

# Ecology of *Mysis relicta* in the Great Lakes

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## Overview

The opossum shrimp *Mysis relicta* is a large zooplankton common in the hypolimnetic waters of the Great Lakes. *Mysis* play a key role in the transfer of energy between phytoplankton and fish production, and between the benthic and pelagic food webs. The role of *Mysis* in the food web is complex because *Mysis* can also affect the size, structure, and abundance of zooplankton, indirectly affecting fish recruitment. *Mysis* also influence the flow of nutrients and contaminants in aquatic systems.

*Mysis*, along with *Diporeia*, have historically been among the most important food items for forage fish (Slimy Sculpin, Rainbow Smelt, Alewife) in the Great Lakes. Forage fish in turn support Salmon and Lake Trout fisheries. The two most important commercial fish species in the Great Lakes, Bloater and Lake Whitefish, also consume *Mysis*. Following drastic declines of *Diporeia* in Lake Michigan in the late 1990s, the importance of *Mysis* as a food resource for planktivorous fish increased for most forage fish species (S. Pothoven, unpublished data). The importance of *Mysis* in the diet of Lake Whitefish, the most important commercial fish species in the Great Lakes, has also increased with declines of *Diporeia*.

Recent work suggests that the abundance of *Mysis* in Lake Michigan is lower in areas where *Diporeia* are absent relative to areas where *Diporeia* is only beginning to decline (S. Pothoven, unpublished data). This difference could be a result of increased fish predation pressure. In order to understand whether *Mysis* are capable of supporting the increased predation pressure by fish, we need to have an accurate assessment of this species abundance and distribution. Most assessments of *Mysis* use vertically towed zooplankton nets at night, but the coefficient of variation among tows can range as high as 49% with this sampling technique, suggesting patchy distribution of *Mysis*. The patchy distribution of *Mysis* is evident based on results from a pilot study at four 100 m stations along a 37 km transect between Grand Haven and Whitehall where the density of *Mysis* ranged from 42 to 162/m<sup>2</sup>. The density of *Mysis* also differs along depth gradients from nearshore to offshore (Pothoven et al. 2000). In order to understand the role of *Mysis* in food web dynamics, sampling techniques that take the patchy distribution of this species into account need to be tested.



## 2002 Plans

We propose to evaluate the potential of underwater hydroacoustics as a tool to evaluate mysids in Lakes Michigan and Huron. High-frequency acoustic methods have been proposed as a technique that will help resolve problems associated with the patchy distribution of mysids and allow sampling over larger spatial scales than traditional sampling alone (Gal et al. 1999). We will evaluate the suitability of a multi-frequency (200 and 420 kHz) acoustic system as a technique to assess mysid populations in the Great Lakes. Acoustic transects off Muskegon, MI will be sampled during the summer and fall 2002. Acoustic transects will be located along a gradient of bottom depths, as well as along depth contours. Vertical net tows (1-m diameter, 1 mm mesh) will be taken for comparison to acoustic abundance estimates, and to determine length distributions of mysids.

We also will begin an evaluation of mysids in Lake Huron off Alpena, MI. Little work has been done to evaluate *Mysis* in Lake Huron since 1971. We plan to evaluate the seasonal abundance, depth distribution, size structure, and reproductive characteristics of *Mysis*. The sampling will be done at night using vertically towed plankton nets (1 m diameter, 1mm mesh). Sampling will occur at 3 stations out to 80 m bottom depth and will take place monthly during May-September. Samples will be processed following Pothoven et al. (2000).

## References

Gal, G., L. G. Rudstam, & C. H. Greene, 1999. Acoustic characterization of *Mysis relicta*. *Limnol. Oceanogr.* 44: 371-381.

Pothoven, S.A., G. L. Fahnenstiel, H. A. Vanderploeg, & M. Luttenton, 2000. Population Dynamics of *Mysis relicta* in southeastern Lake Michigan, 1995-1998. *J. Great Lakes Res.* 26: 357-365.