolfville, and the Science Section of the Nova Scotia Museum. Since species diversity in most habitats is lower than for many equivalent habitats on the mainland of the continent, some species occupy a wider range of habitat types than one would expect from the general literature.

Order INSECTIVORA (Insectivores) Family Soricidae (Shrews)

Sorex cinereus acadicus Gilpin, 1867. Cinerous shrew.

Distribution All of ~~mainland~~ Nova Scotia; also on Seal Island, Yarmouth Co. (23½ km from mainland) and probably on many inshore islands around the province. Type locality: "Nova Scotia".

Habitat Most types of forest, especially mature mixed second-growth; forest edges; burned areas; oldfields, hayfields; wet meadows, bogs, barrens; river and stream banks; lake shores. In mature forests it is usually most common near running water. Requires leaf litter and/or vegetative ground cover. One of the most abundant and widespread insectivores in Nova Scotia.

Biology Primarily a carnivore, feeding on terrestrial invertebrates and small vertebrates; also consumes carrion and seeds, berries or other vegetable matter at times. It is active all year and populations fluctuate. It is a prey species for many carnivores and raptors.

Vulnerability None on the mainland, but populations on islands (such as Seal Island) are potentially of great interest in studies of zoogeography and evolution, and would be vulnerable to gross habitat alteration and disturbance.

Sorex arcticus maritimensis R.W. Smith, 1939. Arctic shrew.

Distribution Maritime populations are disjunct, with a 350-km gap between their northern limits (in eastern New Brunswick) and the Quebec population north of the St. Lawrence. On the Nova Scotia mainland this species is locally distributed in many suitable habitats. Not recorded from Cape Breton Island. The Maritime population is currently being studied by C.G. van Zyll de Jong of the National Museum of Canada. Type locality: Wolfville, Kings Co., N.S.

Habitat Upper zones of saltmarshes; wet meadows, floodplain oldfields, grassy bogs; stream and river margins close to such habitats. The dyked meadows and marshes bordering the Cornwallis River estuary in Kings Co. appear to have the largest populations of this shrew.

Biology Primarily a carnivore, like *Sorex cinereus*. Does not hibernate. Because it is relatively so much less common than *S. cinereus*, it is not known to what extent (if any) Nova Scotian populations fluctuate. Seems to require high soil moisture and/or the proximity of surface water, and appears to be absent from many suitable habitats. Often uses the runways of *Microtus pennsylvanicus*.

Vulnerability The use of wet river-floodplain meadows and oldfields or dyked saltmarsh meadows for anything other than hay or pasturage would affect local populations and could eliminate them entirely.

Sorex fumeus umbrosus Jackson, 1917. Smoky shrew.

Distribution Mainland Nova Scotia and southwestern Cape Breton Island (1 record). Type locality: James River, Antigonish Co., N.S.

Habitat Mixed and deciduous forest, including mature second-growth; forests edges; treed barrens and some dry bogs. Predominantly a forest species, especially along streams through mixed forest with deep leaf litter and a dense herbaceous ground cover. Generally not common but sometimes in high-density "pockets".

Biology Primarily a carnivore. Does not hibernate. Appears to be replaced by *S. gaspensis* in central and northern Cape Breton Island, but much work needs to be done on the distribution of both species.

Vulnerability None on mainland; impossible to assess for Cape Breton Island population.

Sorex gaspensis Anthony and Goodwin, 1924. Gaspé shrew.

Distribution A relict and disjunct species in Nova Scotia, apparently restricted to Cape Breton Island. First collected there on Kelly's Mountain, Victoria Co., in 1971, and subsequently in two localities in Inverness Co. in 1974 and 1979 (see Fig. 1).

Habitat A species of Transition-zone yellow-birch/sugar maple/balsam fir forests (Kirkland and van Deusen, 1979) on slopes flanking the rivers which drain the Cape Breton Highlands. Large boulders seem a requirement, along with leaf litter and abundant ferns, mosses and forbs. Most specimens collected have been trapped within a few metres of running water.

Biology Does not hibernate. In 1 of 4 localities it was associated with *Microtus chrotorrhinus*, another relict and disjunct species recently discovered in the same basic habitat.

Vulnerability High at present, especially if restricted to the 4 known localities. Two of these are in a national park but are by no means safe from such threats as fire. The two localities outside the park (Kelly's Mtn. and the valley of the Northeast Margaree opposite Sugarloaf Mtn.) are also vulnerable to logging or other human disturbance. In all four known localities, overtrapping by mammalogists is a serious threat.

On the mainland, suitable habitats occur locally on North Mountain, in the Cobequids and in the Pictou-Antigonish Highlands. If this species (or *M. chrotorrhinus*) does occur on the mainland, it is most likely to be found in one or more of these three areas, and every effort should be made to protect sites of suitable habitat, at least until they can be thoroughly investigated.

Sorex palustris gloveralleni Jackson, 1926. Water shrew.

Distribution Locally distributed throughout Nova Scotia. Type locality: Digby, Digby Co., N.S.

Habitat Stream and river banks and lake shores in forests, floodplain meadows or oldfields, and grassy bogs. Very local, often occurring in high-density "pockets". Most frequently found along streams in mixed forest, with abundant vegetative ground cover. The full spectrum of habitats utilized is not yet known. In Cape Breton Highlands National Park, one specimen was trapped on a rocky coastal beach (Roscoe and Majka, 1975), but so little beach trapping has been done in Nova Scotia that we do not know whether water shrews normally occupy such habitats in this province.

Biology The most aquatic of Nova Scotian insectivores. A carnivore, feeding on terrestrial and aquatic invertebrates and small vertebrates. Does not hibernate. Often closely associated with *S. fumeus* (the author has collected both species in the same pitfall trap on the same night).

Vulnerability None on a province-wide basis. Stream pollution, fire, clear-cutting or development may eliminate it locally.

Microsorex hoyi thompsoni (Baird) 1858. Pygmy shrew.

Distribution Throughout Nova Scotia, uncommon to rare and local. Subspecies *thompsoni* has been raised to specific rank by Long (1972).

Habitat Data is insufficient to draw any conclusions, but the species has been collected in hardwood forest, dry upland oldfields, bogs and wet meadows.

Biology Does not hibernate. Little else is known about Nova Scotian populations.

Vulnerability Impossible to assess at present.

Blarina brevicauda pallida R.W. Smith, 1940. Short-tailed shrew.

Distribution Throughout Nova Scotia. Type locality: Wolfville, Kings Co., N.S.

Habitat Coniferous, deciduous and mixed forests of all ages, virtually all successional stages following fire, clear-cutting or cultivation; wet habitats (flooded swamps or bogs) to extremely dry situations such as upland heath barrens; upper zones of saltmarshes; roadside verges; suburban and urban residential areas (where it often enters basements); garbage dumps. Usually most abundant in second growth forest and edge situations.

Biology Does not hibernate. Undergoes unpredictable population fluctuations; for example, 5 specimens were collected in Cape Breton Highlands National Park in 1974, in a total of more than 16,000 trap-nights in all major habitats (Roscoe and Majka, 1975), when mainland populations were at normal levels in most areas. A carnivore and scavenger, sometimes also feeding on seeds or berries.

Vulnerability None.

Family Talpidae (Moles)

Condylura cristata nigra R.W. Smith, 1940. Star-nosed mole.

Distribution Throughout Nova Scotia in suitable habitats. Type locality: Wolfville, Kings Co., N.S.

Habitat Major requirement is soil soft enough to tunnel through. Generally absent where bedrock is very close to soil surface, and in extremely dry areas, but may be found almost anywhere else, including wet habitats with seasonally or permanently waterlogged soils, such as river floodplains or alder swamps. Semi-aquatic, often entering water of ponds and streams.

Biology Does not hibernate. Feeds on a wide variety of soil invertebrates, as well as aquatic animals including invertebrates and small fish, which it captures by swimming and diving. Its tunneling sometimes disturbs lawns and pastures.

Vulnerability None.

Order CHIROPTERA (Bats)
Family Vespertilionidae (Smooth-faced bats)

Myotis lucifugus lucifugus (Le Conte) 1831. Little brown bat.

Distribution Throughout Nova Scotia in summer. Winter distribution inadequately known.

Habitat From late May to mid-October these bats forage wherever flying insects occur, being most noticeable over water or cleared land. Females establish nursery colonies to rear their young, often in the attics of buildings. In the late summer and early fall the bats congregate at suitable hibernation sites, usually caves and abandoned mines. Hibernation requires a stable temperature and humidity regime (2-8°C and 90-100% RH), and security from gross human disturbance.

Biology Hibernates. Females leave hibernacula to establish nursery colonies in May. Males leave in early June and forage and roost separately until late summer, when both sexes begin to return to the hibernaculum, where mating takes place, usually in late fall. They continue feeding as long as enough flying insects are available (usually until mid-October). The bats regularly migrate varying distances between summer roosts and winter hibernacula and, though no bat banding has been done in this province, it is known that in New England the distance can be as great as 170 miles. (Davis and Hitchcock, 1965).

Hayes Cave, in Hants County, is the only known large hibernaculum in Nova Scotia at present (there are doubtless others undiscovered). Miller's Creek Cave, also in Hants County, was occupied by about 6000 bats every winter until the early 1970s, when gypsum-quarrying operations caused the bats to abandon it. There are several small hibernacula which in the recent past have been used by from 50 to 500 bats each, but none have been checked in the last 2 years.

Hayes Cave is located on Five Mile River, about 4.5 km west-southwest of South Maitland. The cave is in the gypsum formation on the south side of the river and is about 400 m long. Between 3700 and 6300 bats occupy it in winter, and regular counts have been made annually from 1977 onward. There is no evidence of a decrease in hibernating bat numbers so far. For data on the cave environment, see Scott (1979).

Vulnerability Any disturbance of present hibernacula could cause dispersal to less favorable sites and probably would lead to increased winter mortality. Nursery colonies in buildings, especially homes, are vulnerable when residents cannot tolerate the presence of bats, and call in exterminators to get rid of them. In the case of Hayes Cave the hibernating bats are subject to air pollution (from fires and cavers' carbide lamps, which give off SO₂), loud noise, including people testing the echo or firing guns (this has happened at least once), and to being burned off the walls with improvised wood, tarpaper or plastic torches. It is fortunate that access to the cave is severely limited for the greater part of each winter. The im-

portance of Hayes Cave, as a unique feature as well as a major hibernaculum for three species of bats, cannot be overemphasized.

Myotis ~~keeni~~ septentrionalis (Trouessart) 1897.

Long-eared bat
~~Keen's bat~~

Distribution Throughout the province. Uncommon to rare.

Habitat Essentially the same as for *M. lucifugus*, as far as is known, but little information available. Usually shares hibernacula with *M. lucifugus*, and in Hayes Cave it comprises about 10% of the total bats present in winter.

Biology Hibernates. Very little is known about Nova Scotia populations. In Hayes Cave, this species usually hibernates in horizontal crevices, rather than hanging head-downward.

Vulnerability The same as for *M. lucifugus*.

Lasionycteris noctivagans (Le Conte) 1831. Silver-haired bat.

Distribution A single record, from Kejimikujik National Park in July 1950 (Bleakney, 1965). The rarest bat in the province.

Habitat The specimen was shot in flight over a forest road. There is no other information on Nova Scotian populations.

Biology Hibernates in other parts of its range, and presumably in Nova Scotia.

Vulnerability Impossible to assess.

Pipistrellus subflavus subflavus (Cuvier) 1833. Eastern pipistrelle.

Distribution Uncommon to rare in Queens, Kings, Hants and Colchester counties; in view of a recent record from southeastern New Brunswick (McAlpine, 1976), this species may prove to be more widely distributed in Nova Scotia than present records indicate.

Habitat Two specimens have been collected over lake shores in Nova Scotia. This species is a cave hibernator in winter and has been found in Hayes Cave, Frenchman's Cave (both in Hants County) and Gays River gold mines in Colchester County.

Biology Hibernates. In Hayes Cave it is generally found in the side-chamber just off the main chamber, and at the far end, and does not mix with the *Myotis* species.

Vulnerability Essentially the same as for both species of *Myotis*.

Lasiurus borealis borealis (Müller) 1776. Red bat.

Distribution Inadequately known. There are three records from boats off the Nova Scotia coast to the south or west of Yarmouth (Bleakney, 1965; Peterson, 1970) and one from Sable Island (July 1976) in the Nova Scotia Museum collection. Rare.

Habitat No information on summer habitat in the province.

Biology Migratory. All extant records are almost certainly of bats in migration.

Vulnerability Impossible to assess.

Lasiurus cinereus (Palisot de Beauvois) 1796. Hoary bat.

Distribution Inadequately known. One from Halifax (17 Nov. 1909), one from Dartmouth (22 Oct. 1917) and one from Seal Island, Yarmouth County (2 Sept. 1971) are in the Nova Scotia Museum collection. Bleakney (1965) cites a record from near Halifax, but does not state whether it was at sea or on land. A roosting hoary bat was discovered on a house in Halifax on 2 Nov. 1980 and sent to the museum; it is now in our collection. This species must be considered rare.

Habitat No information on summer habitat in the province.

Biology Migratory. Records indicate that this species migrates much later in the year than *L. borealis*, but whether migration begins at the same time is not known.

Vulnerability Impossible to assess.

Order RODENTIA (Rodents)
Family Sciuridae (Squirrels and chipmunks)

Tamias striatus lysteri (Richardson) 1829. Eastern chipmunk.

Distribution Throughout Nova Scotia.

Habitat Deciduous and coniferous or mixed forests of most ages and types; ecotones between forest and disturbed land; oldfields and regenerating burns; treed barrens; spruce swamps; stream banks and lake shores; roadside verges; brush piles, stone walls, buildings in rural and suburban areas. Sometimes absent from apparently suitable habitats.

Biology Does not hibernate, but is periodically torpid in winter months. Primarily a herbivore, but feeds on a wide variety of animals at times, including slugs, amphibians and small snakes.

Vulnerability None.

Tamiasciurus hudsonicus gymnicus (Bangs) 1899. Red squirrel.

Distribution Throughout Nova Scotia. Introduced to Seal Island, Yarmouth County, from the mainland.

Habitat Most types and ages of coniferous and mixed forests, and sometimes in pure deciduous stands; forest edges; suburban areas. Enters buildings adjacent to woodlands.

Biology Does not hibernate but is periodically inactive in severe winter weather. Herbivorous, but in spring and summer also becomes a predator on a wide variety of animals, including eggs and nestling birds and small rodents. It is also an important prey species for many raptors and mammalian carnivores. Populations can fluctuate drastically in some parts of the province, as occurred in the summer of 1979 in Guysborough, Antigonish and Pictou counties and most of Cape Breton Island, when red squirrels seemed to have virtually disappeared.

Vulnerability None.

Glaucomys sabrinus gouldi Anderson, 1943. Northern flying squirrel.

Distribution Throughout Nova Scotia. Type locality: Frizzleton [now Margaree Valley], Inverness Co., N. S.

Habitat Mature coniferous and mixed forests, particularly where there are dead or dying trees. Often inhabits birdhouses, camps or cottages in wooded and suburban areas. Though seldom seen, it is one of the most abundant squirrels in the province.

Biology Does not hibernate, but is periodically inactive in winter. Like the red squirrel, it is a facultative carnivore in spring and summer. Often forages on the ground.

Vulnerability None.

Glaucomys volans volans (Linnaeus) 1758. Southern flying squirrel.

Distribution A relict and disjunct species in the province, known only from Kejimikujik National Park, where it was discovered in 1971 (Wood and Tessier, 1974). Within the park it appears to be generally distributed in the southeastern half.

Habitat Recorded in mixed forest, a stand of red oak and a campsite.

Biology Virtually nothing is known regarding Nova Scotian populations.

Vulnerability Protected within the park, but could be vulnerable to extensive fire and possibly over-trapping.

Family Cricetidae (Mice and voles)

Peromyscus maniculatus abietorum Bangs, 1896. Deer mouse.

Distribution Most of Nova Scotia. Absent or extremely localized in the 10 to 15 km-wide coastal zone running from western Digby Co. around to Cole Harbour, Halifax Co. In the interior of western Nova Scotia it is local and sometimes common, but seldom as abundant as *P. leucopus*. North of a line from Truro to Canso it is widespread and abundant. The exact limits of its distribution, particularly where it is sympatric with *P. leucopus*, still need investigation. Type locality: James River, Antigonish Co., N. S.

Habitat Mature and second-growth deciduous, coniferous and mixed forests; forest edges, clear-cuts; barrens; regenerating burns, oldfields, roadside verges; bogs, river and stream banks, lakeshores, coastal beaches; often enters buildings. Where locally sympatric with *P. leucopus* it is usually restricted to the moist and conifer-dominated habitats, and is absent from many edge situations, while *leucopus* dominates the drier forests and disturbed habitats, especially where hardwoods are dominant (Kelly, 1978).

Biology Does not hibernate. Nova Scotia populations fluctuate, but not always in synchrony throughout the province. A major prey species for raptors and mammalian predators.

Vulnerability None.

Peromyscus leucopus caudatus R. W. Smith, 1939. White-footed mouse.

Distribution The Nova Scotia mainland south of a line from Truro to Eddy Point, Guysborough Co. It is apparently local and discontinuous in Guysborough and eastern Halifax counties, with populations in the lower St. Mary's River valley (discovered in 1971) and in the East Roman Valley, both in Guysborough Co. The East Roman Valley records are from the 1930s and the author failed to capture any specimens there in 1978, though *P. maniculatus* was present. There is one questionable literature record from near Tatamagouche, Colchester Co. (Peterson, 1966). Type locality: Wolfville, Kings Co., N. S.

Habitat Mature and second-growth coniferous, deciduous and mixed forests; black spruce swamps; forest edges; regenerating burns; barrens, oldfields, clear-cut areas; roadside verges; stream and river banks, lake shores and bog margins; coastal beaches; wooded urban parks; often enters buildings. Where locally sympatric with *P. maniculatus*, it tends to dominate in drier forests and disturbed or edge habitats.

Biology Does not hibernate. Populations fluctuate locally.

Vulnerability None in central and western Nova Scotia; the populations in Guysborough County, if they prove to be isolated, could be vulnerable to large-scale development of housing tracts or shopping centres, which is not likely in the next decade.

Clethrionomys gapperi pallescens Hall and Cockrum, 1952. Red-backed vole.

Distribution Throughout Nova Scotia. Type locality: Wolfville, Kings Co., N.S.

Habitat Mature and second-growth coniferous, deciduous and mixed forest; forest edges; regenerating clear-cuts, burns and oldfields; wooded swamps, ericaceous and sphagnum bogs; barrens and salt-spray barrens; roadside verges; stream and river banks, lake shores; rocky coastal beaches. Most abundant in mixed forest near water. Not recorded from saltmarshes, hayfields and pastures, wet meadows or croplands. The most widespread and abundant small mammal in the province.

Biology Does not hibernate. An important prey species for bird and mammal predators. Populations fluctuate, though not always in synchrony throughout the province. A population around Barrington Passage, Shelburne Co., shows an unusually high incidence of melanism (10-15% in large samples, as much as 50% in small samples).

Vulnerability None, except in the Barrington Passage population, which is of great interest and could be significantly affected by extensive development.

Synaptomys cooperi cooperi Baird, 1857. Southern bog lemming.

Distribution Throughout the province in suitable habitats. Uncommon. Most records are from the south-western mainland of Nova Scotia.

Habitat Pure stands of white pine, balsam fir and hemlock; mixed forest; streambanks in mixed forest; wooded talus slope; sphagnum bogs. No habitat information was recorded for the majority of specimens taken in the province.

Biology Does not hibernate.

Vulnerability Impossible to assess.

Microtus pennsylvanicus acadicus Bangs, 1897. Meadow vole.

Distribution Throughout the province, including some coastal islands.
Type locality: Digby, Digby Co., N. S.

Habitat Grasslands generally, including hayfields, oldfields, pastures, floodplain meadows, highway margins; sedge swamps; coastal salt-spray barrens and grasslands; upper zone of saltmarshes; grass, heath and sphagnum bogs; grassy alder swamps; forest edges; open forest with ground cover of grasses and forbs; can be found in forests along grassy logging roads miles from the nearest extensive open habitats.

Biology Does not hibernate. Populations fluctuate on a \pm 4-year cycle, sometimes reaching plague proportions in parts of Nova Scotia (Patterson, 1888), when it can be a serious pest of crops, fruit-trees and stored vegetables. An important prey species for bird and mammal predators.

Vulnerability None.

Microtus chrotorrhinus chrotorrhinus (Miller) 1894. Rock vole.

Distribution A relict and disjunct species in this province, apparently restricted to Cape Breton Island. First discovered in Cape Breton Highlands National Park in 1974 (Roscoe and Majka, 1976) and subsequently in the Northeast Margaree valley in 1979 (Gordon Kirkland, pers. comm.).

Habitat A species of Transition-zone forests (Kirkland and Knipe, 1979) on the steep slopes of river valleys draining the Cape Breton Island plateau, usually where there are large boulders. In two of the three known localities it was collected near running water. At the Northeast Margaree site it was associated with *Sorex gaspensis*.

Biology Does not hibernate.

Vulnerability Two of the three known localities are within a national park, but are still vulnerable to fire and over-trapping. The Northeast Margaree locality is vulnerable to logging and other human disturbance as well.

Family Zapodidae (Jumping mice)

Zapus hudsonius acadicus (Dawson) 1856. Meadow jumping mouse.

Distribution Throughout Nova Scotia in suitable habitats. Type locality: "Nova Scotia".

Habitat Floodplain, wet or boggy meadows; hayfields; sphagnum and black spruce bogs and barrens; stream and river banks; lake shores; saltmarshes; dry oldfields; roadside verges; birch/aspen, poplar/birch and other successional stages on burns and clear-cuts; logging roads; alder swamps; coniferous, deciduous and mixed forests.

Biology Hibernates. This and the following species are thus partially protected from severe winter conditions, especially extreme low temperatures with little or no snow cover.

Vulnerability None.

Napaeozapus insignis insignis (Miller) 1891. Woodland jumping mouse.

Distribution Throughout the province. The most common jumping mouse in Nova Scotia.

Habitat Deciduous, coniferous and mixed forests of all ages; forest edges; alder swamps; birch/aspen fire succession; regenerating clear-cuts and oldfields; barrens; black spruce and heath bogs; shrubby thickets; stream and river banks and lake shores; grassy floodplain and boggy meadows; roadside verges; salt-spray barrens. Most common along streams in mature forests. Often associated with *Z. hudsonius*.

Biology Hibernates.

Vulnerability None.

LITERATURE CITED

Barnes, R. 1973. Bats in the Nova Scotia Museum collection. Curatorial Report No. 15, Nova Scotia Museum, Halifax. 4 pp.

Bleakney, J. S. 1965. Notes on the migratory tree bats of Nova Scotia. Can. Field-Naturalist, 79: 154-155.

- Davis, W. H. and H. B. Hitchcock. 1965. Biology and migration of the bat, *Myotis lucifugus*, in New England. J. of Mammalogy, 46: 296-313.
- Gilhen, J. 1974. Distribution, natural history and morphology of the blue-spotted salamanders, *Ambystoma laterale* and *A. tremblayi* in Nova Scotia. Curatorial Report No. 22, Nova Scotia Museum, Halifax. 38 pp.
- Kelly, C. 1978. The distribution of *Peromyscus maniculatus* and *Peromyscus leucopus* in Nova Scotia. Unpublished MS. On file at Nova Scotia Museum and Acadia University Biol. Dept. 31 pp.
- Kirkland, G. L. Jr., and C. M. Knipe. 1979. The rock vole (*Microtus chrotorrhinus*) as a Transition Zone species. Can. Field-Naturalist, 93: 319-321.
- _____, and H. M. van Deusen. 1979. The shrews of the *Sorex dispar* group: *Sorex dispar* Batchelder and *Sorex gaspensis* Anthony and Goodwin. American Museum Novitates, No. 2675. 21 pp.
- Long, C. A. 1972. Taxonomic revision of the mammalian genus *Microsorex* Coues. Trans. Kansas Academy of Science, 74: 181-196.
- McAlpine, D. F. 1976. First record of the eastern pipistrelle in New Brunswick. Can. Field-Naturalist, 90: 476.
- Patterson, G. 1888. The plague of mice in Nova Scotia and Prince Edward Island. Story of the disastrous ravages of 1775 and 1815 told by Rev. George Patterson, D. D. The Nova Scotian, 21 Jan. 1888:8.
- Peterson, R. L. 1966. The mammals of eastern Canada. Oxford University Press, Toronto. xxxii + 465 pp.
- _____ 1970. Another red bat, *Lasiurus borealis*, taken aboard ship off the coast of Nova Scotia. Can. Field-Naturalist, 84:401.
- Roscoe, B., and C. Majka. 1974. The mammals of Cape Breton Highlands National Park. Report to the Canadian Wildlife Service. Fredericton, N. B.
- _____ 1976. First records of the rock vole (*Microtus chrotorrhinus*) and the Gaspé shrew (*Sorex gaspensis*) from Nova Scotia and a second record of the Thompson's pygmy shrew (*Microsorex thompsoni*) from Cape Breton Island. Can. Field-Naturalist, 90: 497-498.
- Scott, F. 1979. Preliminary investigations at Hayes Cave, Hants County, Nova Scotia, in 1978. Curatorial Report No. 38, Nova Scotia Museum, Halifax. 14 pp.
- Wood, T. J., and G. D. Tessier. 1974. First records of eastern flying squirrel (*Glaucomys volans*) from Nova Scotia. Can. Field-Naturalist, 88:83-84.

