

Invasive Species in the Great Lakes

Old Threats in New Places

Same Vectors, New Faces

Ottawa County Water Quality Forum

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Dan O'Keefe, Ph.D.
Michigan Sea Grant/MSUE

MICHIGAN STATE
UNIVERSITY
EXTENSION



Rainbow smelt



Purple loosestrife



Zebra mussels



Eurasian ruffe



American eel



Round Goby



Common carp



Alewife



White perch



Spiny waterflea



Threespine stickleback



Sea lamprey



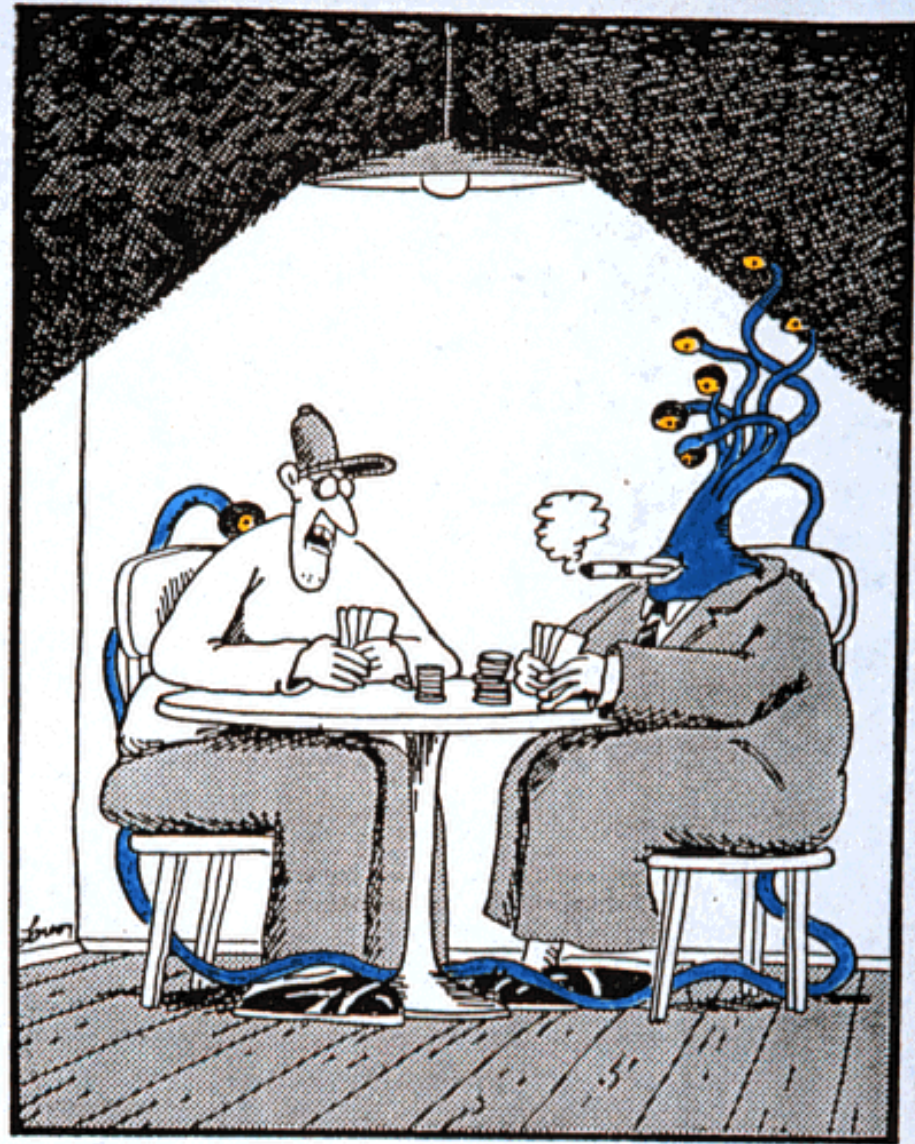
Corbicula



Rusty crayfish

Why Do Some Exotics Become Nuisance Species?

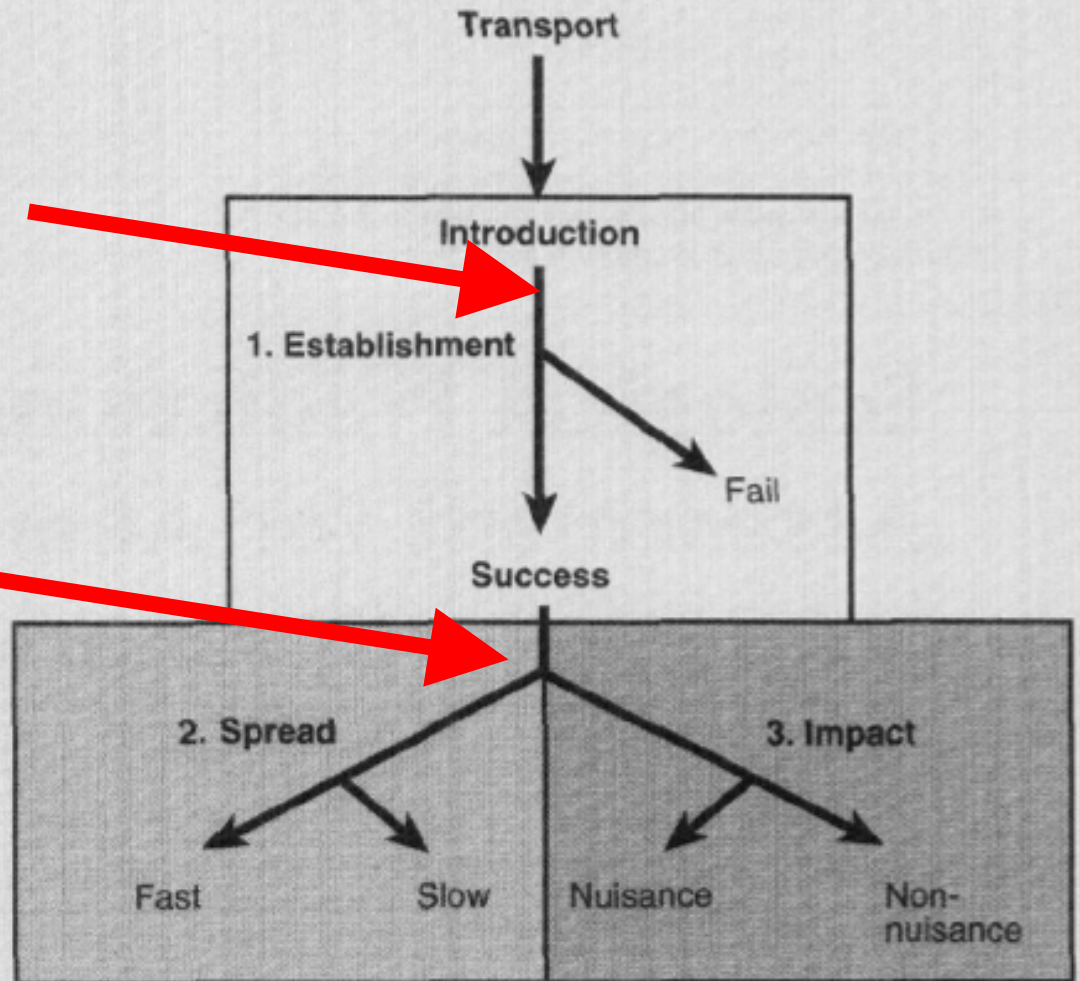
- They are usually prolific and/or disperse rapidly
- They have not coevolved with species present in the new environment
- Anthropogenic disturbance favors colonization by pioneer species (Sousa 1984)



"Well shucks! I've lost again. Talk about your alien species luck!"

Early Detection and Rapid Response Possible?

Control is Often the Only Option After Successful Establishment



Unlike chemical pollution,
which can generally be cleaned up with time,
Exotics are forever



**Exxon Valdez
Valdez, Alaska 1989**

ROUND GOBY



- **Ballast introduction**
- **Extremely tolerant**
- **Density $>20/m^3$**
- **Rapid expansion since 1990**

ECOSYSTEM EFFECTS



This Lake Huron walleye consumed several gobies before being caught by a charter boat customer.



Gobies are implicated in food web changes resulting in avian botulism outbreaks.

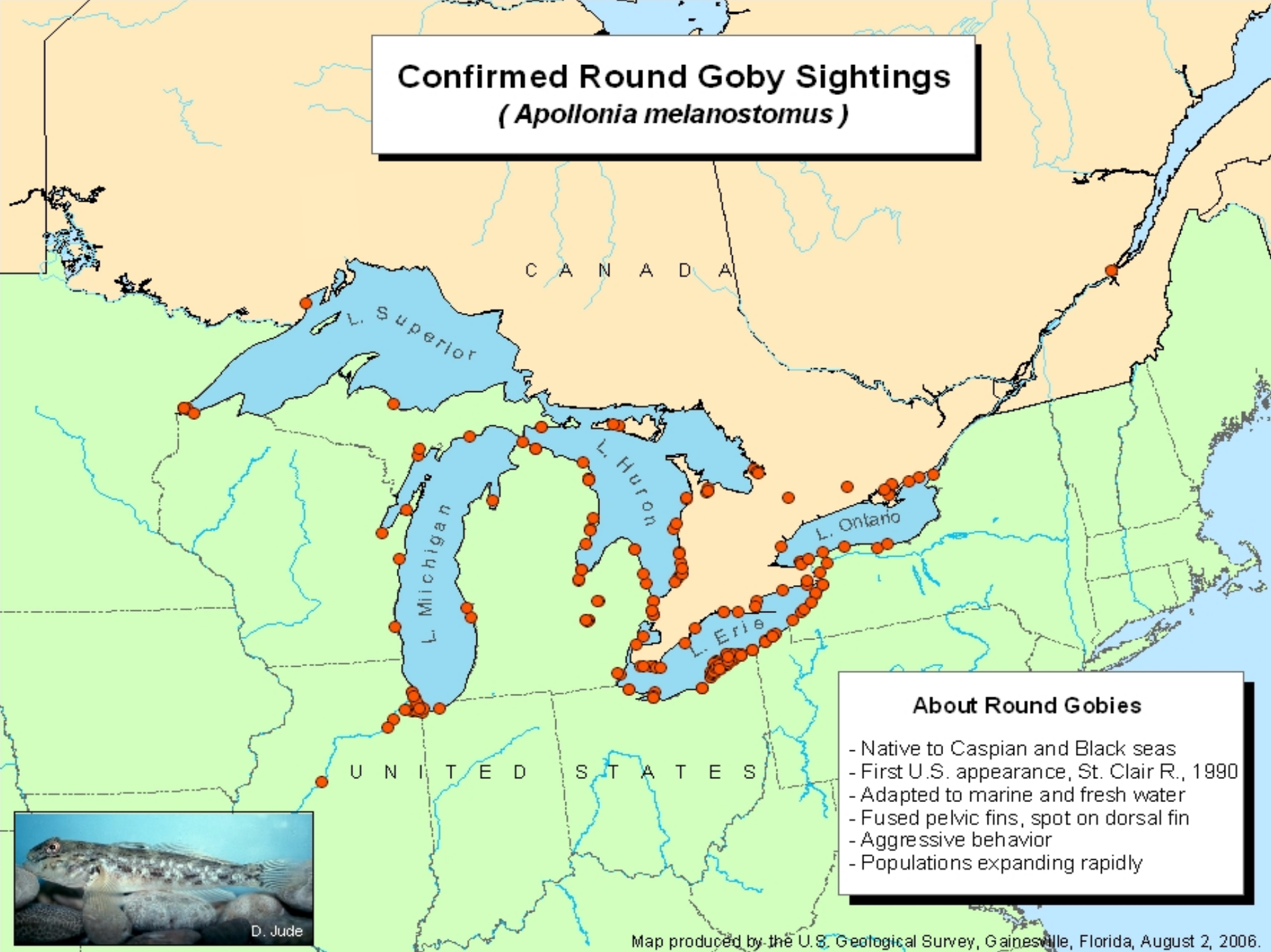
- Displaces native fish (sculpins and darters)
- Reduces benthic inverts, including zebra mussels
- Preyed upon by native fish and waterfowl
- Transfers toxins and energy from benthos
- Can affect periphyton

GOBY DISPERSAL

- Larval DVM
- No swim bladder
- Adults sedentary
- Dams block movement



Confirmed Round Goby Sightings (*Apollonia melanostomus*)



About Round Gobies

- Native to Caspian and Black seas
- First U.S. appearance, St. Clair R., 1990
- Adapted to marine and fresh water
- Fused pelvic fins, spot on dorsal fin
- Aggressive behavior
- Populations expanding rapidly



D. Jude



NATIONAL CENTER FOR RESEARCH ON
AQUATIC INVASIVE SPECIES

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GLANSIS Database

Generate a NonIndigenous Species List

Select your criteria below

Portions of this database are still incomplete. Please be sure to check the **current status**.

A list of nonindigenous species that matches your criteria will be generated. Species with fact sheets will have links to the fact sheets.

Group:

Lake (HUC): (seen on right)

Genus:

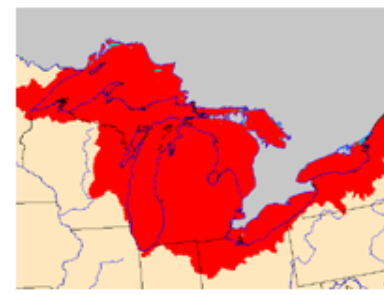
Species:

Common Name:

Status:

Freshwater/Marine:

Pathway:

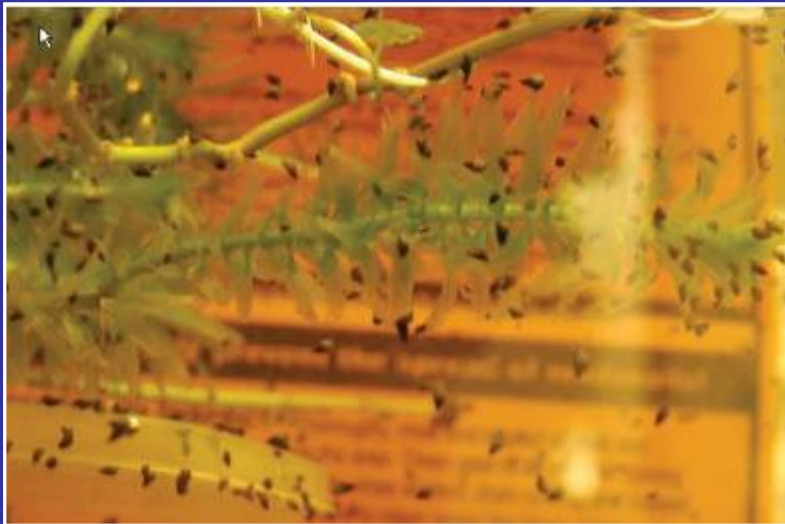


| | | | | | | | |
|------------------------|----|--------------|---|-------|----------|-----------------------|-------------|
| 159429 | MI | Monroe | Swan Creek - within 500 m downstream of Dixie Hwy bridge | 2001 | 04100001 | Ottawa-Stony | established |
| 35625 | MI | Muskegon | Muskegon River about 0.5 mile from Lake Michigan at Coast Guard Station breakwall | 1999 | 04060102 | Muskegon | established |
| 163721 | MI | Muskegon | Muskegon Lake in Muskegon, MI | 2004 | 04060102 | Muskegon | established |
| 35397 | MI | Ottawa | Lake Michigan, offshore from Grand Haven, MI | 1997 | 04060200 | Lake Michigan | established |
| 159450 | MI | Ottawa | Grand River at Riverside [County] Park [~8 mi E of Grand Haven, MI](Dick's Landing) | 2004 | 04050006 | Lower Grand | established |
| 35626 | MI | Presque Isle | Lake Huron at Presque Isle Harbor (45°20'00"N 83°30'00"W) | 1999 | 04080300 | Lake Huron | established |
| 159438 | MI | Saginaw | Saginaw River at Carrollton | 2002 | 04080206 | Saginaw | established |
| 156275 | MI | Saginaw | Saginaw River in Carrollton [just N of Saginaw, MI] | 2002 | 04080206 | Saginaw | established |
| 164200 | MI | Saginaw | Saginaw River [Saginaw, MI] from the I-75 overpass up to the rail bridge in Carrolltown in the ship channel | 2004 | 04080206 | Saginaw | established |
| 35596 | MI | Sanilac | Lake Huron near Lexington, MI | 1997 | 04080300 | Lake Huron | established |
| 35597 | MI | Sanilac | Lake Huron near Port Sanilac, MI | 1997 | 04080300 | Lake Huron | established |
| 35605 | MI | Schoolcraft | Lake Michigan at Port Inland harbor/dock, MI | 1998 | 04060200 | Lake Michigan | established |
| 159433 | MI | Schoolcraft | Port Inland - within harbor and near dock | 2002 | 04060107 | Brevoort-Millecoquins | established |
| 35367 | MI | St. Clair | St. Clair River at Detroit Edison County Belle River Power Plant intake structure. | 1990 | 04090001 | St. Clair | established |
| 35364 | MI | St. Clair | St. Clair River at Detroit Edison County Belle River Power Plant intake structure. | 1990 | 04090001 | St. Clair | established |
| 35339 | MI | St. Clair | St. Clair River at Detroit Edison County Belle River Power Plant screen, | 1990 | 04090001 | St. Clair | established |
| 35340 | MI | St. Clair | St. Clair River near St. Clair, MI | 1990 | 04090001 | St. Clair | established |
| 35342 | MI | St. Clair | St. Clair River near St. Clair, MI | 1990 | 04090001 | St. Clair | established |
| | .. | .. | St. Clair River at Detroit Edison County Belle River | | | | |



New Zealand Mudsnail

- Grazes on attached algae
- Can pass through gut of fish or bird unharmed
- Lives in all types of river and reservoir habitats
- Self-cloning females
- Reaches densities of 300-700,000 per m²

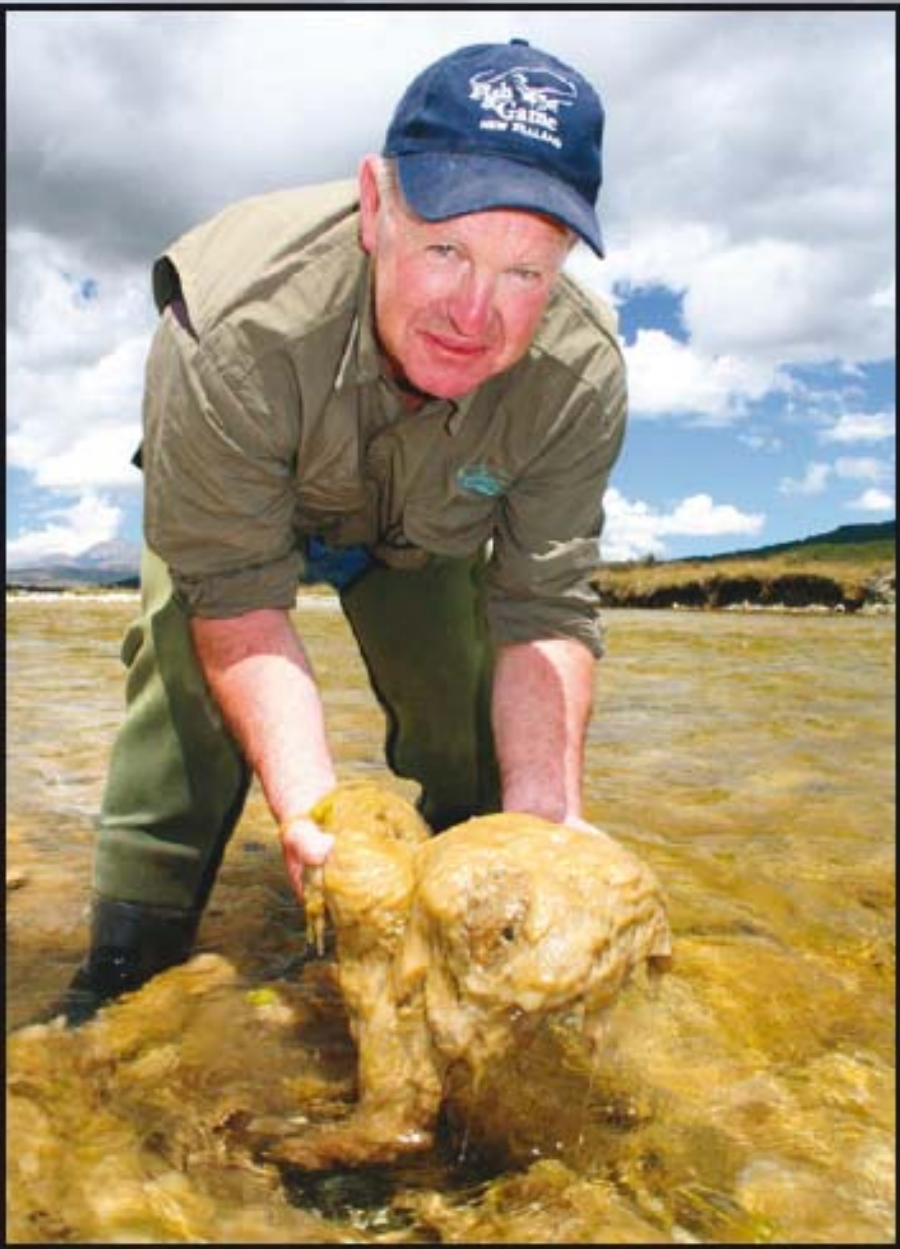




D. L. Gustafson photo, Montana State University

Didymo

- Diatom *Didymosphenia geminata*
- Smothers habitat in streams
- Anglers transport on waders
- Impossible to control
- Anglers asked to disinfect and dry waders after wading in infested river



Fish and Game New Zealand

Confirmed presence of *D. geminata* in the United States and Canada. A total of 401 samples are included. Records are based on data from USGS National Water Quality Assessment (NAWQA), EPA Environmental Monitoring and Assessment (EMAP), and samples from other studies. (Map by Karl Hermann, Sarah Spaulding, and Tera Keller)



Since 2005: South Dakota
Vermont
Tennessee
Virginia
New Hampshire
Maryland
New York (Battenkill R.)

Legend
• *Didymosphenia geminata* Observed
Canada
United States
Mexico

Asian Carp

Coming soon to a river near you?



HOW CAN WE
PREVENT ASIAN
CARP FROM
ENTERING THE
GREAT LAKES??

Lake Michigan



Cal-Sag and Chicago Sanitary and Ship Canal showing details of the connection to the Mississippi River Basin via the Illinois River and the location of the Aquatic Nuisance Species Barriers.

Table 3.1.1. Twenty-two pathways identified by the Working Group are grouped according to attributed risk level (highest risk to low risk)⁶. Risk includes both the likelihood for an introduction to occur and the potential for adverse ecological and/or economic effects. Pathways within the different risk levels are ordered alphabetically and not by relative risk.

| Pathway | Risk Level |
|---|----------------------|
| Accidental and deliberate unauthorized releases by individuals | Highest ⁷ |
| Activities related to wild-caught baitfish | Highest |
| Domestic live transport and distribution of wild-caught fish | Highest |
| Illegal distribution and sales of diploid grass carp as triploid fish | Highest ² |
| Importation into the United States for "non-commercial use" | Highest ² |
| Poorly sited aquaculture facilities with Asian carps | Highest |
| Stocking of diploid Asian carps into non-aquaculture waters | Highest |
| Unintentional live transport "in water" by boats, barges, and ships | Highest ² |
| Unintentional live transport and distribution by natural resources management agencies | Highest ² |
| Aquarium/hobby industry | Moderate |
| Commercial, domestic transport of live farm-raised Asian carps | Moderate |
| Importation into United States for commercial use | Moderate |
| Incidental inclusion of Asian carps in aquaculture shipments of other farm-raised species to non-aquaculture waters | Moderate |
| Research and educational facilities and projects | Moderate |
| Unintentional shipment of black carp in diploid or untested triploid grass carp stockings | Moderate |
| Incidental inclusion and potential release of Asian carps in "farm raised" baitfish | Low |
| Incidental inclusion of Asian carps in domestic shipments of catfish to fish farms | Low |
| Incidental inclusion of Asian carps in domestic shipments of food fishes | Low |
| Incidental inclusion of Asian carps in international imports of other fishes | Low |
| Intentional release of live, "adult-size" (non-baitfish) Asian carps by boaters, anglers, and bow fishers | Low |
| "Properly" sited aquaculture facilities | Low |
| Stocking of triploid Asian carps into non-aquaculture waters for biological control | Low |

WALLEYE BAIT??



Illinois Natural History Survey Photo

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Bighead Carp

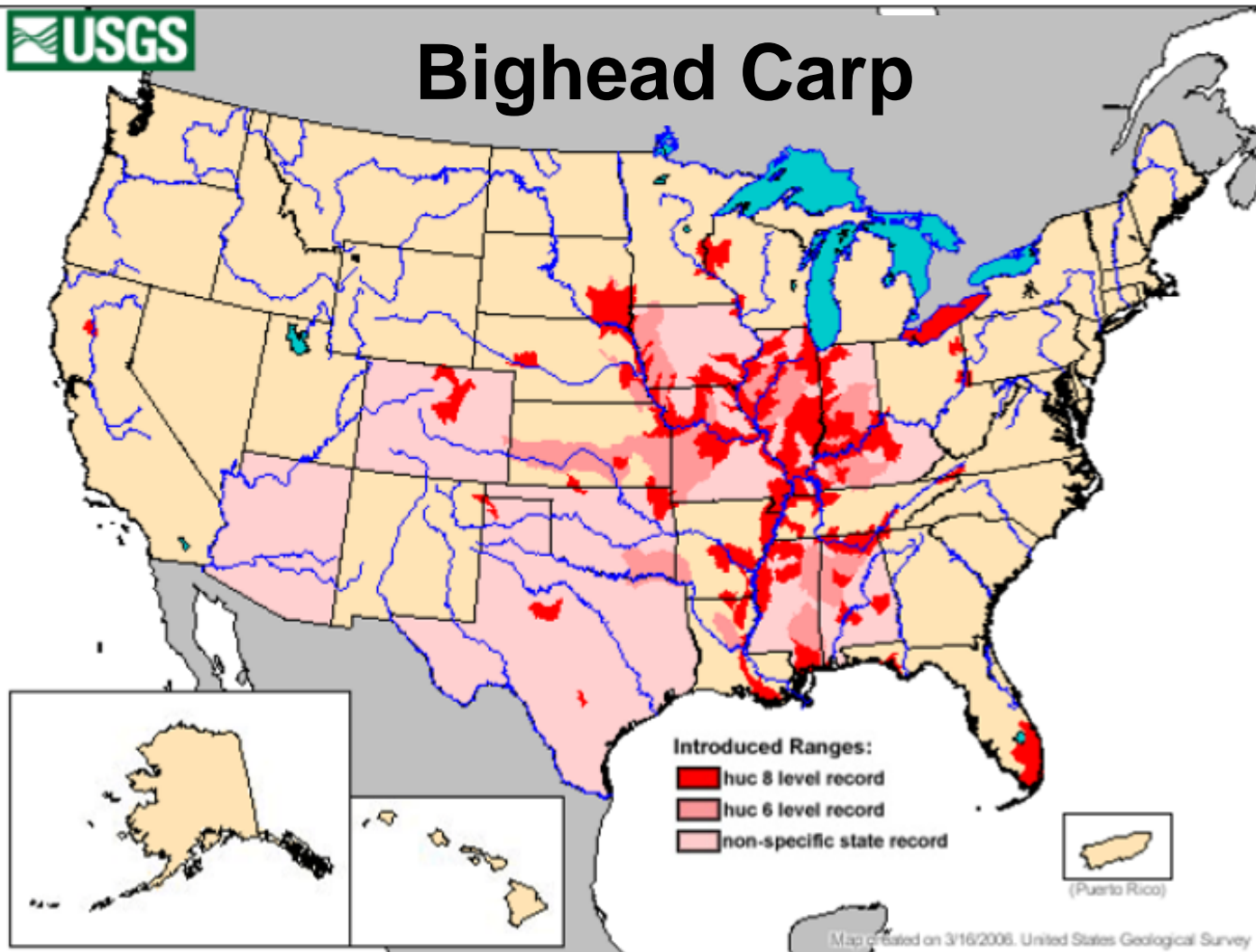


Figure 2.1.2. Distribution of bighead carp in the United States as reported in the Nonindigenous Aquatic Species database at the U.S. Geological Survey (USGS). Map reproduced from <http://nas.er.usgs.gov/>.



Fig. B: Craig Blackie and Dylan Weese are holding a very large carp, the bighead carp *Hypophthalmichthys* sp, which a fisherman had caught in his trap, in Lake Erie, and which an Axelrod Institute of Ichthyology collaborator, Bruce Morrison, brought to the Institute to be identified

Impact on Fishing?



Reproductive Requirements

- Silver carp: 64-72° F
- Bighead carp: >72° F
- Both require a rise in water level (or turbidity?)
- Both require ~30 miles of free-flowing river upstream of lake/bayou

Impact on Boating?



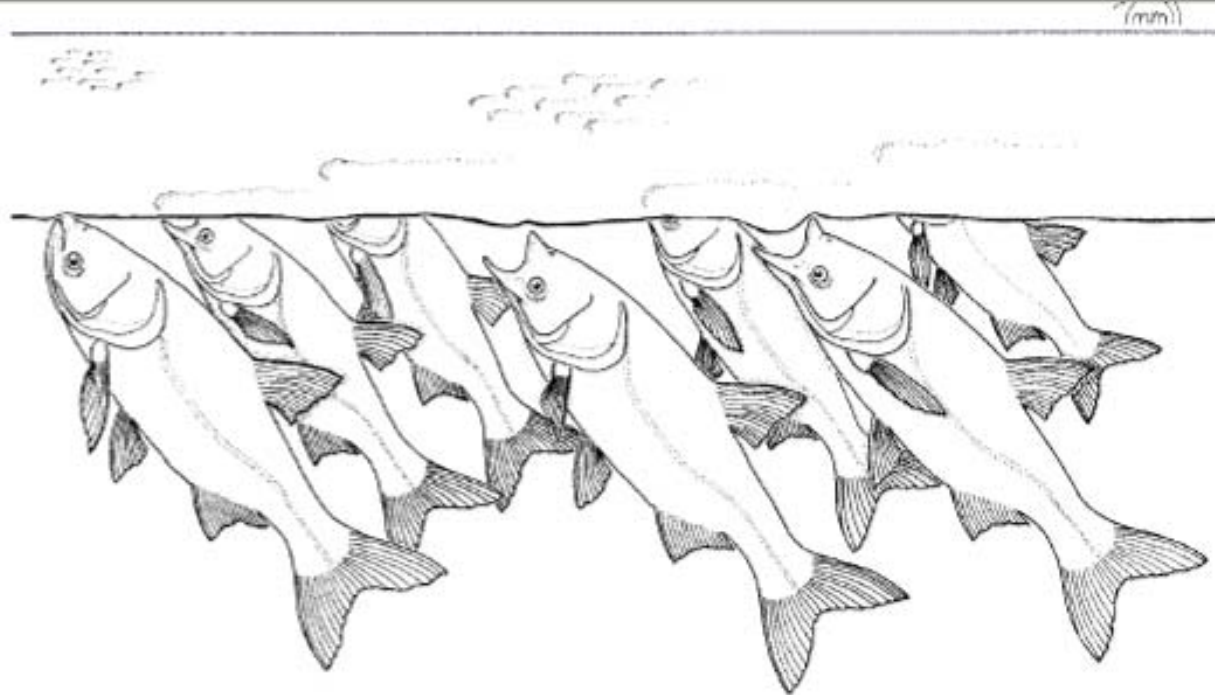


Figure 14. Bighead Carp, *Hypophthalmichthys nobilis*, pump-feeding at water surface. Illustration by Susan Trammell.

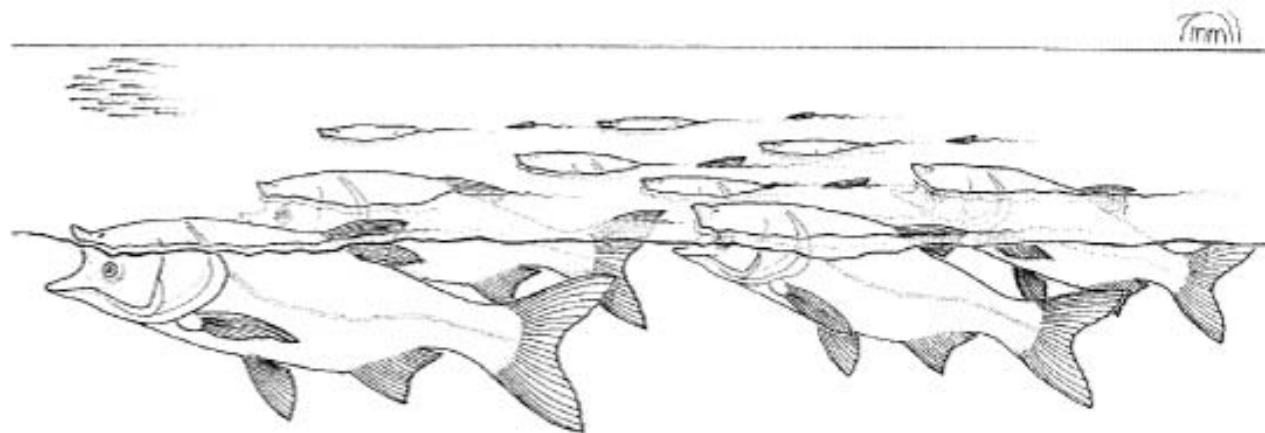


Figure 15. Bighead Carp, *Hypophthalmichthys nobilis*, ram feeding at the water surface. Illustration by Susan Trammell.

HYDRILLA

- Infests 40% of lakes in Florida
- Only midwestern lake infested is Manitou Lake, IN
- \$1.5 million treatment
- Strict boating regs
- Extensive monitoring



How can we prevent the spread of ANS?

- Know which invaders are likely to arrive and how to report
- Clean gear, dispose of bait, and spread the word to avoid accidental introductions
- Stress need for effective legislation and development of rapid response capabilities

