

The *Hemimysis anomala* invasion of the Great Lakes: Recommendations from the Rapid Research Response Planning Meeting

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Hosted by the

NOAA National Center for Research on Aquatic Invasive Species (NCRAIS)

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Photo by Steve Pothoven,
NOAA

The Ponto-Caspian mysid shrimp, *Hemimysis anomala* (G.O. Sars, 1907) has invaded the Great Lakes. See <http://www.glerl.noaa.gov/hemimysis/>. On January 11, 2007 the NOAA Great Lakes Environmental Research Laboratory (GLERL), in conjunction with the NOAA National Center for Research on Aquatic Invasive Species (NCRAIS), hosted a NOAA-University of Michigan Great Lakes Seminar series presentation by GLERL scientist Steve Pothoven on the discovery of this species in the Great Lakes. In order to reach as wide an audience as possible, the USEPA Great Lakes National Program Office (GLNPO) provided and facilitated a web-cast and conference phone capability for the seminar. As a result, in addition to attendees in the local GLERL Conference Room, there were 27 participants via the web-cast and an additional 8 participants on the conference phone. Video and pdf files of the presentation are available on the GLERL website:

<ftp://ftp.glerl.noaa.gov/webcast/2007/pothoven/20070111.pdf>

<ftp://ftp.glerl.noaa.gov/webcast/2007/pothoven/20070111b.wmv>

During the afternoon following the seminar, NCRAIS hosted an open "rapid research response" planning meeting that was also facilitated by the GLNPO conference phone capability. There were approximately 12 local attendees and another ~10-12 on the phone, including several Canadian participants.

Three initial research needs were identified and are listed below, roughly in order of priority. All three should be considered interdependent.

Research Needs:

1. Develop and organize a multi-institutional basin-wide *Hemimysis* Monitoring Network to rapidly search for, map the distribution of, and provide information about the species. NCRAIS will organize and coordinate a Great Lakes-wide network involving three interconnected components:

A) Multi-institutional technical personnel with appropriate field-sampling capabilities and resources, such as agency and academic scientists, who will conduct surveys for the presence of *Hemimysis* at various sites around the Great Lakes basin. Development of recommended sampling methodologies and monitoring protocols is a key first step.

B) A structured network of basin-wide site-specific technical volunteers with appropriate training and resources who are willing to respond to public reports of *Hemimysis* sightings in their area by accessing the reported location and attempting to verify their presence, and if possible, collect samples for taxonomic verification and genetic analysis.

C) A public outreach network to engage and involve the general public in the search for *Hemimysis*. Information will be made available about what to look for, where to look (waters edge in the shadow areas of piers, channel walls, jetties, and other maritime structures, or with a spotlight at night, same areas), and how to report apparent sightings. A reporting website will be established at GLERL.

One of the important needs and uses for a rapid survey and longer-term monitoring program is that as locations with populations are identified, that information can be provided to the shipping industry (domestic and saltwater fleet representatives) and the boating public (marinas, sport fishing associations, etc) to be added to their already existing programs aimed at minimizing their roles in the spread of new AIS by avoiding movement of water from infested locations.

The monitoring/survey program will include inland lakes, since there is great potential for *Hemimysis* to reach inland lakes via recreational boats and bait buckets, especially those close to the Great Lakes and their harbors and embayments.

2. Assess the vectors involved in the introduction and (potential) spread of *Hemimysis* to and within North America. This information will guide monitoring, help predict how and where it may spread outside the basin, and direct efforts to prevent or minimize expansion. The *Hemimysis anomala* invasion of the Great Lakes also poses a unique opportunity to study early invasion history, contributing to the science of invasion biology/ecology and identifying vulnerabilities in our efforts to prevent the introduction and spread of AIS in general. This would involve a combination of monitoring, mapping, and genetic studies.

3. Predict the ecological impacts of *Hemimysis anomala* in the Great Lakes region. Early assessment of potential impacts, particularly to ecosystem services enjoyed by humans, is a key step in determining the relative priority which should be placed on any new invader. The potential impact drives human interest in, funding for, and cooperation with monitoring and control efforts. Further, while the vectors, range expansion, and population densities of a new invader all play a role in determining impact, its potential to exploit certain habitats and food web niches, and to adjust to competitors and predators also drive its capacity to expand its range and increase population density. Thus research into the physiology, life history and ecology of *Hemimysis anomala* may help to guide monitoring efforts and understanding of the vectors involved in potential spread.

A) Rapid assessment of potential impacts of *Hemimysis anomala* based on the history of invasion in Europe and comparison with characteristics of the Great Lakes and inland systems potentially open to invasion in North America. *H. anomala* has been spreading through Europe as a successful invader in nearshore areas and inland lakes and rivers. It is an effective predator and an omnivore – juveniles preyed on phytoplankton, while more mature forms switched to mostly zooplankton. Borchering et al (2006) concluded that *H. anomala* will use of a wide variety of prey, probably depending on what is available. Degree and type of impact seems to vary widely – from little observed impact in the Baltic Sea to disruptions of nutrient recycling in reservoirs, particularly in relation to the silica

cycle. Thus, this species may have the potential to significantly affect areas within the Great Lakes basin where it achieves high population densities, especially small embayments and inland lakes.

(Borcherding J, Murawski S, Arndt H. 2006. Population ecology, vertical migration and feeding of the Ponto-Caspian invader *Hemimysis anomala* in a gravel-pit lake connected to the River Rhine. *Fresh. Biol.* 51(12):2376-2387.)

B) Assessment of habitat requirements of *Hemimysis anomala* relative to available habitats in the Great Lakes and inland lakes is needed in order to predict the potential spread. For instance, the capacity of *Hemimysis* to utilize dreissenid reefs as suitable habitat is an important consideration. Such assessment can also help to direct monitoring efforts.

C) Research on how *Hemimysis* is likely to integrate into the existing Great Lakes food web will become important in areas where it achieves a significant population density. This is linked to the basin-wide monitoring program (#1 above), since food-web impacts will be proportional to the *Hemimysis* population density. Studies from the European literature are insufficient to assess how *Hemimysis* will interact with the existing Great Lakes food web. Potential competition with native *Mysis diluviana* (formerly identified as *Mysis relicta*) and *Diporeia* spp. should be examined. Both lab and field studies will be required. Significant results will need to be integrated into existing food web and fisheries models used for research and management.

D) An important contaminants-related research issue was identified related to the bioconcentration of organic contaminants by *Hemimysis*, and the potential that they could thus affect the contaminant body burden in coastal fish, thus increasing the exposure to food-chain contaminants of consumers.

E) The European literature reports occasional significant impacts of *Hemimysis* on nutrient recycling in reservoirs, particularly in relation to the silica cycle. Researchers need to assess whether *Hemimysis* causes or has the potential to cause similar impacts in the Great Lakes region.

A list of interested persons and organizations was compiled and will be expanded as opportunities allow.

The first activities, which are proceeding with existing resources, include:

- Preparation of outreach information about the species (see <http://www.glerl.noaa.gov/hemimysis/>).
- Developing the *Hemimysis* Monitoring Network.
- Preparation of a bibliography of scientific journal articles about the species (AIS Clearinghouse, <http://www.nysgextension.org/ans/anspages/aquaticinvasiveanimals.htm>).
- Development of guidance on detection and sampling methods, one aimed at technical personnel and one for the general public (see <http://www.glerl.noaa.gov/hemimysis/>).

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