

Update COSEWIC STATUS REPORT

on
Eastern Mole
(*Scalopus aquaticus*)

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Gerald E. Waldron

SPECIAL CONCERN
1998



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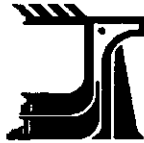
COSEWIC Secretariat
c/o Canadian Wildlife Service
Environment Canada
Ottawa, ON
K1A 0H3

Tel: (819) 997-4991/(819) 994-2407/(819) 953-3215

Fax: (819) 994-3684

E-mail: sylvia.normand@ec.gc.ca
shirley.sheppard@ec.gc.ca
shirley.hamelin@ec.gc.ca

Cover illustration: Eastern Mole - Frontal View - Courtesy of Illinois Natural History Survey.



Eastern Mole

Reason for status: Very restricted range in southern Ontario with limited and fragmented habitat. Ecological specialist with low dispersal abilities. Potential threat from direct killing. [Designated vulnerable in 1980 and reconfirmed as vulnerable in 1998.]

Occurrence: Ontario

NOTES

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COSEWIC

A committee of representatives from federal, provincial and private agencies that assigns national status to species at risk in Canada and the chairs of the scientific species specialist groups

COSEPAC

Un comité de représentants d'organismes fédéraux, provinciaux et privés qui attribue un statut national aux espèces canadiennes en péril ainsi que des président(e)s des groupes des spécialistes scientifiques.

Update
COSEWIC Status Report

on

Eastern Mole
(*Scalopus aquaticus*)

by

Gerald E. Waldron
7641 County Road 20, R.R. No. 1
Amherstburg, Ontario
N9V 2Y7

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Environment Canada

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Executive Summary

Distribution

The Eastern Mole (*Scalopus aquaticus*) is widespread in eastern North America. In Canada it is confined to a small area of about 350 km² in southwestern Ontario. There are historical records and recent observations from Essex County (Colchester South, Gosfield South, Gosfield North, Meresea townships) and a small area in adjacent Kent County.

Habitat

The preferred habitat of the mole is stone-free sand and sandy loam soil with a cover of woody plants. Moles are also found in urbanized areas in parks, cemeteries and home grounds. The total natural habitat available to the species in Canada is calculated at 1,060 hectares of which 810 ha. is contained within Point Pelee National Park.

General biology

The Eastern Mole is a fossorial mammal that inhabits subterranean tunnel systems. The tunnels provide shelter and are used as foraging areas. The diet is mostly earthworms and some larval invertebrates. This species is solitary and defends its tunnels from other individuals. Reproductive rate is low with females producing one litter per year with an average litter size of four young.

Populations

Thirteen years of monitoring data from Point Pelee National Park indicate that although the Eastern Mole population within the park has exhibited some significant variation between years, there has not been a clear trend for either a decrease or increase in the population. Outside Point Pelee, the range appears to have expanded slightly to the east and west, but continued expansion will be constrained by unsuitable soil types which occur just one to two kilometres beyond the present documented range. Based on estimates of the total available habitat and population densities published for the United States (2-12 moles per ha.), the total Canadian population is estimated to range from 2,000-13,000 animals.

Limiting factors

The availability of suitable soils (sandy loam soils that are not cultivated) is the most limiting factor for this species. With the exception of Point Pelee National Park, most of the potential soil habitat available to the Eastern Mole within the Canadian range has been converted to agriculture and other uses incompatible with mole habitation.

Evaluation and proposed status

Although much of the range is contained within a protected national park and there is no evidence of population declines, it is recommended that the Eastern Mole continue to be designated Vulnerable in Canada. Less than 4% of the land area remains as natural habitat for this species. Its distributional area in Canada is small and fragmented; the Canadian population is also highly isolated by water barriers from the nearest populations in the United States.

Résumé

Répartition

La taupe à queue glabre (*Scalopus aquaticus*) est très répandue dans l'Est de l'Amérique du Nord. Au Canada, son habitat se limite à une région d'environ 350 km² dans le Sud-Ouest de l'Ontario. Il y a eu des observations récentes de ces taupes dans le comté d'Essex (municipalités de Colchester South, de Gosfield South, de Gosfield North et de Meresea) et dans une petite zone du comté adjacent de Kent. Il existe également des documents historiques dans ces comtés.

Habitat

Les taupes préfèrent un sol sablonneux sans caillou ou du sable limoneux recouvert de plantes ligneuses. Les taupes vivent aussi dans les parcs, les cimetières et les terrains privés des zones urbaines. Cette espèce dispose d'un habitat naturel au Canada de 1 060 hectares dont 810 ha se situent dans le Parc national de la Pointe-Pelée.

Biologie générale

La taupe à queue glabre est un mammifère fouisseur qui habite un réseau de galeries souterraines. Les galeries servent d'abri et d'aire d'alimentation. Leur régime se compose principalement de vers de terre et d'invertébrés larvaires. Cette espèce est solitaire et protège ses galeries contre d'autres individus. Le taux de reproduction est faible. Les femelles ont une seule portée par année produisant quatre petits en moyenne.

Populations

Treize ans de données de surveillance de la taupe dans le Parc national de la Pointe-Pelée indiquent que, malgré des variations importantes de la population du Parc au cours des années, il n'y a eu aucune tendance démographique croissante ou décroissante. L'aire de répartition de la taupe à l'extérieur du Parc s'est étendue légèrement vers l'Est et l'Ouest. Cependant, l'expansion sera limitée à cause de la nature inappropriée des sols à un ou à deux kilomètres de l'aire documentée. D'après des estimations sur l'habitat disponible total et les densités des populations (de 2 à 12 taupes par ha), publiées pour les États-Unis, la population canadienne totale se chiffre entre 2 000 et 13 000 individus.

Facteurs limitants

La disponibilité de sols appropriés (sable limoneux non cultivé) est le facteur qui limite le plus cette espèce. À l'exception du Parc national de la Pointe-Pelée, presque tout l'habitat naturel éventuel dont disposent les taupes à queue glabre au

Canada est utilisé à des fins agricoles ou à d'autres usages qui ne permettent pas aux taupes de vivre dans leur habitat.

Évaluation et proposition de statut de l'espèce

Bien que l'aire de répartition soit située presque entièrement dans un parc national protégé et que rien ne laisse présager un déclin de la population, il est recommandé que la taupe à queue glabre conserve sa désignation d'espèce vulnérable au Canada. Il reste moins de 4 p. 100 de son territoire qui peut être considéré comme un habitat naturel. L'aire de répartition au Canada est petite et fragmentée. De plus, des plans d'eau isolent la population du Canada des populations des États-Unis les plus proches.

Abstract

The Eastern Mole (Fr. Taupe à queue glabre) *Scalopus aquaticus L.*, although widespread in North America, is confined to a small area of 350 square kilometres in southern Essex County and adjacent Kent County in southwestern Ontario. With the exception of Point Pelee National Park, most of the habitat available to moles within the Canadian range has been converted to agriculture and other uses incompatible with mole habitation. Less than 4% of the land area remains as natural habitat. The preferred habitat of the mole is stone-free sand and sandy loam soil with a cover of woody plants. Moles are also found in urbanized areas in parks, cemeteries and home grounds. The total natural habitat available to the species in Canada is calculated at 1,060 hectares of which 810 ha. is contained within Point Pelee National Park. This area of habitat is calculated to support 2,000-13,000 moles at a density of 2-12 moles per hectare. Thirteen years of mole monitoring data from Point Pelee National Park indicate that although the population within the park has exhibited some significant variation between years, there has not been a trend towards a decrease or increase in the population. Outside the National Park, the range of the species appears to have expanded slightly to the east and west, but continued expansion will be constrained by unsuitable soil types which occur just one to two kilometres beyond the present documented range. The status of Vulnerable is recommended for the Eastern Mole in Canada.

Abrégé

La taupe à queue glabre, *Scalopus aquaticus* L., bien que très répandue en Amérique du Nord, a un habitat qui se limite à une région de 350 km² dans le comté d'Essex sud et le comté adjacent de Kent dans le Sud-Ouest de l'Ontario. À l'exception du Parc national de la Pointe-Pelée, presque tout l'habitat naturel des taupes au Canada est utilisé à des fins agricoles ou à d'autres usages qui ne permettent pas aux taupes de vivre dans leur habitat. Il reste moins de 4 p. 100 du territoire qui peut être considéré comme habitat naturel. Les taupes préfèrent un sol sablonneux sans caillou et du sable limoneux recouvert de plantes ligneuses. Les taupes se retrouvent aussi dans les parcs, les cimetières et les terrains privés des zones urbaines. Cette espèce dispose d'un habitat naturel au Canada de 1 060 ha dont 810 ha se situent dans le Parc national de la Pointe-Pelée. On évalue que cet habitat naturel peut soutenir de 2 000 à 13 000 taupes, selon une densité de 2 à 12 taupes par hectare. Treize ans de données de surveillance de la taupe dans le Parc national de la Pointe-Pelée indiquent que, malgré des variations importantes de la population du Parc au cours des années, il n'y a eu aucune tendance démographique croissante ou décroissante. À l'extérieur du Parc national, l'aire de répartition de la taupe s'est légèrement étendue vers l'Est et l'Ouest, cependant, l'expansion sera limitée à cause de la nature inappropriée des sols à un ou à deux kilomètres de l'aire documentée. On recommande que le statut d'espèce vulnérable soit accordé à la taupe à queue glabre au Canada.

Distribution

The Eastern Mole has the widest range of any North American mole species. The range includes the northern portion of the Mexican State of Tamaulipas north into the U.S.A. to southeastern South Dakota, east to Massachusetts and south to the southernmost tip of Florida (Yates and Pedersen 1982). This includes most of the central and eastern United States (Fig. 1). In Canada, collections and recent sightings have been restricted to the southern and eastern townships of Essex County, Ontario. These include the four Townships of Colchester South, Gosfield South, Gosfield North and Mersea. Canadian specimens at the Royal Ontario Museum, Toronto (Appendix 1) and the Canadian Museum of Nature, Ottawa, and records from the Atlas of the Mammals of Ontario (Dobbyn 1994) (Appendix 2), are all from these four townships.

In 1911, Saunders (1932) examined a mole specimen reputed to have been collected at the Town of Strathroy, in Middlesex County, a distance of 120 kilometres from the Essex County range and in the same publication reported another observation from near the Town of Rodney, in Elgin County, a distance of 84 km. from the Essex County range. Macauley (1980) was unable to locate the Strathroy specimen for verification and an examination of the *Scalopus aquaticus* specimens held by the Canadian Museum of Nature, Ottawa (but stored in a facility at Aylmer, Quebec) by the author of this report, showed that all Canadian specimens were collected at Point Pelee National Park, Essex County (Table 1). Therefore, the Strathroy station mapped as a National Museum record in the 1980 Status Report is presumably based on Saunders' (1932) report in 'Notes on the Mammals of Ontario' which reads as follows:

"Common locally in Essex county near Leamington only. Point Pelee is doubtless the area of greatest abundance, but I saw some workings near Harrow, some twenty miles west of the point in June, 1909; and in November, 1910, a newspaperman from Rodney described one that was taken nearby that autumn. In 1911, I saw one in the possession of Mr. Lamotte at Strathroy, which had been taken near that town some year previously. All other reports I have received are more likely to be of the Brewer mole,..."

Noted Canadian mammalogists R.L. Peterson (1966) and C.G. van Zyll de Jong (1983) do not accept Saunders' records for Rodney and Strathroy.

Records collected for the Atlas of the Mammals of Ontario Atlas project (Dobbyn 1994) (Appendix 2) suggest that the Eastern Mole occupies its historic range and the fieldwork associated with this updated report has confirmed these records and expanded the known range slightly, both eastward and westward. Prior to 1997 the species was not recorded in Kent County or within the Town of Harrow, Essex County.



Figure 1. Range of Eastern Mole in North America. (after Jones and Birney 1988)

Table 1: Point Pelee National Park Eastern Mole Monitoring.
 Yearly Summary of Counts of Observed Mole Features
 1985-1997

	1985	86	87	88	89	90	91	92	93	94	95	96	97
<u>Transect 1</u>													
Runways	11	11	8	16	5	8	10	16	14	12	12	7	9
Pushups	3	2	19	9	7	3	-	8	7	15	8	15	3
<u>Transect 2</u>													
Runways	7	12	18	36	12	26	13	34	37	13	9	7	14
Pushups	4	2	46	38	12	25	9	25	44	29	14	18	19
<u>Transect 3</u>													
Runways	-	4	31	16	4	15	7	2	10	8	5	4	5
Pushups	-	3	57	25	6	16	1	2	5	2	13	17	0
<u>Transect 4</u>													
Runways	-	2	11	20	8	22	16	19	18	6	7	5	15
Pushups	-	1	28	25	16	21	4	4	6	3	11	6	8
<u>Transect 5</u>													
Runways	3	4	11	20	8	22	11	14	17	10	8	6	8
Pushups	-	-	2	25	16	21	3	4	2	2	4	5	1
<u>Transect 6</u>													
Runways	1	12	7	14	19	31	8	8	21	12	6	18	6
Pushups	-	3	12	15	15	15	4	18	15	3	6	4	2
TOTAL													
Runways	22	45	86	122	56	124	65	93	117	61	47	47	57
Pushups	7	11	164	137	72	101	21	61	79	54	56	65	33

Mole works seen outside Point Pelee National Park during the 1997 field season are recorded in Table 2. Seemingly suitable sites where mole works were not seen in 1997 are recorded in Table 3.

Macauley (1980) noted that, based on a personal communication with S.L. Cumbaa, there is no evidence of the species in any archaeological material unearthed in Canada nor, according to Harrington (1978), from the Quaternary fossil record.

Protection

The species receives no legal protection in states of the U.S.A., although trapping and other methods of damage control may be limited by state and local laws (Henderson 1983). The 'global rank' assigned to the species is G5 (very common). It is listed as vulnerable by the Ontario Ministry of Natural Resources based on the COSEWIC designation of 1980. The Natural Heritage Information Centre for Ontario has assigned the species a S1 S2 rank and is actively 'tracking' information on occurrences of the species. An S1 rank is defined as:

"extremely rare in Ontario; usually 5 or fewer occurrences in the province or very few remaining individuals; often especially vulnerable to extirpation".

An S2 rank is defined as:

"very rare in Ontario; usually between 5 and 20 occurrences in the province or with many individuals in fewer occurrences; often susceptible to extirpation".

None of these designations confer legal protection on the species.

Probably the largest interbreeding population of Eastern Moles in Canada is found in Point Pelee National Park where the species is legally protected. Smaller populations are found in Conservation Areas owned by Conservation Authorities where they are also legally protected. Specifically, these areas are: Two Creeks C.A. owned by the Lower Thames Conservation Authority; Kopegaron Woods C.A., Arner Point C.A. and Cedar Creek C.A. owned by the Essex Region Conservation Authority.

Other mole habitat occurs in areas which have been designated Carolinian Canada Sites, Areas of Natural and Scientific Interest or Environmentally Significant Areas. These designations are assigned by various agencies and often overlap. Mole habitat under such designation receives some protection through the Implementation Guidelines in the Comprehensive Set of Policy Statements contained in the Ontario Planning Act. The goal of the Policy Statements is "To protect the quality and integrity of ecosystems including air, water, land and biota..." Policy A1.2 begins by stating that

Table 2: Sites Where Eastern Mole works were observed in 1997.
(outside Pt. Pelee National Park)

<u>Name of Site</u>	<u>Location</u>	<u>U.T.M. Coordinates</u>
Two Creeks Conservation Area	Wheatley, Kent Co.	793 635
Bank of West Branch of Two Creeks	Wheatley, Kent Co.	790 601
Fairview Cemetery	Wheatley, Essex Co.	789 601
Kopegaron Conservation Area	Mersea Twp., Essex Co.	765 591
Evergreen Memorial Cemetery	Leamington, Essex Co.	650 560
Seacliff Park	Leamington, Essex Co.	671 543
Harrow Park	Harrow, Essex Co.	414 546
Cedar Creek Conservation Area	Colchester South Twp., Essex Co.	487 543
New Settlement Woods Environmentally Significant Area (E.S.A.)	Colchester South Twp., Essex Co.	414 522
Arner Point Conservation Area	Gosfield South Twp., Essex Co.	497 542
Harrowood Retirement Community	Harrow, Essex Co.	409 548
Holy Family Retreat House	Oxley, Essex Co.	434 501
Klie's Sugar Bush (Arner Spleenwort Woods E.S.A.)	Gosfield South Twp., Essex Co.	462 535
G. Moulard farm	Mersea Twp., Essex Co.	740 586
Mill Creek ravine	Kingsville, Essex Co.	554 548
1060 Point Pelee Drive (Essex Rd. 33)	Mersea Twp., Essex Co.	713 497
White Oak Woods E.S.A.	Mersea Twp., Essex Co.	734 603
Bennie Woods	Leamington, Essex Co.	698 538
Cinnamon Fern E.S.A.	Mersea Twp., Essex Co.	727 565
Sweetfern Woods E.S.A.	Mersea Twp., Essex Co.	726 627
Greenbrier Woods E.S.A.	Gosfield North Twp., Essex Co.	641 640
Oxley Poison Sumac Swamp E.S.A.	Colchester South Twp., Essex Co.	452 526
Kingsville Golf & Curling Club	Gosfield South Twp., Essex Co.	535 555
Union Ravine	Gosfield South Twp., Essex Co.	612 553

Table 3: Sites where Eastern Mole works were not observed in 1997.

<u>Name of Site</u>	<u>Location</u>	<u>U.T.M. Coordinates</u>
Wheatley Provincial Park	Wheatley, Kent Co.	805 604
East Mersea Public School	Mersea Twp., Essex Co.	768 600
Olinda Unitarian-Universalist Cemetery	Gosfield South Twp., Essex Co.	618 605
Kennedy Woods, Jack Miner Sanctuary	Gosfield South Twp., Essex Co.	555 582
Ruthven Cemetery	Gosfield South Twp., Essex Co.	639 562
Heinz Woods	Leamington, Essex Co.	679 555
Union Water Plant	Gosfield South Twp., Essex Co.	614 554
Kurtz farm	Colchester South Twp., Essex Co.	548 484
Oxley Italian Park	Colchester South Twp., Essex Co.	417 495
Iler Baptist Cemetery	Gosfield South Twp., Essex Co.	477 511
Palen Road Woodlot	Colchester South Twp., Essex Co.	400 511
St. Marks Cemetery	Colchester South Twp., Essex Co.	398 516
Anderson Woods	Gosfield South Twp., Essex Co.	595 583
Bayview Cemetery	Mersea Twp., Essex Co.	686 544
Hillman Marsh Conservation Area	Mersea Twp., Essex Co.	768 535
Affleck Woods	Colchester South Twp., Essex Co.	430 560
Lot 10, Concession III.	Colchester South Twp., Essex Co.	414 575
Marentette Beach	Mersea Twp., Essex Co.	767 528
Anglican Church Cemetery	Colchester, Essex Co.	402 496
Fish Point Provincial Nature Reserve	Pelee Island	608 212
LaSalle	Essex Co.	312 780
Strathroy	Caradoc Twp., Middlesex Co.	481 548
Rodney	Aldborough Twp., Elgin Co.	432 134

"Natural heritage features and areas will be protected." All remaining natural areas in Essex County receive a degree of protection through the consideration of planning policies when municipal Official Plans are developed.

Given the fossorial habits of the species, it would be difficult to determine what exact proportion of the Canadian population, or its occupied habitat, is under various forms of protection.

Habitat

Dagg (1974) described the habitat of the Eastern Mole in Ontario as meadows, open woodlands, gardens and lawns with moist but well drained soil. Van Zyll de Jong (1983) described the Canadian habitat as soft, moist soils with humus in forests or fields; Banfield (1974) described it similarly as moist, friable loams in open woodlands and pastures. Both van Zyll de Jong and Banfield noted the species' avoidance of gravel and stony soils although Banfield also stated that dry sands are avoided. In the U.S. portion of the range, Arlton (1936) noted that loose and sandy soil was not favoured unless there was moisture and abundant food to compensate for the "inconvenience" of digging. He also noted the general avoidance of gravel and stony soils, although he had seen a tunnel on a "small stony plateau". Arlton appears to be the first observer to note that hillsides were preferred over hilltops, that, although floodplains are suitable as habitat and moles may become numerous, large numbers are drowned during floods and that moles may leave a soil that becomes dry, hot, hard and depleted of food.

Hamilton (1943) states that the Eastern Mole frequents open fields and pastures but is also found in thin woods and meadows. He further states that the species is more common in the southern U.S. and that in the southern states cultivated fields are "riddled" with burrows after a rain.

In Michigan, Baker (1983) described the most favourable habitat as alluvial soils along streams especially where forest and shrub cover provide shade although moist and friable loam and sandy soil under forest duff in woodlots were also frequented. He also noted that where fertilizers are used in parks, golf courses, residential areas, cemeteries and pasture, the conditions exist for an increase in mole prey and hence mole numbers. Further, he states that fertilization plus agricultural tillage have improved the mole habitat in southern Michigan and allowed the species to spread.

In Illinois, Hoffmeister (1989) found the Eastern Mole in a variety of habitats as long as the soil was sufficiently soft to allow it to be pushed upwards and sideways. In such soils they could be found in mature and young woodlands, pasturelands, gardens, cemeteries, plowed fields, mown lawns and crops of corn and soybeans.

In Indiana, Mumford and Whitaker (1982) reported that the species was found in moist habitats, even in areas that were periodically flooded although excessive soil moisture seemed to "inhibit it". Open fields, lawns, roadsides, open woods, gardens and cultivated fields were all reported as suitable habitat. Loose, fairly moist soils were preferred but they found a mole extending a tunnel through "very dry, clay soil in a woods".

Similarly, Jones and Birney (1988) report that although moist, loose soils are preferred by Eastern Moles, all but the driest and hardest substrates in both forested and non-forested habitats are occupied.

During the 1997 fieldwork for this study, Eastern Mole works were observed on the following soil types: Berrien Sand, Berrien Sandy Loam, Brookston Clay Sandspot Phase, Caistor Sand Spot Phase, Eastport Sand, Fox Sandy Loam, Harrow Sand, Harrow Sandy Loam, Plainfield Sand, and Tuscola Fine Sandy Loam. These soils can be typified as being stone-free, loose (coarse-textured) and, where topography permits, fast draining. They range from slightly alkaline to moderately acid. Caistor Sand Spot Phase and Brookston Clay Sand Spot Phase are dense, stone-free, clay soils with sandy knolls of variable size and depth overlying the clay. On these soils, moles are restricted to the sandy knolls. The location of the soil types suitable as Eastern Mole Habitat in Essex and Kent Counties, Ontario is mapped in Figure 2.

In Essex County, Eastern Mole works were not observed in clay or gravelly soils, in very loose, sparsely vegetated sands or in open sunny areas without shade. Tunnels were observed to radiate out from shady areas, in some cases from the shade provided by a single tree or clump of bushes. Tunnels were not seen in pastures or cultivated fields except where these were immediately adjacent to fencerows or other areas with undisturbed soils and in those cases the tunnels only penetrated into the cropland a distance of three metres or less.

Soil types presently used by the Eastern Mole in Essex County total 17,400 hectares. The Sand Spot phases of Caistor and Brookston soils total 7,890 ha. but only the sandy knolls on these soils provide suitable habitat, therefore the actual amount of suitable habitat contributed by these two soil types is unknown and not included in the 17,400 ha. The latest figures available from the Essex Region Conservation Authority show that 4.2% of Essex County consists of forest and hedgerows suitable for moles. If 4.2% of the suitable soils have the habitat needed by moles, then approximately 1,060 ha. of natural habitat is available for mole habitation in Essex County. This figure is at best a very rough estimate for at least three reasons. First, some of the areas with suitable soil are well outside the present range of the mole and will be difficult to colonize. Secondly, the four townships in Essex County that encompass the present range do not have a uniform 4.2% appropriate natural cover. 1992 forest cover data from the Essex Region Conservation Authority shows Colchester South with 6.56% forest cover (hedgerows not included), Gosfield South

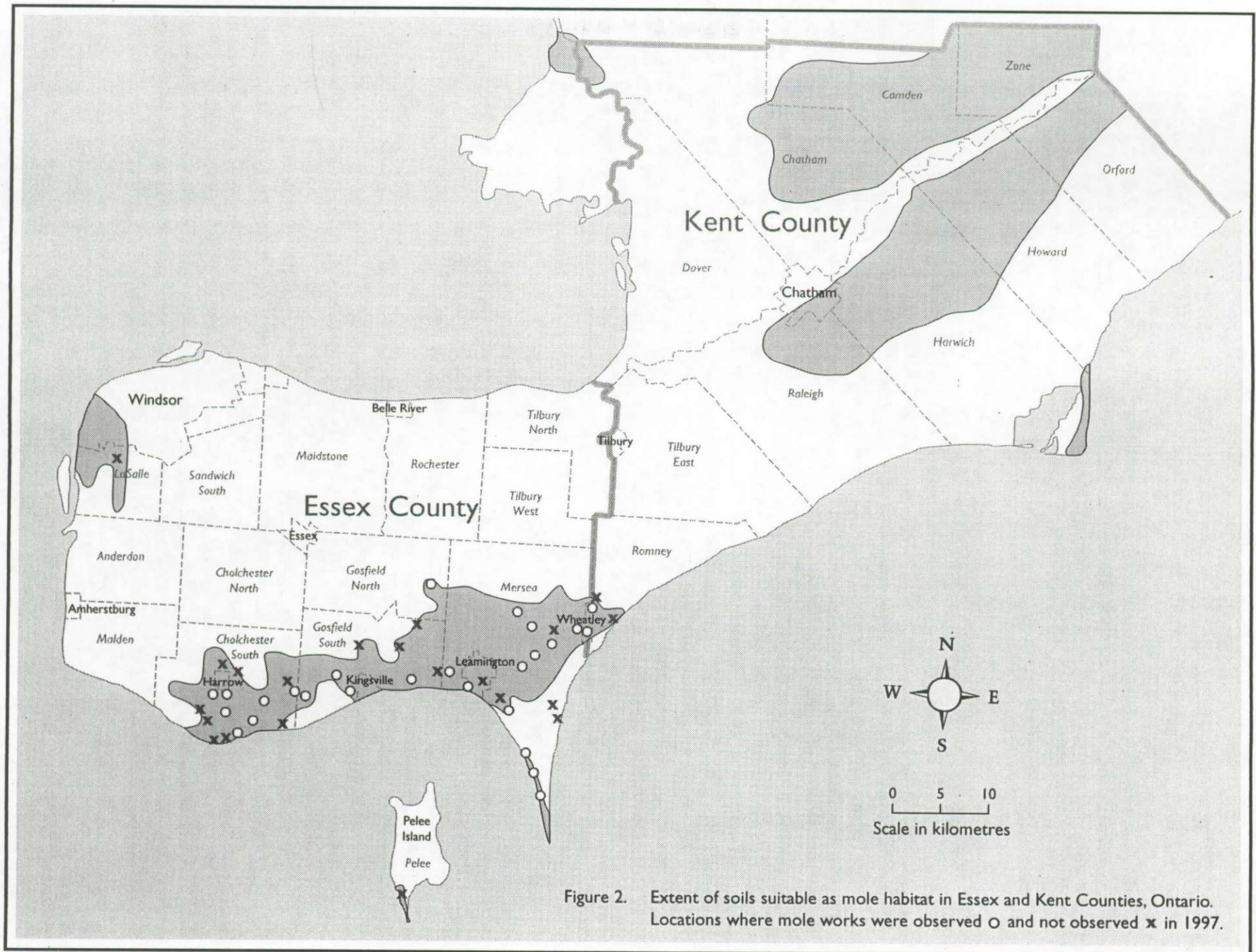


Figure 2. Extent of soils suitable as mole habitat in Essex and Kent Counties, Ontario. Locations where mole works were observed O and not observed x in 1997.

with 6.06%, Gosfield North with 1.61% and Mersea with 2.46%. Thirdly, moles live in places other than natural habitat; for example, in disturbed areas such as cemeteries, manicured parks, orchards, and suburbs. Macauley (1979) noted that at Point Pelee National Park, the species appeared tolerant of human disturbance; roads and pathways did not block movement. Flooded areas were recolonized within a few years after the water receded even where roads acted as barriers and mole works were seen along even intensively used roads and paths.

General Biology

The Eastern Mole is the only species in the genus *Scalopus*. According to some authorities there are 16 subspecies (Yates and Schmidly 1978); Eastern Moles in Canada belong to the largest of these subspecies, *S. aquaticus machrinus*, sometimes called the Prairie Mole. The species is almost entirely fossorial (Harvey 1976, Peterson 1966) but it does occasionally come to the surface as evidenced by roadkills at Point Pelee National Park (G. Mouland, pers. comm.) and kills by owls and domestic cats (Baker 1983). Eastern Moles build two types of tunnels - near surface tunnels of 3.2 - 3.8 cm. diameter in which the earth loosened by the forefeet is pressed to the upper side of the tunnel causing a raised ridge to form on the soil surface, and deep, permanent galleries with diameters of 5.5 cm. (Baker 1983) at depths of 10 to 60 cm. in which the soil is actually excavated and then pushed into other tunnels or onto the surface to form a molehill (also known as 'pushups')(Banfield 1974).

A 10 - 20 cm. diameter nest of grass, leaves and fine rootlets is built in the permanent galleries. The volume of the chamber averages about 0.95 litre (Henderson 1983). Nests may be located 5 cm. to 30 cm. deep, often under a stump or rock (Baker 1983). Some moles have two or more nests (Harvey 1976).

Harvey (1976) reported that, in Kentucky, Eastern Moles did not shift their home ranges. Although large areas were added to the range, the nest site remained unchanged. Harvey also found that the home range varied between 1,512 and 3,430 m² for females and 3,616 and 18,041 m² for males.

The Eastern Mole uses its tunnels to forage for invertebrates. Its varied diet includes earthworms, beetle adults and larvae, ants and vegetable matter. According to Jackson (1961) (as reported in Baker 1983) at least 80% of the mole diet consists of earthworms and adult and larval ground-living insects. The other 20% is vegetable matter. A study by Whitaker and Schmeltz (1974) in Indiana (as reported in Mumford 1982) found that the most important food items were earthworms at 26.8% of the total volume and insect larvae at 23.3%. Animals constituted 80.8% of the total volume; seeds constituted 7.3%. They also found that moles eat ants, especially in the pupal stage and that 10.5% of the diet can be this food. One mole's stomach contained 98% ants. Eastern Moles in Canada seem attracted to ant hills - an ant hill within a mole range will exhibit foraging tunnels radiating around it.

Arlton (1936) found that moles readily eat many kinds of seeds including corn, wheat and oats but did not eat roots, shoots, tubers and bulbs. Banfield (1974), citing other sources, described the diet as 31% earthworms, 29% insect larvae, 23% adult insects and 13% vegetable matter. He also noted that potatoes and tomatoes are readily eaten. The large percentage of earthworms in the diet raises the question of mole diet prior to the introduction of earthworms to Ontario. There does not appear to be any dietary data for the Ontario population.

The mole patrols its tunnels for prey and extends the foraging tunnels in pursuit of more food. Harvey (1976) found Eastern Moles constructing tunnels throughout the year but particularly when the ground was soft as in spring and after rain. In dry periods most activity was restricted to existing tunnels. Surface runs were used when air temperatures were as low as -12°C ; the Eastern Mole does not hibernate. The animal may be active at any time of the day but especially from 8:00 a.m. to 2:00 p.m. and 11:00 p.m. to 4:00 a.m. (Harvey 1976). They sleep in their nests or anywhere in the tunnels.

Most of the year, the mole is solitary and defends its tunnels from intruders. During breeding season in late March and early April, the males enter the tunnels of neighbouring females (Arlton 1936). The factor(s) that triggers the reproductive cycle in this blind, subterranean creature is unknown - neither temperature nor day length appear to be involved (Yates and Pederson 1982). Gestation has been reported as 28 to 42 days. In the northern portion of the range most of the young are born in early May (Banfield 1974) or late April (Conaway 1959). In Wisconsin, Conaway (1959) collected very few pregnant females after May 5 but did report one very late pregnancy on July 4. Only one litter is produced each year. According to some authorities, the young remain in the nest until nearly full grown (Mumford and Whitaker 1982); others (Baker 1983) state that the young leave the nest when half grown at about 35 days old. Hamilton (1943) states that the young can leave the nest and live independently at about four weeks of age.

Litter size can be five (Yates and Pederson 1982) but is usually four according to Jones and Birney (1988). Before autumn, the young are developing their own burrows. Baker (1983) states that the dispersal of the young is a critical period in the mole's life history when above-ground movement exposes them to predators. No information is available on dispersal distances, either above or below ground.

The following species have been noted by Baker (1983) as predators of the Eastern Mole: "Red Fox, Grey Fox, Coyote, domestic dog, house cat, Red-tailed Hawk, Red-shouldered Hawk, Broad-winged Hawk, Screech Owl, Barred Owl and Barn Owl". Snakes and weasels, especially the Least Weasel, *Mustela nivalis*, may easily invade the tunnels (Jackson 1961). An Eastern Fox Snake *Elaphe vulpina gloydi* has been

observed possibly foraging in a surface tunnel at Point Pelee National Park (Sahanatien and Leggo 1989). Many predators seem to kill and then abandon moles because of their offensive odour (Mumford and Whitaker 1982).

A longevity of up to six years is suggested by some authors. Davis and Choate (1993) estimated maximum longevity as greater than 3.5 years in Kansas with a greater than 50% year to year mortality. They also found that sex ratio and survivorship for most age classes favoured females, suggesting a polygynous breeding strategy.

Population Size and Trends

The demography of moles is poorly known. The only comprehensive study of home range for the Eastern Mole was by Harvey (1976) and only twelve individuals were observed in his study. Harvey found that individual ranges overlapped but multiple captures (of different individuals) from a single tunnel system were rare.

Gorman and Stone (1990) found that European Moles, *Talpa europaea*, living where food densities were high, occupied small ranges of between 300 to 400 m² whereas moles in areas with low food densities had territories in excess of 5,000 m². They also found that male moles expanded their ranges at the beginning of the breeding season. The moles in their study seemed very aware of the presence of neighbouring moles and when a mole was removed its neighbours rapidly encroached into the empty area. Although the moles in the Gorman and Stone study used overlapping ranges, they used temporal avoidance with only one individual using the area held in common at any one time.

The estimated sizes of the range of individual Eastern Moles are as follows:

male 1.09 ha., female .28 ha. (Harvey 1976)

male 1.0 ha., female 0.3 ha. (van Zyll de Jong 1985, apparently based on Harvey 1976).

The densities of moles per hectare have been estimated as follows:

20-25 per ha. (Jackson 1961)

7-12 per ha. (Henderson 1983)

2-5 per ha. (Baker 1983)

Given the above, it appears that densities could vary from 2-25 moles per ha. but with the more recent literature favouring a lower density of 2-12 per ha.

Davis and Choate (1993) found a female biased sex ratio as high as 1:1.8. Females have ranges only 1/3 the size of male ranges and this would increase the population density. However, other researchers have reported a male bias in the sex ratio: 1.9:1 Arlton (1936), 1.18:1 Conaway (1959), and 1.24:1 Hartman (1992 Ph.D.

dissertation as cited in Davis and Choate 1993). A male biased sex ratio would of course decrease the density of moles.

If we assume that there are 1,060 ha. of suitable habitat within the Canadian portion of the range (see section D. Habitat), then the Canadian population living outside urbanized locales will be in the range of 2,000 - 13,000 individuals (@ 2 - 12 moles/ha.). Point Pelee National Park with 810 ha. of suitable habitat could have a population of between 1,600 and 10,000 moles. As to what proportion this might be of the total North American population (no estimate given in the literature) it is not possible to calculate; however, because the Eastern Mole ranges over 2,240,000 sq. kilometres of North America, it is certainly much less than 1%.

Point Pelee N.P. has 75% of the suitable natural habitat within the present range of the Eastern Mole in Canada. It is reasonable to assume that the Park has a similar percentage of the Canadian population. The species has been monitored in the Park yearly from 1985 and monitoring has been a management requirement since 1989 when a Natural Resource Management Plan (Sahanatien and Leggo 1989) was approved. Within the Park there are six sampling transects selected on the recommendations of Macauley (1979). Four of the transects were located in areas judged to have "high value" as mole habitat and two were located in areas of "medium value". Each transect is 3 m wide and 500 m long. In April or early May, the transects are walked and the number surface tunnels and pushups (molehills) recorded. The results of the monitoring are given in Table 1.

A statistical analysis of the data was performed using the Tukey-Kramer test which is designed for non-parametric data and compares each year to every other year. A test of the correlation between runways and pushups revealed that they are not highly correlated ($R^2 = 0.4079$). Therefore, recording both pushups and runways during monitoring is valid.

The data do not allow for much statistical analysis, a problem which could be corrected by a change in data collection methods (see section J. Recommendations). Overall year to year variation was tested, with the average number of pushups/runways in all six transects compared by year. This analysis yielded the following results:

- Number of pushups in 1987 is significantly different than numbers in 1986, 1991 and 1997.
- Number of pushups in 1988 is significantly different than number in 1986.
- Number of runways in 1986 is significantly different than number in 1990.

Signs of mole activity and therefore, presumably, mole numbers vary significantly from year to year, but, in the 13 years of monitoring, the overall trend has been no increase or decrease in the population of the park.

Macauley (1979) considered the species common and possibly increasing within Point Pelee N.P. The 1997 field work suggests that the species is often present in areas of suitable habitat within the historic range in Essex County and that the range is expanding slightly. The results of the 1997 field work are mapped on Fig. 2.

Limiting Factors

Wellcome and Haug (1995) defined limiting factors as any components of a species' environment that either cause mortality of individuals or restrain recruitment into the breeding population. In the original COSEWIC Status Report, Macauley (1980) noted that the factors limiting the population in Canada had not been investigated. With one exception, the same can be said in 1997. R. Russel and coworkers at the Great Lakes Institute, University of Windsor, Ont. found Eastern Moles in Point Pelee N.P. that were "highly contaminated" with DDT (G. Moulard pers. comm.). Earthworms were also found to be highly contaminated on old orchard soils with a history of DDT application. Russel *et al.* (unpublished) propose that the DDT contaminated soils pose a threat to soil dwelling organisms and the predators feeding on them. DDE the persistent breakdown product of DDT is an endocrine system modulator which can mimic estrogen and affect reproductive success. The evidence for this in amphibians, reptiles and birds is well documented, but whether it has the same activity in moles living in contaminated soils at Point Pelee is speculative (G.D. Haffner pers. comm.).

None of the mole monitoring transects at Point Pelee N.P. are located in areas of DDT (DDE) contaminated soils. It is likely that present and former orchard sites outside the National Park are also contaminated with persistent pesticides.

Habitat modification is probably the most serious limiting factor for the species. Outside Point Pelee N.P. the range of the species encompasses a largely agricultural landscape of cash crops (corn, soybeans, wheat), greenhouses, vegetable crops, orchards, vineyards, and other horticultural crops. In Ontario, Eastern Moles use agriculturally modified habitat to a very limited extent, although, in the U.S., the species uses disturbed soils, such as plowed land, (Hamilton 1943). During the fieldwork associated with this report, mole surface runways were not found to extend more than three metres into tilled ground. The kind of agriculture compatible with the life history of the mole, namely pastureland and hay production, is very limited in Essex County.

In Canada, mole works are most frequently found in forested areas and along wooded or brushy fencerows, watercourses and open drains. The most recent figures available from the Essex Region Conservation Authority (1992 unpublished) estimate that 3.55% of Essex County has forest cover with an additional 0.6% treed cover along

drains/fencerows and watercourses. The Conservation Authority states that this is the lowest percentage of any county in Ontario and that there have been no recent changes in this figure.

It is encouraging to note that moles will rapidly colonize natural habitat restoration projects as illustrated by a dune restoration in Point Pelee N.P. Moles occupied this area within three years of the project's completion. (G. Moulard pers. comm.) Reforestation and habitat restoration could increase the habitat available to moles.

Clearly, very little suitable habitat remains within the Canadian range and what is left exists in a highly fragmented state. There are 642 woodlots greater than 0.5 ha. in Essex County (Essex Region C.A. unpublished). The natural areas are largely 'islands' surrounded by intensive agriculture. Point Pelee N.P. is itself a habitat island for forest and meadow species - the 4.4 km sand ridge which links it to similar habitat is almost completely developed for permanent and recreational housing. Watercourses in Essex County are often channelized and the woody vegetation removed; nevertheless, moles will use this linking habitat if patches of shade are available.

In the last decade, forest destruction in Essex County has slowed and reforestation has reversed the trend to reduced forest cover. At the same time, an increase in residential and rural estate housing at the expense of agricultural land could be increasing the amount of habitat available to moles. The construction of golf courses and increase in land devoted to equestrian pursuits may also augment the trend to increased habitat. The adoption of minimum tillage for crop production with its attendant increase in earthworm populations has the potential to greatly expand the amount of foraging habitat.

Climate is unlikely to be a limiting factor. In Michigan and Minnesota, Eastern Moles are found 400 km north of the Essex County range. Neither is food likely to be limiting. The main items in the diet, beetle larvae and introduced European earthworms, occur beyond the present range.

The limited area of suitable soils is more likely to prove constraining. Moles appear to be occupying almost all of the available habitat on contiguous sand and sandy loam soils in southern Essex County and adjacent Kent County (Fig. 2). About two km. of suitable habitat remains uncolonized in the east from the Essex-Kent border to Wheatley Provincial Park and perhaps an additional one km. is unoccupied in the west in the Harrow-Colchester area. Similar soil types in the Ojibway area of Windsor-LaSalle are separated by 20 km. of Brookston Clay soil (formerly swamp forest, now drained) and sandy loam soils near Chatham in Kent County are isolated by 30 km. of Brookston Clay. No Eastern Moles have been found in either area nor have mole works been seen on Brookston Clay except for the Sand Spot phase.

As Macauley (1980) noted in the original Status Report, moles at Point Pelee are affected by fluctuations in the water table: "Once the tunnels are flooded, both the food supply and habitat of the mole are eliminated. Moles may also be forced to the surface where they become vulnerable to predators...". The water table on Point Pelee is influenced by levels in Lake Erie. With rising lake levels less land is available for habitat. The waters in the western basin of Lake Erie have been rising for the last two centuries and millennia before (Mosquin 1987). Rising lake levels in the absence of new dune creation and point enlargement will cause a reduction in the mole population at Point Pelee. In the past, land suitable for habitat was created within the National Park by dredging the wetlands and sidestepping the dredgeate. Between 1955 and 1963, 20 ha. of orchard land (now regenerating) were created (Battin and Nelson 1978).

Yates and Schmidly (1978) state that the fossorial niche tends to limit dispersal and reduce gene flow between populations. The highly fragmented environment available to Eastern Moles in southwestern Ontario and the apparent lack of linkage between many of those habitats should, theoretically, isolate small populations of moles into demes with restricted genetic exchange. Whether this results in any deleterious effects such as inbreeding depression remains unstudied.

Special Significance of the Species

The Eastern Mole seems to have little significance attributed to it beyond the general perception that it is a horticultural pest. As Henderson (1983) notes,

"considered from the standpoint of food habits alone, moles do not negatively affect the interests of farmers and gardeners. Rather they remove many damaging insects and grubs. However, their burrowing habits disfigure lawns and parks, destroy flower beds, tear up the roots of grasses and create havoc in small garden plots."

Moles are trapped regularly at the Kingsville Golf and Curling Club in Gosfield South Township, Essex County and by homeowners in Essex County. Mole traps are available from local retailers. About five to ten Eastern Moles are killed by trapping at the Kingsville Golf and Curling Club each year. Otherwise the mortality from trapping in Ontario is unknown.

There was once a viable trade in moleskins both in North America and Europe (Yates and Pederson 1982). From the 17th to 20th centuries, moleskins were used for caps, purses, tobacco pouches and garment trim. As late as 1959, about one million skins were being trapped in Britain. Moleskins are not used in North America today and there is no evidence that the Canadian population was ever trapped except as a form of damage control.

The mole does not appear to have any significance to First Nation people or to any other segment of the Canadian population.

That the species plays an important role in the ecology of the woodlands it inhabits is obvious to the most casual observer. The amount of soil being lifted, shifted and mixed from depths of up to 60 cm. is impressive at a single observation and compounded by centuries of occupation could be at least as significant as that attributed to earthworms. Charles Darwin in his book titled *The Formation of Vegetable Mold, Through the Action of Worms, With Observations of Their Habits*, calculates that the average British earthworm population of 53,767 per acre was shifting ten tons of earth per year. The area now occupied by moles in Canada, did not support a worm fauna until pioneer settlement circa 1800 A.D. Patches of mineral soil are created by moles and these likely are important for the establishment of some plant species and other organisms.

The disjunction, small size and fragmentation of the Canadian population into demes makes it an appealing candidate for population genetics studies. Generally speaking, most aspects of mole biology are poorly understood and the literature on them fragmented and incomplete (Yates and Pederson 1982).

Evaluation and Proposed Status

The original COSEWIC Report on the Eastern Mole, *Scalopus aquaticus*, in Canada (Macauley 1980) assigned a Rare (Vulnerable) status to the species because,

"In Canada an adequate population is known to exist only on terrestrial portions of a six-square-mile National Park which is mostly cattail marsh."

Thirteen years data from the mole monitoring transects at Point Pelee N.P. suggest that the population, while not stable from year to year, is neither increasing nor decreasing over longer periods.

This present report confirms the presence of a population estimated at between 1,600 and 10,000 individuals within Point Pelee National Park and a further 400 to 3,000 moles in natural areas outside the park, with an unknown number living in urbanized areas and disturbed landscapes. Some of the moles outside the National Park are living in protected Conservation Areas or areas with natural heritage designations that afford some protection.

The 'global rank' assigned to the species is G5 (very common). The Ontario Ministry of Natural Resources lists the Eastern Mole as 'vulnerable' and the Natural Heritage Information Centre for Ontario assigns it a S1S2 rank.

If the Eastern Mole population was occupying its present Canadian range prior to settlement by Europeans then it has experienced a great loss of habitat due to forest clearing in the last two centuries. The Essex Region Conservation Authority estimates that only 4.2% of the Essex Region is covered by forest and fencerows suitable for mole habitat. There are roughly 1,060 ha. of natural habitat available to the species with 810 ha. of this figure in Point Pelee National Park.

According to the Conservation Authority, the area of woodland habitat is stable whereas the area of fencerows is declining. The loss of fencerows will affect linkage.

Based on the 1997 fieldwork, the Canadian range of the species has expanded slightly from the range circumscribed by previous records but this may be a reflection of greater surveying effort. A significant continued expansion is unlikely because soil types unsuitable for use by moles lies a few thousand metres outside the present range.

In view of the above factors, it is recommended that the Vulnerable status be retained.

Recommendations

Greater refinement in the estimate of the Canadian population is possible. Densities can be determined using the method outlined by Harvey (1976) with, perhaps, a modification using radio transmitters. Much suitable mole habitat outside Point Pelee remains unsurveyed. If this habitat were surveyed, the amount of occupied habitat could be calculated using aerial photographs and this figure multiplied by the average density will determine more exactly the population size.

Saunders' (1932) reports for the Eastern Mole in Middlesex and Elgin Counties need more study. During the 1997 field work 360 hours (5 traps @ 72 hrs) of trapping effort at a site in Strathroy, Middlesex County yielded a single specimen of Brewer's Mole (syn. Hairy-tailed Mole), *Parascalops breweri*. Mole works at Rodney, Elgin County also appeared to be of this species; nevertheless, more time should be spent examining both areas.

The data presently being generated by monitoring at Point Pelee N.P. does not lend itself to statistical analysis. There is even some question as to whether mole works are proportionate to the number of moles present (Mead-Briggs and Woods 1973). Analysis would be facilitated by changing the data collection methods to increase the number of repeated data. As presently taken, the data do not allow for the calculation of within transect trends or comparisons between transects since only one measurement (runway & pushups) of mole activity is taken per year at each transect and naturally one measurement cannot be averaged. Point Pelee N.P. staff are advised to consult with a statistician to improve their methodology. It would be

advisable for Point Pelee N.P. staff to create at least one transect for monitoring the moles living on DDT (DDE) contaminated soils in the old orchard sites of the park.

Any research into the basic biology and ecology of the Eastern Mole would be a worthwhile investment for Parks Canada.

Biographical Summary of Author

Gerald E. Waldron holds two degrees in biology from the University of Guelph. He has worked as a biologist for 27 years with such organizations, institutions and agencies as: The International Biological Programme, Biosystems Environmental Consultants, Ontario Ministry of Natural Resources, Agriculture Canada, Essex Region Conservation Authority, University of Guelph, Natural Habitat Restoration Program, Windsor Board of Education, World Wildlife Fund, BioLogic Environmental Planners, Essex County Stewardship Network, City of Windsor, Dillon Consulting, Windsor Harbour Commission and Parks Canada. He is the author of 13 scientific papers, many popular articles and a book on natural history.

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**Appendix 1: Canadian Specimens of *Scalopus aquaticus*
in the Royal Ontario Museum, Toronto**

CN:	17484	CPDA:	19090425
ORCY:	ESSEX		
LOCNM:	PT PELEE		
LAT:	415100 N	LNG:	0823200 W
CN:	17486	CPDA:	19100410
ORCY:	ESSEX		
LOCNM:	PT PELEE		
LAT:	415100 N	LNG:	0823200 W
CN:	17487	CPDA:	19101121
ORCY:	ESSEX		
LOCNM:	PT PELEE		
LAT:	415100 N	LNG:	0823200 W
CN:	17488	CPDA:	19110320
ORCY:	ESSEX		
LOCNM:	PT PELEE		
LAT:	415100 N	LNG:	0823200 W
CN:	17489	CPDA:	19110410
ORCY:	ESSEX		
LOCNM:	PT PELEE		
LAT:	415100 N	LNG:	0823200 W
CN:	17490	CPDA:	19110515
ORCY:	ESSEX		
LOCNM:	PT PELEE		
LAT:	415100 N	LNG:	0823200 W
CN:	17496	CPDA:	19150516
ORCY:	ESSEX		
LOCNM:	PT PELEE		
LAT:	415100 N	LNG:	0823200 W
CN:	22008	CPDA:	19091006
ORCY:	ESSEX		
LOCNM:	PT PELEE		
LAT:	415100 N	LNG:	0823200 W

CN: 22907 CPDA: 19500507
ORCY: ESSEX
LOCNM: PT PELEE
LAT: 415100 N LNG: 0823200 W

CN: 2811190001 CPDA: 19181117
ORCY: ESSEX
LOCNM: KINGSVILLE
LAT: 420200 N LNG: 0824500 W

CN: 2911140082 CPDA: 19280923
ORCY: ESSEX
LOCNM: LEAMINGTON
LAT: 420300 N LNG: 0823600 W

CN: 2911140083 CPDA:
ORCY: ESSEX
LOCNM: LEAMINGTON
LAT: 420300 N LNG: 0823600 W

CN: 3001150006 CPDA: 19280215
ORCY: ESSEX
LOCNM: LEAMINGTON
LAT: 420300 N LNG: 0823600 W

CN: 34129 CPDA: 19140511
ORCY: ESSEX
LOCNM: PT PELEE
LAT: 415100 N LNG: 0823200 W

CN: 3503260003 CPDA: 19350525
ORCY: ESSEX
LOCNM: KINGSVILLE
LAT: 420200 N LNG: 0824500 W

CN: 80156 CPDA: 19271128
ORCY: ESSEX
LOCNM: KINGSVILLE
LAT: 420200 N LNG: 0824500 W

CN: 80254 CPDA: 19081018
ORCY: ESSEX
LOCNM: PT PELEE
LAT: 415700 N LNG: 0823200 W

Appendix 2: Records from the Atlas of Mammals of Ontario

Date	Sampling Square	UTM
10/28/07	17LS65	
10/28/07	17LS75	
10/31/07	17LS65	
10/31/07	17LS75	
5/08/09	17LS74	743 451
5/09/09	17LS74	743 451
11/27/09	17LS74	743 451
5/14/11	17LS74	743 451
5/31/13	17LS74	743 451
6/01/13	17LS74	743 451
6/04/13	17LS74	743 451
6/13/13	17LS74	743 451
9/21/14	17LS74	743 451
3/14/19	17LS74	743 451
3/16/19	17LS74	743 451
6/01/42	17LS74	
7/07/63	17LS74	
7/08/63	17LS74	
7/18/63	17LS74	
7/21/63	17LS74	
8/13/63	17LS74	
8/23/63	17LS74	
9/01/63	17LS74	
10/28/64	17LS65	
10/28/64	17LS66	
10/28/64	17LS75	
10/28/64	17LS76	
8/04/72	17LS74	
6/01/79	17LS74	
8/24/81	17LS65	668 543
1/01/89	17LS74	
1/01/91	17LS74	
10/31/9	17LS75	
12/14/9	17LS44	418 496
12/14/9	17LS45	436 502



MANDATE

COSEWIC determines the national status of wild species, subspecies, varieties and nationally significant populations that are considered to be at risk in Canada. Designations are made on all native species for the following groups: fish, amphibians, reptiles, birds, mammals, molluscs, lepidoptera, vascular plants, mosses and lichens.

MEMBERSHIP

COSEWIC is comprised of representatives from each provincial and territorial government wildlife agency, four federal agencies (Canadian Wildlife Service, Parks Canada Agency, Fisheries and Oceans Canada, and the Federal Biosystematic Partnership), three national conservation organizations (Canadian Nature Federation, Canadian Wildlife Federation, and World Wildlife Fund Canada) and the chairs of the scientific species specialist groups. The Committee meets twice a year to consider status reports on candidate species.

DEFINITIONS

Wildlife Species	- A species, subspecies, variety or biographically distinct population of animal, plant or other organism, other than a bacteria or virus, that is wild by nature and (a) is native to Canada; or (b) has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Species at Risk	- An extirpated, endangered or threatened species or a species of special concern.
Extinct (X)	- A wildlife species that no longer exists.
Extirpated (XT)	- A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild.
Endangered (E)	- A wildlife species that is facing imminent extirpation or extinction.
Threatened (T)	- A wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern* (SC)	- A wildlife species that is of special concern because it is particularly sensitive to human activities or natural events, but does not include an extirpated, endangered or threatened species.
Not at Risk** (NAR)	- A species that has been evaluated and found to be not at risk.
Data Deficient*** (DD)	- A species for which there is insufficient scientific information to support a status designation.

* Formerly described as "vulnerable" from 1990 to 1999, or "rare" prior to 1990.

** Formerly described as "Not in any category", or "no designation required".

*** Formerly described as "indeterminate" from 1994 to 1999 or "ISIBD" (Insufficient scientific information on which to base a designation) prior to 1994.



The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. COSEWIC meets annually in April each year. Species designated at this meeting are added to the list.



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The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.