Introduction
Status of Important Prey Fishes in the U.S. Waters of Lake Ontario, 2005

R. O'Gorman
U.S. Geological Survey, Great Lakes Science Center, Lake Ontario Biological Station Oswego, New York 13126

The U.S. Geological Survey (USGS) and New York State Department of Environmental Conservation (NYSDEC) have cooperatively assessed Lake Ontario prey fishes each year since 1978. Bottom trawling has been conducted during spring to assess alewife *Alosa pseudoharengus*, summer to assess rainbow smelt *Osmerus mordax*, and autumn to assess slimy sculpin *Cottus cognatus*. Timing of the surveys was selected to correspond with the season when bottom trawl catches of the target species peaked during May to October trawling conducted in 1972 (Owens et al. 2003). Twelve transects were established at roughly 25-km (15.5 mile) intervals along the U.S. shoreline (Figure 1). Bottom trawling was generally conducted at all transects to assess alewife, at all transects except Fair Haven to assess rainbow smelt, and at 6 transects to assess slimy sculpin. Although each of the three surveys targets one species of fish, catches of non-target fishes are also tracked and they provide information on ecologically important changes in the fish community such as resurgence of once abundant native species (e.g. deepwater sculpin *Myoxocephalus thompsoni*) or increasing abundance of invasive species (e.g. round goby *Neogobius melanostomus*).

At each transect, trawl hauls were usually made at 10-m depth intervals through the range of depths occupied by the target species. Fixed station sampling designs, such as ours, are commonly used for assessing fish populations in the Great Lakes and in northern Europe (ICES 2004). The underlying assumption is that changes in relative abundance at the fixed stations are representative of changes in the whole population. Mean abundance from fixed station surveys will not be biased if the fish are randomly distributed. We have always assumed that the fish are randomly distributed in the geographic area in which a transect is located and, because we have numerous transects spaced at regular intervals around the shore, that our abundance indices are unbiased. However, we did not initiate acoustic sampling to test the assumption of random distribution within geographic areas until 2004 when we began an acoustic evaluation of fish distribution during the alewife assessment (see Status of Alewife, below). If the fish are not randomly distributed within geographic areas, mean abundance will be biased, although if the non-random pattern of fish distribution persists through time, the differences in mean abundance between years will be unbiased (Warren in ICES 1992). Although random sampling is preferable for estimating precision, the systematic, fixed-station sampling that we employ in Lake Ontario will often be optimal for getting the most precise estimate of relative abundance even though the variance of the estimated relative abundance will be biased (ICES 2004).

Two vessels participated in prey fish surveys during 1978-1982, the 19.8-m (65 ft), steel hull R/V *Kaho* (USGS) and the 12.8-m (42 ft), fiberglass hull R/V *Seth Green* (NYSDEC). During 1983-1985, all assessment trawling was conducted by the *Kaho* (the fiberglass *Seth Green* was permanently retired in fall 1982). In 1985, the NYSDEC accepted delivery of a new R/V *Seth Green* and this 14-m (46 ft), steel hull vessel participated with the *Kaho* in prey fish surveys during 1986-2002 and in 2004

Presented at: Great Lakes Fishery Commission
Lake Ontario Committee Meeting
Windsor, Ontario Canada
March 21-22, 2006

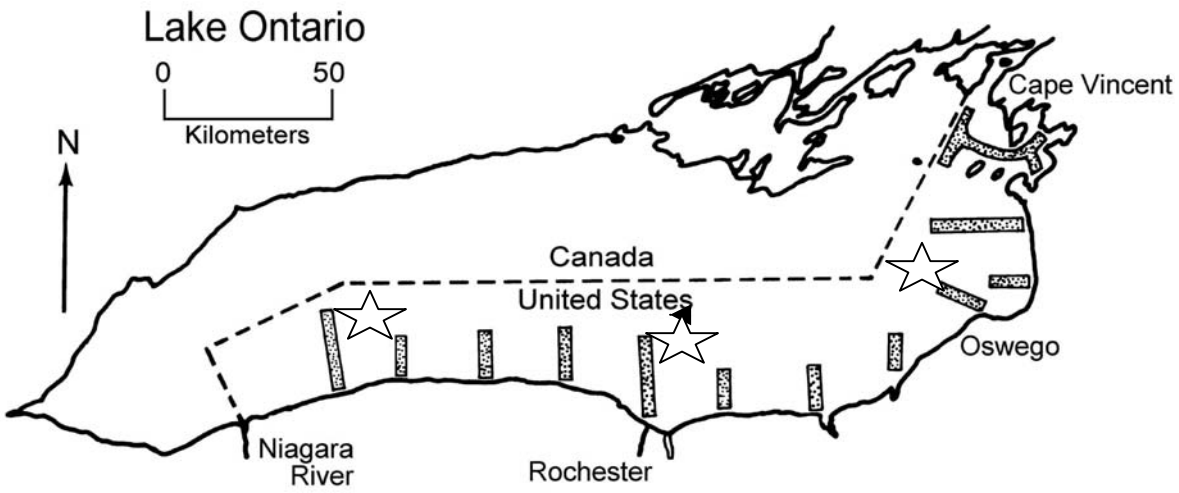

Figure 1. − Lake Ontario showing 12 transects sampled with bottom trawls. Transect names, from west to east, are: Olcott, Thirty Mile Pt., Oak Orchard, Hamlin, Rochester, Smoky Pt., Sodus, Fair Haven, Oswego, Mexico Bay, Southwick, and Cape Vincent. The six transects sampled during the slimy sculpin assessment are adjacent to the stars.

Because of personnel shortages within the NYSDEC, only the *Kaho* was used to assess prey fish stocks in 2003. Intercalibration studies determined that, for alewife and rainbow smelt, the fishing power of the *Kaho* did not differ from that of either the fiberglass or steel *Seth Green* (O'Gorman et al. 2005, see Status of Rainbow Smelt below). Intercalibration studies were not conducted for slimy sculpin because the *Kaho* was the only vessel used to assess slimy sculpin in fall.

A bottom trawl with a 12-m (39 ft) headrope and flat, rectangular trawl doors were used to assess alewife and rainbow smelt until 1997 when fouling by zebra and quagga mussels (*Dreissena polymorpha* and *D. bugensis*, respectively, hereafter referred to collectively as dreissenids) forced a change to a 3-in-1 bottom trawl with a 18-m (59 ft) headrope and slotted, cambered V-doors. We made a series of paired tows to determine calibration factors for the two gears to allow comparison of alewife and rainbow smelt catches made by the new gear with those made by our traditional trawling gear. However, up until 2004, we continued to use the traditional trawling gear to assess slimy sculpin in areas where dreissenid density was sufficiently low (mainly in deep water) to allow us to trawl unimpeded. In 2004, the 18-m (headrope) trawl was used to assess slimy sculpin because increased dreissenid density in deeper water had greatly reduced not only the number of depths at which we could tow a trawl but also the amount of time we could tow at most depths. Few slimy sculpin were caught in 2004, however, indicating that the 18-m (headrope) trawl, which does not ride hard on the bottom, was not suitable for assessing benthic sculpin. In 2005, to increase bottom contact, a tickler chain was added to the 18-m (headrope) trawl for the slimy sculpin assessment (see Status of Sculpins and Round Goby below).

In 2005, the number of trawl hauls made for assessment of alewife, rainbow smelt, and slimy sculpin totaled 263 ─ 113 during April 19 - May 3, 91 during June 1 - June 10, and 59 during October 11 - 28. The number of trawl tows made to assess alewife was about 10% greater than the long-term average and was similar to that in 2004. Trawling effort during the rainbow smelt assessment was similar to that in recent years whereas effort during the slimy sculpin assessment was about 40% higher than that in most recent years. In addition to the three assessments of major prey species, we conducted the first assessment of the profundal fish community in mid-lake with bottom trawls and gillnets.

References

ICES. 1992. Report of the workshop on the analysis of trawl survey data. ICES CM 1992/D:6. 96 p.

ICES. 2004. Report of the workshop on survey design and data analysis (WKSAD). Fisheries Technology Committee. ICES CM 2004/B:07, Ref. D, G. 65 p. *www.ices.dk/reports/ftc/2004/wksad04.pdf*

O'Gorman, R., R. W. Owens, S. E. Prindle, J. V. Adams, and T. Schaner. 2005. Status of Major Prey Fish Stocks in the U.S. Waters of Lake Ontario, 2005. Section 12, *in* 2005 NYSDEC Annual Report, Bureau of Fisheries Lake Ontario Unit and St. Lawrence River Unit to the Great Lakes Fishery Commission's Lake Ontario Committee.

Owens, R. W., R. O'Gorman, T. H. Eckert, and B. F. Lantry. 2003. The offshore fish community in southern Lake Ontario, 1972-1998. Pages 407-442, *in* M. Munawar [ed.], The State of Lake Ontario: Past, Present, and Future. Ecovision World Monograph Series, Aquatic Ecosystem Health and Management Society, Burlington, Ontario, Canada.