

Species Status Assessment

Class: Osteichthyes (bony fishes)
Family: Cottidae (sculpin)
Scientific Name: *Myoxocephalus thompsonii*
Common Name: Deepwater sculpin

Species synopsis:

Deepwater sculpin occur in deep, cool waters of mainland lakes in northern North America, from the Great Bear Lake in Canada to the Great Lakes. This species lives off-shore in deep, bottom areas of Lake Ontario and may have existed in Lake Erie. It remains in its former range in Lake Ontario but it is not known whether this species currently exists as an established population in Lake Erie.

I. Status

a. Current and Legal Protected Status

- i. **Federal** Not Listed **Candidate:** No
- ii. **New York** Endangered, SGCN

b. Natural Heritage Program Rank

- i. **Global** G5
- ii. **New York** S1 **Tracked by NYNHP** Yes

Other Rank:

Species of Northeast Regional Conservation Concern (Therres 1999)
COSEWIC: Special Concern (Great Lakes – Western St. Lawrence populations)
SARA: Threatened (Great Lakes populations)

Status Discussion:

Deepwater sculpin is globally ranked as Secure. In New York, it is ranked as Critically Imperiled and it is state-listed as endangered. Populations are extremely localized. This species is common in some lakes (e.g., Lake Michigan, Huron, and Superior).

Deepwater sculpin in Lake Ontario were considered rare by the 1960s and presumed extirpated in the 1980s; however, three individuals were caught in 1996 and both juvenile and adults have increased in number and distribution since then (Weidel et al. 2012). The historical occurrence in Lake Erie is uncertain (Auer 1982), and larvae captured in 1995 may have appeared due to downstream drift from Lake Huron (Roseman et al. 1998). The designs of past and current fish surveys on Lake Erie are such that they may not detect an established population.

II. Abundance and Distribution Trends

a. North America

i. Abundance

declining increasing stable unknown

ii. Distribution:

declining increasing stable unknown

Time frame considered: Based on G5 rank

b. Regional

i. Abundance

declining increasing stable unknown

ii. Distribution:

declining increasing stable unknown

Regional Unit Considered: Region 5 – Northeast (Species of Concern)

* NY is the only state that would have deepwater sculpin in this region, and they occur only in Lake Ontario and Lake Erie. The Lake Ontario population has increased since 1996 and the status of the Lake Erie population is unknown (J. Lantry, pers. comm.).

Time Frame Considered: _____

c. Adjacent States and Provinces

CONNECTICUT	Not Present <u> X </u>	No data _____
MASSACHUSETTS	Not Present <u> X </u>	No data _____
NEW JERSEY	Not Present <u> X </u>	No data _____
VERMONT	Not Present <u> X </u>	No data _____
ONTARIO	Not Present _____	No data _____

i. Abundance

___ declining X increasing X stable ___ unknown

ii. Distribution:

___ declining X increasing X stable ___ unknown

Time frame considered: Since 1996

Listing Status: Threatened

* The three individuals captured in Lake Ontario in 1996 were in Canadian waters; captures have continued. Lake Huron has an established population.

PENNSYLVANIA	Not Present _____	No data _____
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i. Abundance

___ declining ___ increasing ___ stable X unknown

ii. Distribution:

___ declining ___ increasing ___ stable X unknown

Time frame considered: _____

Listing Status: Not Listed SGCN? No

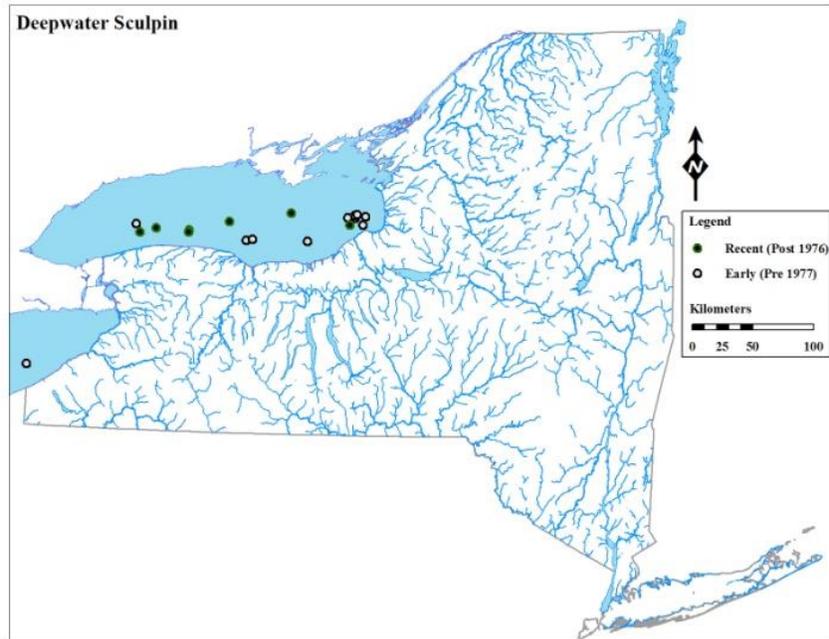


Figure 2. Deepwater sculpin distribution in New York, depicting fish sampled before 1977 and from 1977 to current time.

Water body	Pre-1977	Post-1977
Erie	unknown	Unknown
Ontario	loss	gain

Table 1. Records of rare fish species in hydrological units (HUC-10) are shown according to their water body in early and recent time periods (pre- and post-1977) to consider loss and gains. Further explanations of details are found in Carlson (2012).

III. New York Rarity, if known:

Historic	<u># of Animals</u>	<u># of Locations</u>	<u>% of State</u>
prior to 1970	_____	<u>20 records</u>	<u>2/18 water bodies</u>
prior to 1980	_____	_____	_____
prior to 1990	_____	_____	_____

Details of historic occurrence:

Deepwater sculpin historically occurred in Lake Ontario and possibly in Lake Erie.

Current	<u># of Animals</u>	<u># of Locations</u>	<u>% of State</u>
(since 1977)	_____	<u>at least 80</u>	<u>1/18 water bodies</u>

Details of current occurrence:

Juvenile and adults of this species were present in Lake Ontario 1996–2012. During 1998–2012 there were 275 records obtained in Lake Ontario trawl surveys (Weidel et al. 2013). If one included the suspected ‘drifter’ from Lake Huron into Lake Erie, presence could be considered in two water bodies.

New York’s Contribution to Species North American Range:

% of NA Range in New York	Classification of New York Range
<u> </u> 100 (endemic)	<u> </u> Core
<u> </u> 76-99	<u> X </u> Peripheral
<u> </u> 51-75	<u> </u> Disjunct
<u> </u> 26-50	Distance to core population:
<u> X </u> 1-25	<u> 250 miles </u>

IV. Primary Habitat or Community Type:

1. Summer-stratified Monomictic Lake
2. Great Lakes Deepwater Community

Habitat or Community Type Trend in New York:

Declining Stable Increasing Unknown

Time frame of decline/increase: _____

Habitat Specialist? Yes No

Indicator Species? Yes No

Habitat Discussion:

Other than the fact that it is found in cold water (40°F or less) at depth of 25-366 m, very little is known about its habitat requirements. Adults and juveniles are benthic and spawning occurs in deep water. Larvae are pelagic and likely occur in the meta- and hypolimnion (NatureServe 2012, J. Lantry, pers. comm.).

V. New York Species Demographics and Life History

- Breeder in New York
 - Summer Resident
 - Winter Resident
 - Anadromous
- Non-breeder in New York
 - Summer Resident
 - Winter Resident
 - Catadromous
- Migratory only
- Unknown

Species Demographics and Life History Discussion:

It is not known when deepwater sculpin spawns. Studies by R. Ruby (SUNY, ESF) have summarized the literature, and examined the diet and bioenergetics in the laboratory. It feeds on small crustaceans (primarily *Mysis* and *Diporeia*) and other aquatic invertebrates that live on the bottom.

VI. Threats:

As recently as 1950, deepwater sculpin were still abundant in Lake Ontario (Christie 1973). Reasons for the decline are unknown, but interactions with alewife and rainbow smelt are implicated; contaminants may also have played a role in historical declines (Lantry et al. 2007).

The more recent decline of another sculpin, slimy sculpin (*Cottus cognatus*), in Lake Ontario has been linked to the introduced animals in the lake (i.e. Dreissenid mussels and round goby) and the subsequent reduction of their food supply (i.e. an amphipod, *Diporeia*) (Owens et al. 1999); however, increased abundance and distribution of deepwater sculpin in the last decade indicate that current conditions in Lake Ontario are favorable for them. If future alewife and/or smelt abundance increase relative to current levels the deepwater sculpin population may be threatened.

Because of their reliance on cold waters, temperature fluctuations due to climate change may pose a threat to deepwater sculpin.

Are there regulatory mechanisms that protect the species or its habitat in New York?

No Unknown
 Yes

The deepwater sculpin is listed as an endangered species in New York and is protected by Environmental Conservation Law (ECL) section 11-0535 and the New York Code of Rules and Regulations (6 NYCRR Part 182). A permit is required for any proposed project that may result in a take of a species listed as Threatened or Endangered, including, but not limited to, actions that may kill or harm individual animals or result in the adverse modification, degradation or destruction of habitat occupied by the listed species.

The Protection of Waters Program provides protection for rivers, streams, lakes, and ponds under Article 15 of the NYS Conservation Law.

Describe knowledge of management/conservation actions that are needed for recovery/conservation, or to eliminate, minimize, or compensate for the identified threats:

Deepwater sculpin are recovering on their own in Lake Ontario. Continued sampling to monitor their index of abundance and obtain data on age, growth, maturity, fecundity and timing of spawning is recommended.

Conservation actions following IUCN taxonomy are categorized in the following table.

Conservation Actions	
Action Category	Action
External Capacity Building	Alliance & Partnership Development

The Comprehensive Wildlife Conservation Strategy (NYSDEC 2005) includes recommendations for the following actions for deepwater sculpin.

Population monitoring:

___ Continue sampling in Lake Ontario.

VII. References

Carlson, D.M. 2001. Species accounts for the rare fishes of New York. N. Y. S. Dept. Env. Cons. Albany, NY.

Carlson, D.M. 2012 (draft). Species accounts of inland fishes of NYS considered as imperiled, 2012. NYDEC Watertown, NY

Becker, G.C. 1983. Fishes of Wisconsin. Univ. Wisconsin Press, Madison. 1052 pp.

Brandt, S. B. 1986. Disappearance of the deepwater sculpin (*Myoxocephalus thompsonii*) from Lake Ontario: the keystone predator hypothesis. *J. Great Lakes Res.* 12:18-24.

Bruch, R.M. 1986. Age and growth, mortality, reproductive cycle and fecundity of the deepwater sculpin, *Myoxocephalus thompsoni* (Girard), in Lake Michigan. MS Thesis, Univ. Wisconsin, Milwaukee.

Christie, W. J. 1973. A review of the changes in the fish species of Lake Ontario. Great Lakes Fish. Comm. Tech. Rept. 23.

Christie, W.J. and N.A. Thomas. 1981. Biology. pp 327-340. in IFYGL-The International Field Year for the Great Lakes. (ed) E.J. Aubert and T.L Richards. NOAA, Great Lakes Env. Res. Lab. Ann Arbor, MI

- Fish, M.P. 1932. Contributions to the early life history of sixty-two species of fishes from Lake Erie and its tributary waters. Bull. U.S. Bur. Fish. 10, Vol. 47:293-398.
- Lantry, B.F., R. O'Gorman, M. G. Walsh, J.M. Casselman, J.A Hoyle, M.J. Keir and J. R. Lantry. 2007. Reappearance of deepwater sculpin in Lake Ontario: resurgence or last gasp of a doomed population? J. Great Lakes Res. 33(Supplement 1):34-45.
- Lee, D.S., et al. 1980. Atlas of North American freshwater fishes. North Carolina State Mus. of Nat. His. 867 pp.
- McAllister, D.E. 1961. The origin and status of the deepwater sculpin, *Myoxocephalus thompsonii*; nearctic glacial relict. Bull. Natl. Mus. Can. 172, Contrib. to Zool.: 44-65.
- Mills, E.L. (and 18 others) 2003. Lake Ontario: food web dynamics in a changing ecosystem (1970-2000). Can. J. Fish. Aquat. Sci. 60:471-490.
- NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: May 5, 2012).
- Owens, R.W., R. Ruby and R.O'Gorman. Decline of slimy sculpin in southeastern Lake Ontario: consequences of dreissenid colonization and nutrient abatement. Abstract of oral presentation at NY Chapter Amer. Fish. Soc., Saratoga Springs, Jan 28-30, 1999.
- Owens, R.W., R. O'Gorman, T.H. Eckert and B.F. Lantry. 2002 in press. The offshore fish community in southern Lake Ontario, 1972-1998. In State of Lake Ontario (SOLO): food-web dynamics and management, Munawar, M. Edsall, T. and Leach, J. (eds) SPB Academic Publishing, Amsterdam, Netherlands.
- Page, L.M. and B.M. Burr. 1991. A field guide of freshwater fishes, North America north of Mexico. Houghton Mifflin Co. Boston. 432 pp.
- Parker,, B.J. 1988. Status of the deepwater sculpin, *Myoxocephalus thompsoni*, in Canada. Can. Field Nat. 102(1):126-131.
- Roseman, E.F., D.J. Jude, M.K. Raths, T.G. Coon and W.W. Taylor. 1998. Occurrence of the deepwater sculpin (*Myoxocephalus thompsoni*) in Western Lake Erie. J. Great Lakes Res. 24(2):479-483.
- Scott, W.B., and E.J. Crossman. 1973. Freshwater fishes of Canada. Fish. Res. Bd. Can., Bull. 184. 966 pp.
- Smith, C.L. 1985. The inland fishes of New York State. New York State Dept. of Environmental Conservation. Albany, NY. 522 pp.
- Stone,U.B. 1947. A study of the deepwater cisco fishery of Lake Ontario with particular reference to the bloater, *Leucichthys hoyi* (Gill) Trans. Am. Fish. Soc. 74(1944):230-249.

Therres, G.D. 1999. Wildlife species of regional conservation concern in the northeastern United States. *Northeast Wildlife* 54:93-100.

Weidel, B.C., M.G. Walsh, M.J. Connerton. 2012. Sculpin and Round Goby Assessment in the U.S. waters of Lake Ontario, 2011. Section 21 pp. 12-20 *in* NYSDEC 2011 Annual Report, Bureau of Fisheries, Lake Ontario Unit and St. Lawrence River Unit to the Great Lakes Fishery Commission's Lake Ontario Committee.

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