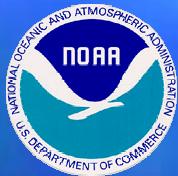


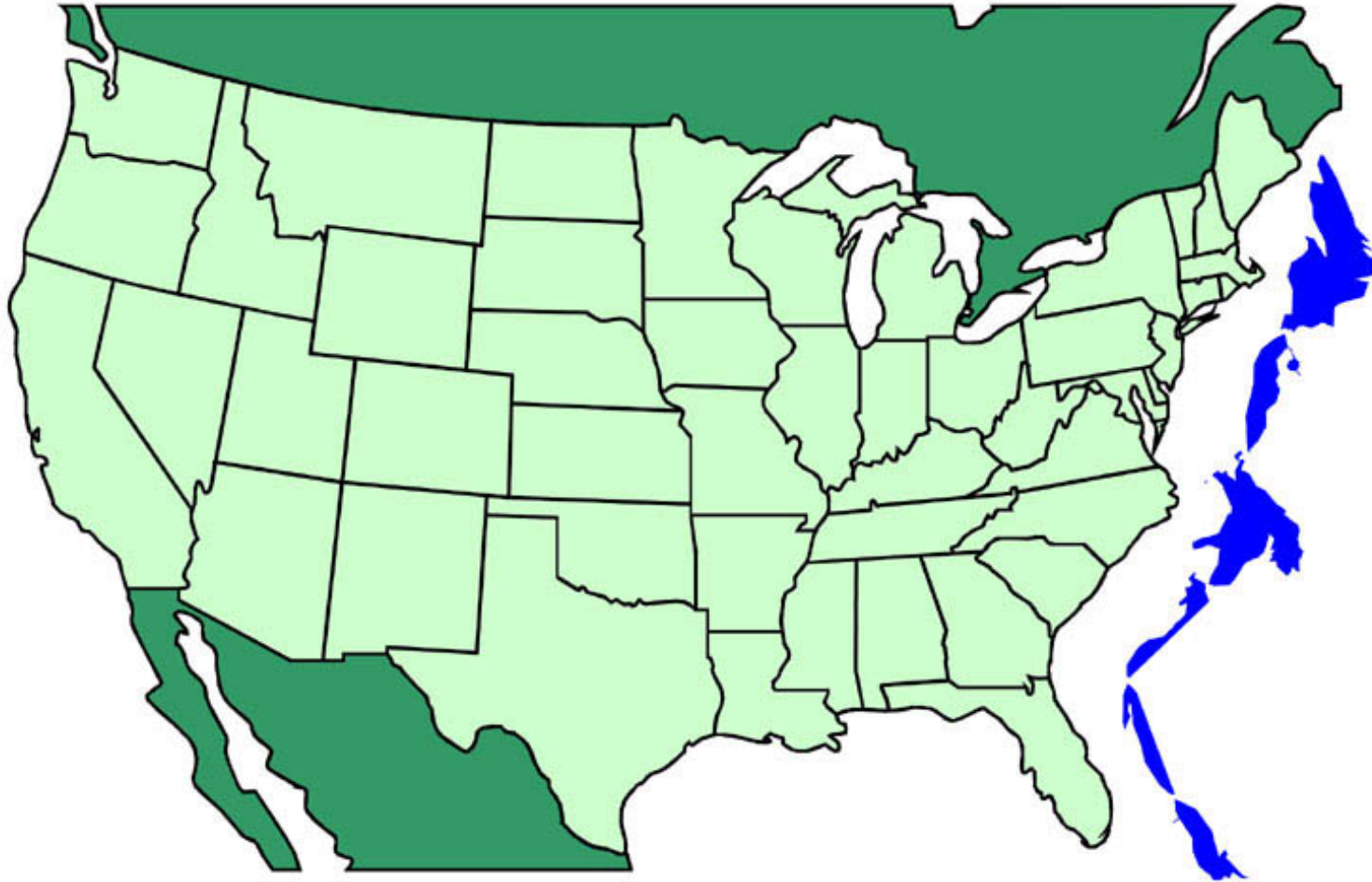
# Great Lakes Environmental Research Laboratory



[www.glerl.noaa.gov](http://www.glerl.noaa.gov)

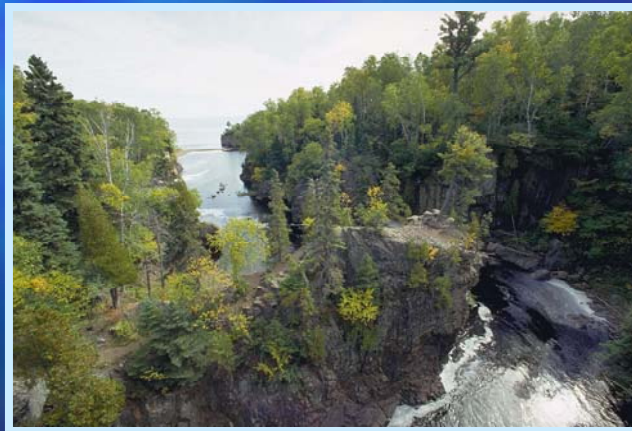


# ***Great Lakes Coastlines***



# Mission

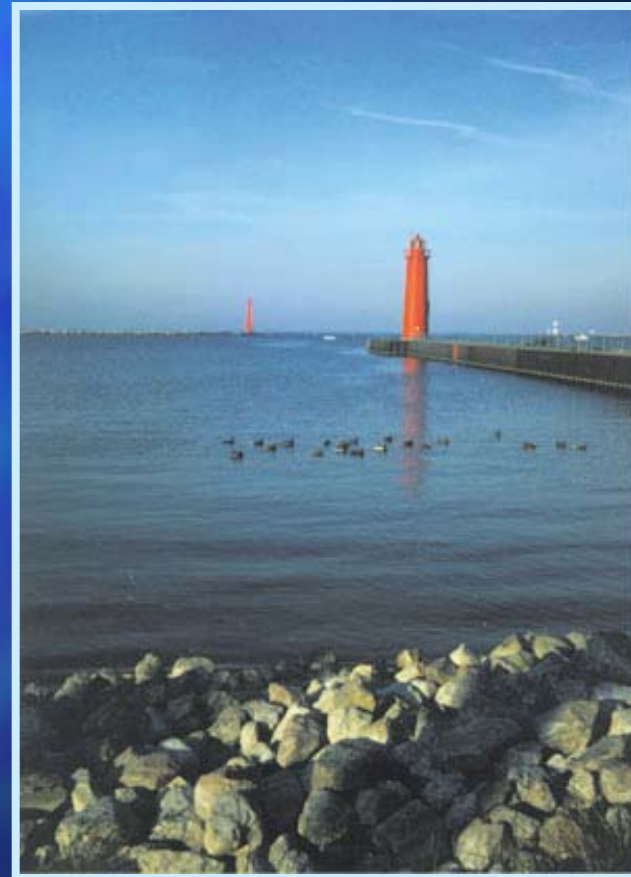
GLERL conducts high-quality research and provides scientific leadership on important issues in both the Great Lakes and marine coastal environments, leading to new knowledge, tools, approaches, awareness, and services.





# What does GLERL do?

- Research
- Leadership
- Long-Term Monitoring
- Technology Development
- Information Synthesis and Assessment
- Outreach



# GLERL Facts



- Main facility located in Ann Arbor, Michigan with a research vessel and Lake Michigan Field Station in Muskegon, Michigan.
- Established in 1974.
- 54 permanent staff, 20 University staff.
- FY2001 budget \$7.0 (federal \$'s).



# Information Services



- Provides editorial and publication support.
- Provides information to the public and user community.
- Oversees Data Visualization Lab.
- Coordinates outreach activities.
- Sea Grant Link.

# Main Facility



- 14-year-old main facility in Ann Arbor, Michigan.
- Occupies 25,500 square feet.
- Wet and dry laboratories.
- Computer facility.
- Marine Instrumentation Laboratory.
- Remote Sensing Laboratory.
- Geographic Information System Lab.
- Fish Acoustics Laboratory.
- Research Library.
- Data Visualization Laboratory.



# Lake Michigan Field Station



- Former Coast Guard base in Muskegon, Michigan.
- Acquired by NOAA in 1990.
- Includes four buildings and research vessel dockage.
- 1993 renovation included a scientific laboratory, offices, and storage.
- Six full-time staff.



# Lake Michigan Field Station

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- Provides a base of operation for GLERL research vessels.
- Provides a focal point for field research on Lake Michigan.
- Provides outreach--teaching university classes, general public education, and volunteer programs.

# R/V Shenehon

- Built in 1953.
- 65 feet long.
- Acquired by NOAA in 1976.
- Serves as GLERL's primary research platform.



# Cooperative Institute for Limnology and Ecosystems Research (CILER)



- Joint endeavor of GLERL, the University of Michigan, and Michigan State University

- Mission: to promote and facilitate collaborative research between NOAA and academic scientists from Great Lakes basin institutions

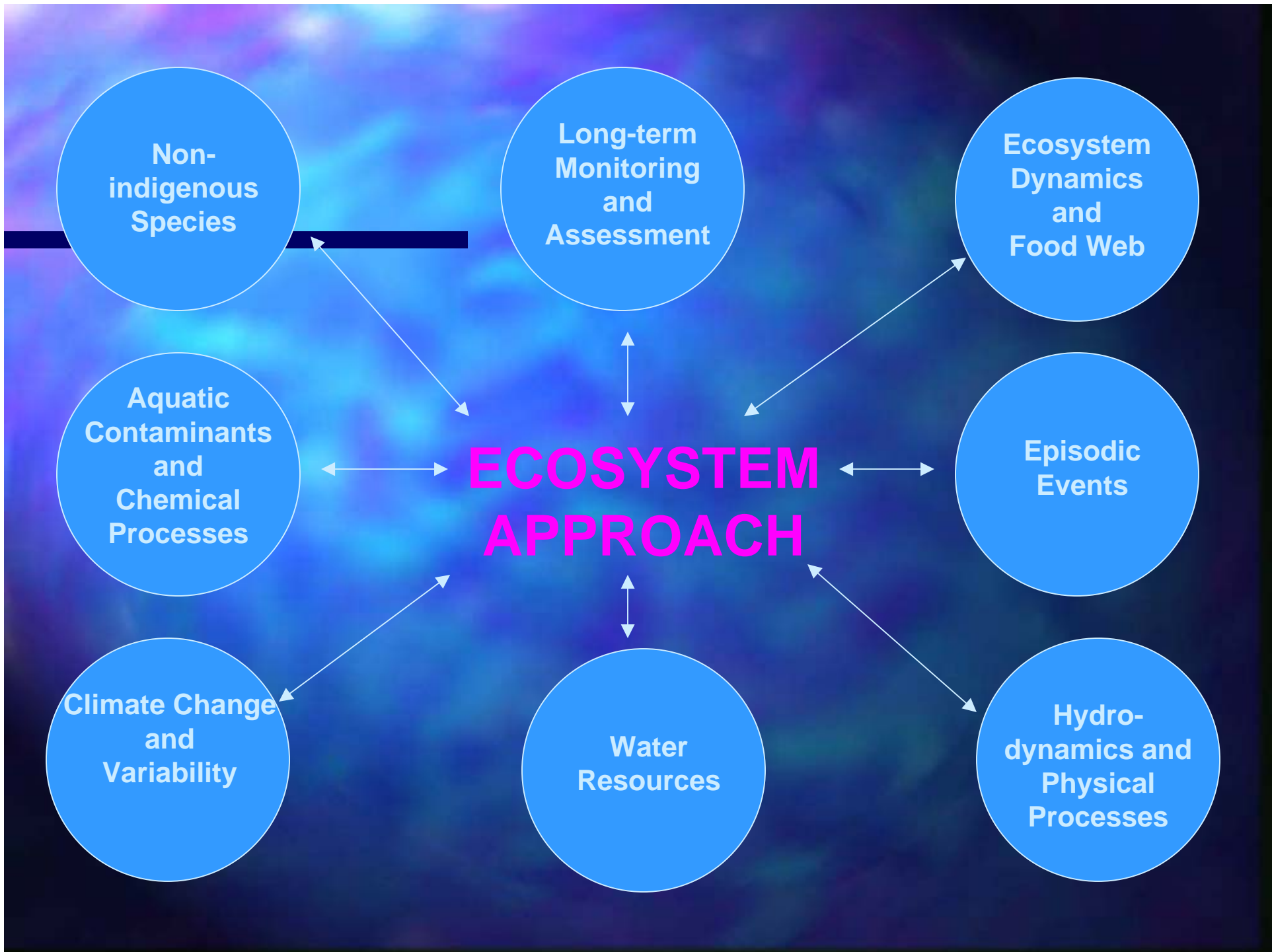
- Research areas in:
  - Nearshore processes.
  - Large-lake ecosystem structure and function.
  - Climate and large-lake dynamics.
  - Remote sensing of ocean dynamics.
  - Marine environmental engineering..
  - Fish ecology.



# Cooperative Institute for Climate and Ocean Research (CICOR)

- Joint institute of the Woods Hole Oceanographic Institute (WHOI) and NOAA.
- Builds ties between WHOI investigators and colleagues at NOAA laboratories.





# Nonindigenous Species



- Impact structure and function of aquatic ecosystems.
- Have high cost (e.g. zebra mussels cost \$10 billion annually).
- National Invasive Species Act of 1996 recognized this problem and the need to prevent, control, and assess the impact of these exotic organisms.
- GLERL is congressionally mandated to conduct research on this area.



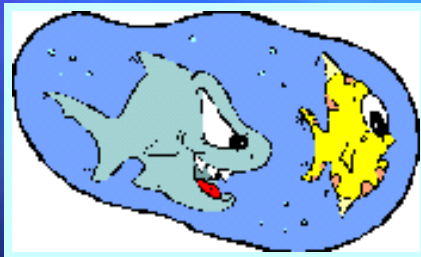
# Long-term Monitoring and Assessment

- Understanding and predicting changes in an ecosystem require baseline observations on natural scales of variability. Long-term data on water quality, the distribution, abundance and interactions of organisms with the ecosystem, and physical status are required to:
  - Identify perturbations and changes.
  - Put current trends into historical framework.
  - Provide context to assess impact of predicted changes.



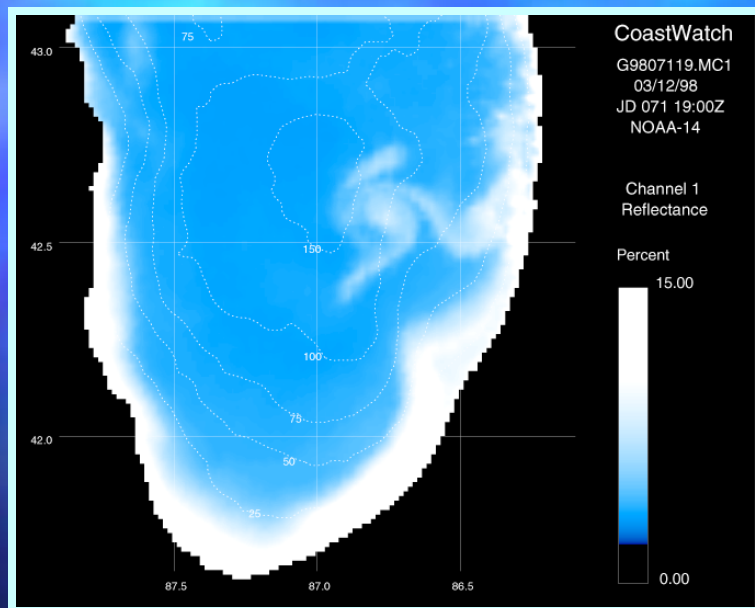
# Ecosystem Dynamics and Food Web

- Changes in the food web have a direct impact on fisheries production that support a multi-billion dollar sports fishery in the Great Lakes.



- Understanding the food web is also critical for predicting:
  - Contaminant accumulation.
  - Impact of exotic species.
  - Impact of fisheries management decisions.
  - Production and predator-prey interactions.
  - The impact of changes in nutrient loads, water quality, and climate on the ecosystem.

# Episodic Events



Episodic events, e.g. storms, run-off events, downwelling, upwelling, lake ice cover, and thermal bar formation, have major and long-term impacts on ecosystem processes. Understanding these will help advance prediction of and management responses to anthropogenic and natural perturbations to ecosystem structure and function.



# Hydrodynamics and Physical Processes

- The physical driving forces, waves, currents, storm surges, seiches and related physical phenomena distribute particles, chemicals and biota and affect rate processes.
- Physical processes also directly impact such things as boating safety, shore erosion, fishing success and fish recruitment.
- The ability to predict the physical environment allows forecasting of the location and drift of toxic chemical spills, and protection of life.



# Water Resources



- The Great Lakes provide the largest source of surface freshwater in the country.
- The water is used directly for drinking, power production, and other consumptive uses and the demand for water continues to increase.
- Water quantity issues are projected to be a key issue over the next few decades. This has been exacerbated by the current low water levels.



# Climate Change and Variability

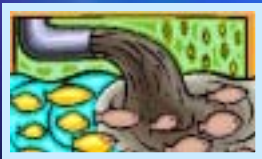
- Changes in climatic characteristics have the potential to:
  - Disrupt foodwebs.
  - Alter ecosystem productivity.
  - Impact the physical system.
  - Changes resources afforded the Great Lakes community from shipping capacity to fisheries productivity.

*GLERL was the first scientific agency to explore potential impacts of climate change on water levels, which have become a major public issue.*





# Aquatic Contaminants and Chemical Processes



- Pollutants, both common nutrients and persistent anthropogenic contaminants impact:
  - Survival and productivity of aquatic terrestrial species.
  - Reproduction and tumors in important fishes, birds, and mammals.
  - Human health.

# Current Issues

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- Lake water levels.
- Invasive species and “No-Ballast-on-Board (NOBOB).”
- Disappearance of *Diporeia*.

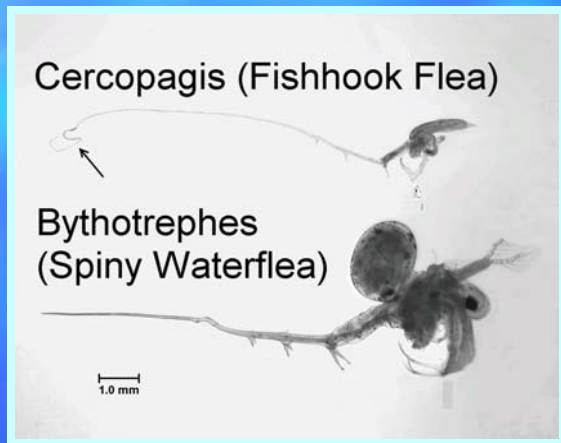
# Lake Water Levels

- GLERL uses complex computer-based models of the Great Lakes hydrologic cycle to predict short- and long-term changes in lake levels.
- This helps managers and decision makers identify the most effective strategies to reduce costs and damages related to excessively high, or low, lake levels (i.e. impacts on commercial shipping, recreational boating, and shoreline erosion).

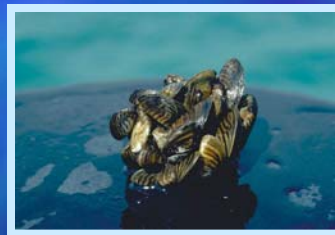
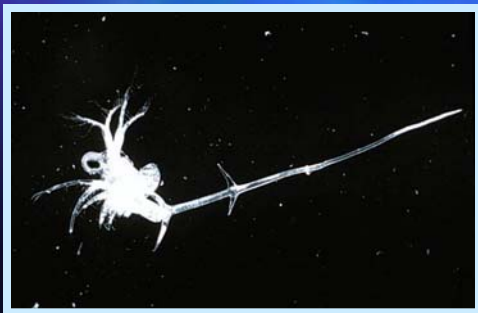




# Invasive Species



- GLERL tracks the spread of invasive (exotic) species and determines their impact on Great Lakes and coastal ecosystem health.
- GLERL's research and monitoring efforts have led to increased understanding of how invasive species, such as the zebra mussel and the round goby, affect Great Lakes foodwebs.



# “No-Ballast-on-Board”



- A new three-year research program involving collaboration between six institutions is being conducted by a U.S.-Canadian team of scientists, lead jointly by GLERL and CILER.
- The primary goal of the program is to provide the scientific knowledge needed to understand the risk of invasive species introduction passed on by transoceanic NOBOB (“no-ballast-on-board”) vessels operating in the Great Lakes.

# Disappearance of *Diporeia*

Researchers at GLERL are in the process of identifying how the disappearance of *Diporeia* affects Great Lakes food webs and, ultimately, fish production.

