

# ROUND GOBY

## Overview

The round goby (*Neogobius melanostomus*) is a non-native fish that is causing substantial ecological and economic impacts on Great Lakes fisheries. Originating from central Eurasia, the round goby and the closely related tubenose goby were first detected in the St. Clair River in 1990, introduced via contaminated ballast water of transoceanic vessels.

While tubenose goby populations have remained relatively small, a rapid range expansion of round goby has occurred throughout the Great Lakes since initial introduction. This expansion has been facilitated round goby larvae pumped into ballast tanks and subsequently discharged during vessel movement from one port to the next. Several physiological and behavioral traits have allowed this bottom-dwelling fish to thrive in the Great Lakes ecosystem. These include aggressive behavior, voracious feeding habits, and a well developed sensory system that enhances their ability to detect water movement, allowing them to feed in complete darkness. Fishery managers and researchers have found that round gobies have caused declines in populations of other bottom-dwelling Great Lakes native fish like mottled sculpin, logperch, and darters. The round goby competes with these species for food and habitat, especially spawning sites. Other competitive advantages held by the round goby over natives are their ability to survive in degraded water conditions, spawn more frequently over a longer period, reproduce rapidly, and guard nests from predation of their eggs. Gobies, as observed in laboratory experiments, consume the eggs and fry of lake trout, posing a substantial threat to this economically and ecologically valuable native fishery. Round gobies also are troublesome to recreational anglers given their ability to “steal” bait, replacing the catch of desired species such as walleye.



Round gobies generally prefer nearshore habitats of rock, sand, cobble, gravel, and/or submerged aquatic vegetation (e.g., macrophytes), but are also invading offshore reefs where they are an increasing source of prey for burbot, lake trout, and lake whitefish. This is problematic to these predator species since round gobies contain less energy upon consumption than native prey. In addition, the round goby has a tendency to ingest toxic substances due to feeding habits, such as consumption of large quantities of zebra and quagga mussels, invasive mollusks. As filter feeders, the zebra and quagga mussels are exposed to toxic substances circulating in the water column. The toxins progressively bioaccumulate in the food web as round gobies consume the invasive mollusks and are then consumed by higher-level predators. Many of these predator fish are also popular sport fish, causing an increase in human health risks for those anglers who eat their catch on a regular basis.

**Photo:** David Jude, University of Michigan, School of Natural Resources and Environment, Center for Great Lake and Aquatic Sciences

## Identification

Young round gobies are solid, slate-gray. Older fish are mottled gray with olive green and brown markings, while nest-guarding males are black in color. The dorsal fin lacks spines and appears green in color with a rearward black spot. A distinctive feature of this species is the raised, frog-like eyes. Another unique characteristic of the round goby that helps in distinguishing it from the native sculpin is the fused pelvic fins, which form a suction disk. They also have a slightly down-turned mouth and specialized teeth designed to crush mollusk shells, their primary food source.

**Size:** Can reach up to about 7 inches in length in the United States.

**Native range:** Eurasia, including the Black and Caspian Seas, and Sea of Azov and tributaries

## Occurrences in the Great Lakes Basin

The round goby was first detected in 1990 into the St. Clair River, where several collections were made on both the U.S. and the Canadian sides of the border. By 1994, the species had spread to the north end of Lake St. Clair at Anchor Bay. The round goby was reported in 1993 in the Calumet River in South Chicago. Via the Grand Calumet River, (which flows downstream from Lake Michigan) and the Chicago Sanitary and Ship Canal, the round goby has migrated from the Great Lakes toward the Mississippi River basin. It has been captured in the Illinois River as far downstream as Peoria, Illinois, 170 miles southwest from the Chicago lakefront. The round goby was first discovered in Lake Superior in 1995 and it was introduced into Michigan's Shiawassee and Flint Rivers (flowing into Saginaw Bay of Lake Huron) in August 1996 and June 1997 (respectively) and the River Raisin in 1999. In New York, round gobies were first identified in 2002 in the New York State Canal System near Buffalo. In 2007, they were confirmed as far east as Rochester within the canal system and are currently established as far as Massena, near the Moses-Saunders Dam. In Ontario, gobies have established throughout Georgian Bay and as far eastward as Kingston. There have been several instances of round goby collection (though not necessarily establishment) along the St. Lawrence River in Quebec.

**Means of Introduction and spread:** The goby was introduced into the St. Clair River via ballast water discharge of trans-Atlantic cargo vessels containing larvae originating from Eurasian waters. It is believed that the spread of round goby to other parts of the Great Lakes system, such as the Calumet River and Lake Superior, was the result of ballast water discharge from domestic vessels during routine shipping activities within the Great Lakes. Their introduction into the Shiawassee and Flint Rivers is connected with recreational angling. The Chicago Sanitary and Ship Canal facilitated passage of the round goby from the Lake Michigan basin into the Illinois River,

before operation of the aquatic invasive species electric dispersal barrier system (<http://www.lrc.usace.army.mil/AsianCarp/barrier.htm>). The spread of round goby to other inland lakes and waterways of the Great Lakes basin has likely been facilitated by their use and transport as live bait by recreational anglers. They also can be spread by incidental transport in live wells and bilge water of recreational boats and boaters' equipment, including trailers, fishing tackle, downriggers, anchors, axles, rollers and centerboards.

**Status:** Round goby populations have undergone considerable expansion in the Great Lakes, colonizing parts of all of the lakes within 8 years. There are currently no records of the species beyond the Great Lakes basin and Illinois River.

**Current Regulations:** In the United States, local laws vary concerning the possession and use (e.g., bait and aquarium trade) of round gobies. Such activities are addressed via the *Habitattitude* and *Stop Aquatic Hitchhikers* campaigns of the national Aquatic Nuisance Species (ANS) Task Force. In fall of 2005, the Ontario government made their possession and use as bait illegal.

**Distribution Maps:** Geographic information on the location of aquatic invasive species sightings in the United States is made available through the U.S. Geological Survey, Nonindigenous Aquatic Species (NAS) program (<http://nas.er.usgs.gov>). The NAS distribution maps for the round goby can be found at: <http://nas2.er.usgs.gov/viewer/omap.aspx?SpeciesID=713>.

**Significant Contributions Provided by:**

U.S. Geological Survey, Nonindigenous Aquatic Species Program. 2009. <http://nas.er.usgs.gov>.

**References:**

- Crosier, D.M. and D. P. Molloy. 2006. U.S. Army Corps of Engineers Aquatic Nuisance Species Research Program. [http://el.erdc.usace.army.mil/ansrp/neogobius\\_melanostomus.pdf](http://el.erdc.usace.army.mil/ansrp/neogobius_melanostomus.pdf)
- Jude, D. J. 2001. Round and Tubenose Gobies: 10 Years with the Latest Great Lakes Phantom Menace. *Dreissena* 11(4): 1-14.
- Jude, D.J., J. Janssen, and G. Crawford. 1995. Ecology, distribution, and impact of the newly introduced round & tubenose gobies on the biota of the St. Clair & Detroit Rivers. Center for Great Lakes and Aquatic Sciences. University of Michigan, Ann Arbor, Mich.

## Studies, Assessments and Management Plans

### What Will Round Gobies Do to Great Lakes Streams? (2011)

University of Wisconsin Sea Grant

<http://www.seagrant.wisc.edu/home/default.aspx?tabid=575&videoid=63>

After sampling round gobies in 26 Wisconsin streams and observing no devastating ecosystem impacts, University of Wisconsin researchers are continuing stream assessments throughout the state to gain a deeper understanding of the potential impacts (or lack thereof) of this Great Lakes invader.

### Bioacoustic traps for the management of the round goby (2010)

Allen F. Mensinger, University of Minnesota, Duluth

[http://www.lccmr.leg.mn/PeerReview/2010/Addendums/Subd\\_6d\\_Mensinger.pdf](http://www.lccmr.leg.mn/PeerReview/2010/Addendums/Subd_6d_Mensinger.pdf)

Researchers from the University of Minnesota at Duluth are in the process of investigating the use of bioacoustic techniques to interrupt round goby spawning, whereby male calls are used to attract reproductively active females. It is thought that this approach could both limit the spread of the species, and eradicate small, localized populations.

### Impact of Data Availability on Site Assessment and Predictive Behavior of Aquatic Invasive Species (2010)

U.S. Army Corps of Engineers, Aquatic Nuisance Species Research Program

<http://el.erdc.usace.army.mil/elpubs/pdf/ansrp10-1.pdf>

This document outlines the status of documentation and physiological ecology – in relation to the ability to predict site susceptibility to new invasions – of several aquatic invasive species, including the round goby.

### Fish Pesticide May Control Unwanted Round Goby (2008)

USGS

[http://www.usgs.gov/newsroom/article.asp?ID=2014&from=rss&utm\\_source=feedburner&utm\\_medium=feed&utm\\_campaign=Feed%3A+UsgsNewsroom+%28USGS+Newsroom%29](http://www.usgs.gov/newsroom/article.asp?ID=2014&from=rss&utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+UsgsNewsroom+%28USGS+Newsroom%29)

Scientists at the Upper Midwest Science Center in La Crosse, Wisc., evaluated four fish pesticides, as well as experimentally-manipulated dissolved oxygen levels, for toxicity to round gobies.

### Scientists use odour cues to lure invasive round gobies into traps (2008)

L Corkum and M. Gaden, Great Lakes Fishery Commission

<http://www.qlfc.org/pressrel/Corkum.pdf>

In this study, researchers used the urine of male round gobies to lure females into traps for removal. Preliminary evidence showed that these methods were effective at disrupting goby behavior, and may be useful in preventing their further spread among waterways.

### Use of electrical barriers to deter movement of round goby (2001)

Savino, J.F., D.J. Jude, and M.J. Kostich

<http://md1.csa.com/partners/viewrecord.php?requester=gs&collection=ENV&recid=5716682&q=&uid=789566972&setcookie=yes>

(Abstract)

In this study, researchers performed both laboratory trials and field tests (Shiawassee River, Mich.) to determine the effectiveness of a series of electric cables in preventing the movement of adult round goby among watersheds in the Great Lakes region.

## U.S. and Canadian Federal Resources

### Round Goby - *Neogobius melanostomus*

U.S. Army Corps of Engineers-Aquatic Nuisance Species Research Program

[http://el.erdc.usace.army.mil/ansrp/neogobius\\_melanostomus.pdf](http://el.erdc.usace.army.mil/ansrp/neogobius_melanostomus.pdf)

### Round Goby

U.S. Geological Survey-Great Lakes Science Center

[http://www.glsc.usgs.gov/main.php?content=research\\_invasive\\_goby&title=Invasive%20Fish0&menu=research\\_invasive\\_fish](http://www.glsc.usgs.gov/main.php?content=research_invasive_goby&title=Invasive%20Fish0&menu=research_invasive_fish)

### Roundy Goby Factsheet

U.S. Geological Survey-Nonindigenous Aquatic Species

<http://nas.er.usgs.gov/queries/FactSheet.asp?speciesID=713>

### Round Goby Species Profile

U.S. Department of Agriculture-National Invasive Species Information Center

<http://www.invasivespeciesinfo.gov/aquatics/goby.shtml>

### Nab the Aquatic Invader – Gabby “the Lowlife” Round Goby

Sea Grant Nonindigenous Species (SGNIS)

[http://www.iiseagrant.org/NabInvader/Lakes/suspects/suspect\\_gabby.html](http://www.iiseagrant.org/NabInvader/Lakes/suspects/suspect_gabby.html)

### Round Goby

National Sea Grant Network & Geographic Education Alliances-Exotic Aquatics on the Move

<http://www.iisgcp.org/exoticsp/roundgoby.htm>

### Round Goby

Aquatic Nuisance Species Task Force Species of Concern

[http://www.anstaskforce.gov/spoc/round\\_goby.php](http://www.anstaskforce.gov/spoc/round_goby.php)

### Round Goby

Stop Aquatic Hitchhikers!

[http://www.protectyourwaters.net/hitchhikers/fish\\_round\\_goby.php](http://www.protectyourwaters.net/hitchhikers/fish_round_goby.php)

### Aquatic Invasive Species

Fisheries and Oceans Canada

<http://www.dfo-mpo.gc.ca/science/enviro/ais-eae/index-eng.htm>

## State and Provincial Resources

### Round Goby Watch Card

Great Lakes Sea Grant Network

<http://www.iisgcp.org/catalog/ais/rwach.htm>

### Round Goby

Illinois Environmental Protection Agency

<http://www.epa.state.il.us/water/conservation/lake-notes/aquatic-exotics.pdf>

### Round Goby Fact Sheet

Indiana Department of Natural Resources

[http://www.in.gov/dnr/files/ROUND\\_GOBY.pdf](http://www.in.gov/dnr/files/ROUND_GOBY.pdf)

### Great Lakes Photography: Round Goby

Michigan Sea Grant

<http://www.miseagrant.umich.edu/photos/ais/goby.html>

### Round Goby

Minnesota Department of Natural Resources

<http://www.dnr.state.mn.us/invasives/aquaticanimals/roundgoby/index.html>

### Round Goby (*Neogobius melanostomus*)

Minnesota Sea Grant

<http://www.seagrant.umn.edu/ais/roundgoby>

### Round Gobies Invade North America

Minnesota Sea Grant

[http://www.seagrant.umn.edu/ais/gobies\\_inva](http://www.seagrant.umn.edu/ais/gobies_inva)

**Round Goby**

New York Sea Grant- New York Invasive Species Web Site  
[http://www.nyis.info/index.php?action=invasive\\_detail&id=23](http://www.nyis.info/index.php?action=invasive_detail&id=23)

**Round Goby (*Neogobius melanostomus*)**

New York Sea Grant  
<http://newyorkinvasivespecies.info/animals/RoundGoby.aspx>

**Nuisance Species: Round Goby**

Ohio Department of Natural Resources-Division of Wildlife  
[http://www.dnr.state.oh.us/Home/wild\\_resource/subhomepage/dealing\\_with\\_wildlifeplaceholder/NuisanceSpecieslandingpage/terrestrial\\_nuisance\\_wildlife/fishing\\_nuisance\\_goby/tabid/5829/Default.aspx](http://www.dnr.state.oh.us/Home/wild_resource/subhomepage/dealing_with_wildlifeplaceholder/NuisanceSpecieslandingpage/terrestrial_nuisance_wildlife/fishing_nuisance_goby/tabid/5829/Default.aspx)

**Round Goby (*Neogobius melanostomus*)**

Ontario Federation of Anglers and Hunters-Invasive Species Awareness Program  
<http://www.invadingspecies.com/Invaders.cfm?A=Page&PID=8>

**The Round Goby**

University of Windsor  
<http://web2.uwindsor.ca/courses/biology/corkum/goby/goby.htm>

**Round Goby Factsheet**

Pennsylvania Sea Grant  
[http://pserie.psu.edu/seagrant/publications/fs/Round\\_Goby\\_12-2003.pdf](http://pserie.psu.edu/seagrant/publications/fs/Round_Goby_12-2003.pdf)

**Round Goby**

Aquatic Invasive Species of Pennsylvania  
<http://www.pserie.psu.edu/seagrant/ais/watershed/goby.htm>

**Round Goby Factsheet**

Wisconsin Department of Natural Resources  
<http://dnr.wi.gov/invasives/fact/goby.htm>

**Alien Profile: Round Goby**

Wisconsin Department of Natural Resources-Environmental Education for Kids  
<http://www.dnr.state.wi.us/org/caer/ce/ee/critter/fish/roundgoby.htm>

**Round Goby Factsheet**

Wisconsin Sea Grant  
<http://www.seagrant.wisc.edu/Home/Topics/InvasiveSpecies/Details.aspx?PostID=652>

**Round Goby (*Neogobius melanostomus*)**

Wisconsin Sea Grant-Fish of the Great Lakes  
<http://seagrant.wisc.edu/greatlakesfish/roundgoby.html>