

Round Goby - *Neogobius melanostomus*

This benthic fish species has the potential to seriously impact North American aquatic ecosystems. Researchers are studying its biology, distribution, and management - as well as working to predict its potential ecological, recreational, and economic impacts.

Taxonomy

Phylum	▪ Chordata
Class	▪ Actinopterygii
Order	▪ Perciformes
Family	▪ Gobiidae

General Biology

Juvenile Morphology

- Slate gray – solid in color
- Light border around the black spot which is usually present on front dorsal fin

Adult Morphology

- Mottled gray, olive green, and brown markings (parental males are black)
- Dorsal fin may appear greenish in color and it lacks spines
- A black spot is usually present on the front dorsal fin (Fig. 1), e.g., some gobies from Lake Erie lack this identifying characteristic
- Raised eyes (Fig. 2)
- Fused pelvic fins that form suction disk (Fig. 3)
- Length of up to 17.8 cm in US waters, larger in native European range

Behavior

- Male guards nest of eggs and newly hatched young
- Able to feed nocturnally
- Appears to detect prey only while stationary



Fig. 1 The front dorsal fin of the round goby usually has a characteristic black spot.¹

¹ David Jude (University of Michigan)



Fig. 2 The round goby has frog-like, raised eyes.²

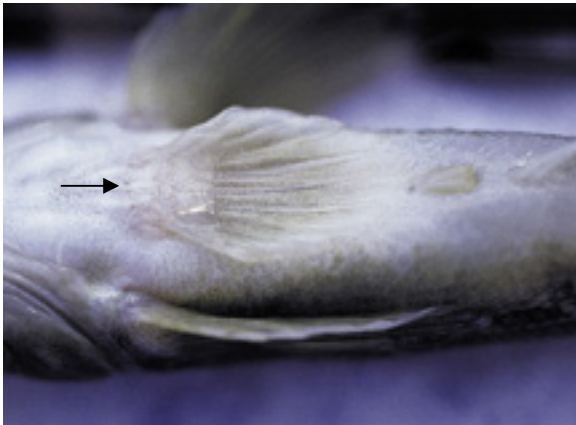


Fig. 3 The pelvic fins of gobies form a single, scallop-shaped suckorial disk, allowing them to attach to the bottom.³

² David Jude (University of Michigan)

³ <http://www.seagrant.wisc.edu/greatlakesfish/lyons.html#Table%20of%20Contents>

Identification

Distinguishing Characteristics

- Similar in appearance to native sculpin (Fig. 4) and tubenose goby (Fig. 5). For characteristics of the adult round goby see Fig. 6.

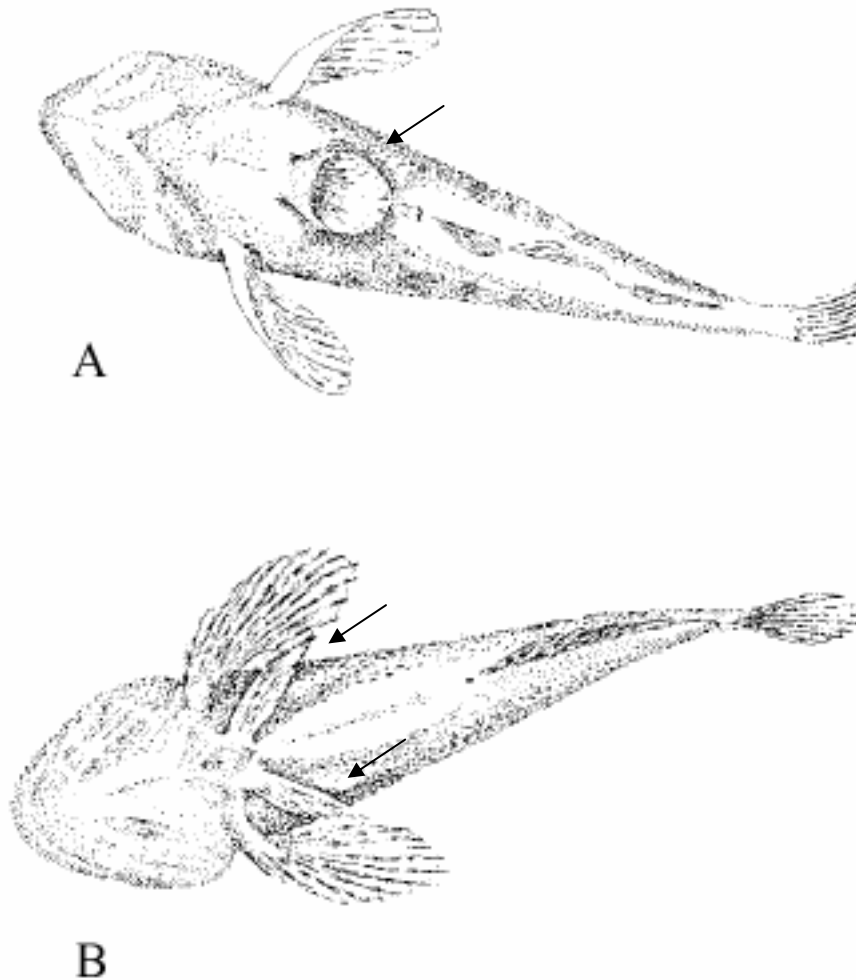


Fig. 4 A. The underside of a round goby – note the fused pelvic fins which form a suctorial disk. B. The underside of a mottled sculpin – note the separation of the two pelvic fins.⁴

⁴ Charlebois et al. 1997. Page 7.



Fig. 5 Tubenose goby (*Proterorhinus marmoratus*).⁵

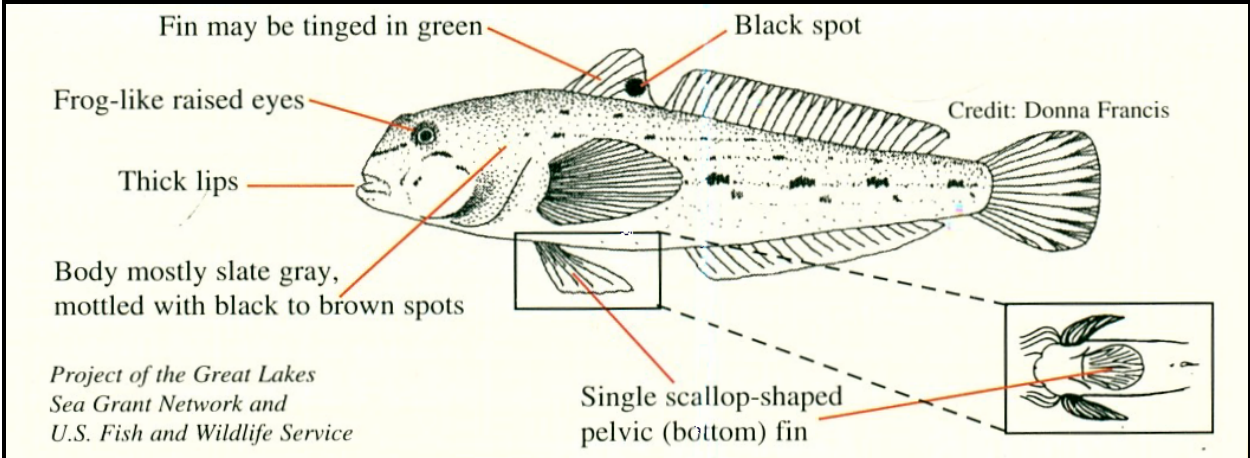


Fig. 6 Identifying characteristics of the adult round goby.⁶

⁵ Igor Grigorovich, University of Windsor

⁶ Round Goby Watch. Identification Card. 1998. University of Minnesota Sea Grant Program.

Life Cycle

- Eggs**
 - 4 x 2.2 mm in size (Fig. 7)
- Juveniles**
 - Resemble adults
- Maturity**
 - Female at 1-2 years
 - Male at 3-4 years
- Spawning**
 - April – September
 - Female – spawns several times (up to 6 times every 20 days) each spawning season
 - Male – spawns once after attaining large size
 - 300-5000 eggs per female during each year
 - Eggs are deposited in nests in crevices on the tops and undersides of logs, rocks, and other hard substrates

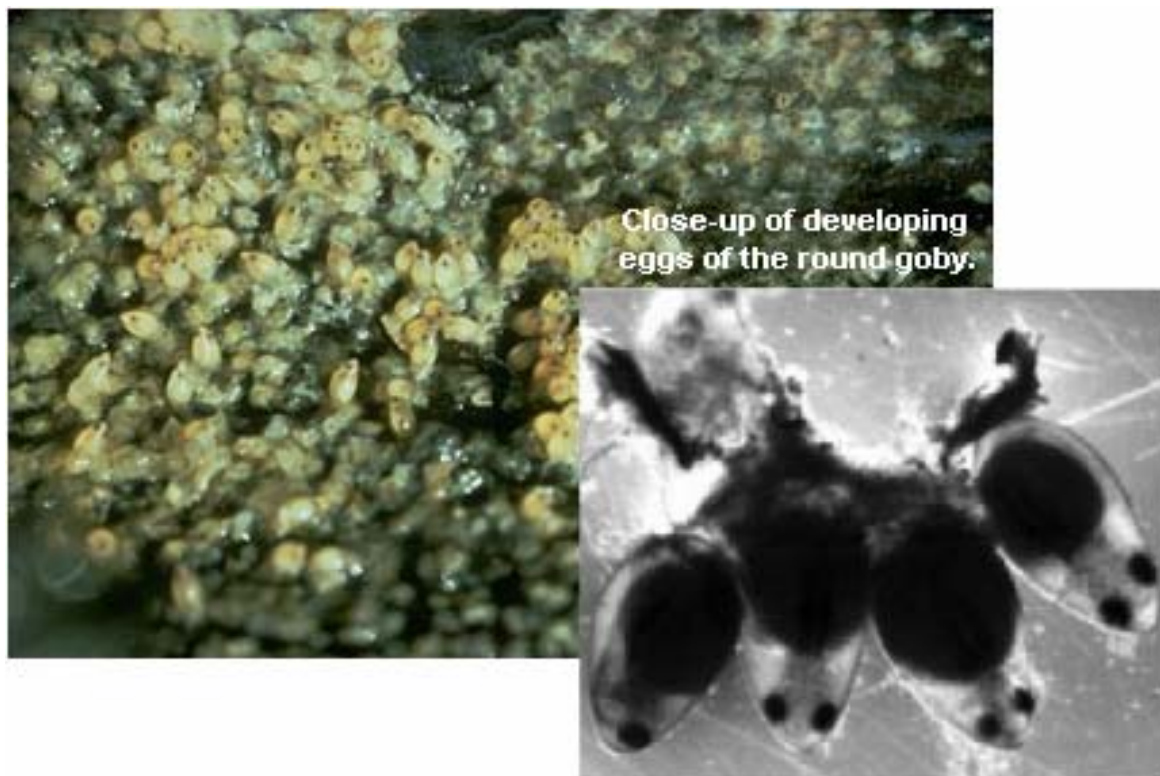


Fig. 7 Several females deposit eggs into one nest.⁷

Habitat Characteristics

- Preferred Environment**
 - Prefers rock, sand, cobble, gravel, and macrophyte habitats and hides in crevices
 - In their native habitats generally inhabit near shore areas, but will migrate during the winter months to depths of up to 50 m
- Temperature**
 - Eurythermal

⁷ Adapted from David Jude (University of Michigan) and Charlebois et al. 1997. Page 13.

- Oxygen**
 - Threshold concentration ranges between 0.3 and 0.9 ml/L
 - 13% of respiration obtained via the skin
- Salinity**
 - Can inhabit slightly brackish waters
- Water Quality**
 - Able to survive under degraded conditions

Distribution

- Native Range**
 - Caspian and Black Sea regions, including their tributaries
- North American Distribution**
 - See Fig. 8
- Probable Means of Introduction**
 - Ballast water discharged by transatlantic ships originating from Eastern Europe

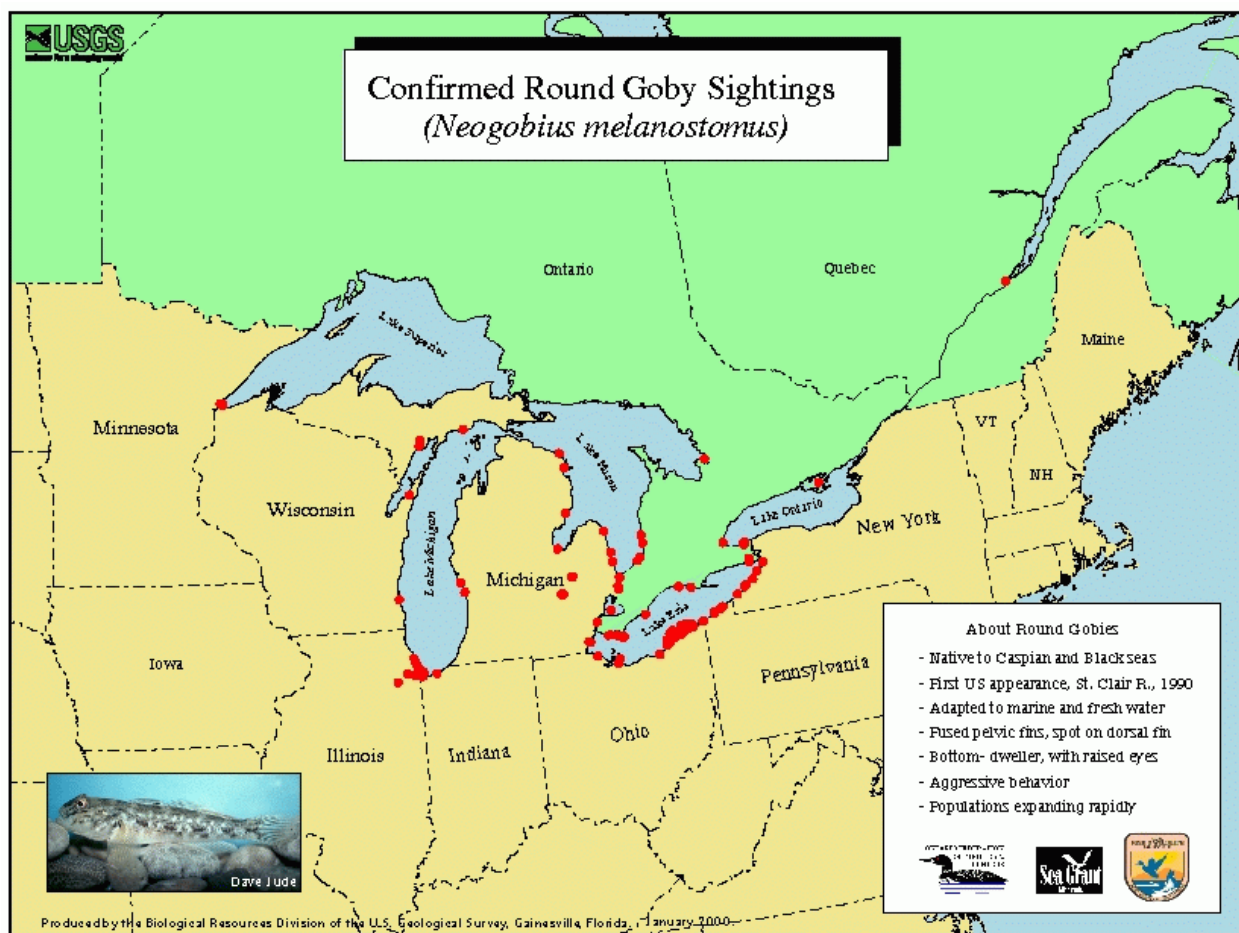


Fig. 8 North American distribution of the round goby as of January 2000. The round goby was first found in North America in 1990 in the St. Clair River, which is located between Lake Huron and Lake St. Clair.⁸

⁸ <http://www.sgnis.org>

Diet

- Adults**
- Benthic organisms including molluscs, crustaceans, worms, fish eggs, small fish, and insect larvae
- Juveniles**
- Primarily consists of benthic zooplankton and invertebrates

Impacts

- Negative**
- Populations of native sculpin and logperch have exhibited a substantial decline in the St. Clair River where gobies were first introduced
 - Predation on darters, sculpins, logperch, and other small fish; ingestion of eggs/fry of lake trout (laboratory study) and eggs of lake sturgeon
 - Possible transfer of contaminants in food cycle (e.g., zebra mussel to goby, goby to bass/trout/perch/walleye/etc.)
 - Interference with angler activities (e.g., gobies remove bait from hooks, anglers catch gobies instead of sport fish)
 - Interference with habitat restoration projects
 - Aggressive behavior toward other fish; drive native fish away from prime spawning areas
 - Outcompete native fish for food due partially to an ability to feed in darkness and to the presence of a suction disk located on their pelvic fin which allows them to attach to rocks/substrates and remain fixed on the bottom even in faster currents (tubenose and round gobies are the only fish to possess this unique characteristic)
- Positive**
- Predation on zebra mussels; substantial impact upon zebra mussel populations, however, is unlikely
 - Food source for larger predatory fishes and water snakes

Management

- Control Measures**
- Use of electrical barriers to deter movement (Savino et al. 2001 for further information)
 - Use of piscicides to deter movement (Dawson et al. 1998 for further information)
 - Prohibiting transport of round goby for use as live bait to limit spread

Literature

- Camp, J. W., Blaney, L. M., and Barnes, D. K. 1999. Helminths of the round goby, *Neogobius melanostomus* (Perciformes: Gobiidae), from southern Lake Michigan, Indiana. *Journal of Helminthological Society of Washington* 66(1):70-72.
- Charlebois, P. M., Marsden, J. E., Goettel, R. G., Wolfe, R. K., Jude, D. J., and Rudnika, S. 1997. The Round Goby, *Neogobius melanostomus* (Pallas), A Review of European and North American Literature. Illinois-Indiana Sea Grant Program and Illinois Natural History Survey, Illinois. 76 pp.
- Chotkowski, M. A. and Marsden, J. E. 1999. Round goby and mottled sculpin predation on lake trout eggs and fry: Field predictions from laboratory experiments. *Journal of Great Lakes Research* 25:26-35.
- Clapp, D. F., Schneeberger, P. J., Jude, D. J., Madison, G., and Pistis, C. 2001. Monitoring round goby (*Neogobius melanostomus*) population expansion in eastern and northern Lake Michigan. *Journal of Great Lakes Research* 27(3):335-341.

- Corkum, L. D., Macinnis, A. J., and Wickett, R. G. 1998. Great Lakes Research Review 3:13-20.
- Dawson, V. K., Boogaard, M. A., and Bills, T. D. 1998. Evaluation of Piscicides for Controlling Range Expansion of Round Goby (*Neogobius melanostomus*) and Ruffe (*Gymnocephalus cernuus*). United States Geological Survey, Biological Resources Division.
- Djuricich, P. and Janssen, J. 2001. Impact of round goby predation on zebra mussel size distribution at Calumet Harbor, Lake Michigan. *Journal of Great Lakes Research* 27(3):312-318.
- French, J., R. P. III and Jude, D. J. 2001. Diets and diet overlap of nonindigenous gobies and small benthic native fishes co-inhabiting the St. Clair River, Michigan. *Journal of Great Lakes Research* 27(3):300-311.
- French, J. R. P. III. 1993. How well can fishes prey on zebra mussels in eastern North America? *Fisheries (Bethesda)* 18(6):13-19.
- Ghedotti, M. J., Smihula, J. C., and Smith, G. R. 1995. Zebra mussel predation by round gobies in the laboratory. *Journal of Great Lakes Research* 21(4):665-669.
- Janssen, J. and Jude, D. J. 2001. Recruitment failure of mottled sculpin *Cottus bairdi* in Calumet Harbor, southern Lake Michigan, induced by the newly introduced round goby *Neogobius melanostomus*. *Journal of Great Lakes Research* 27(3):319-328.
- Jude, D. J. 1996. Gobies: Cyberfish of the 90s. Center for Great Lakes and Aquatic Sciences, University of Michigan, Ann Arbor, Michigan. 4 pp.
- Jude, D. J. 1997. Round gobies: Cyberfish of the third millennium. *Great Lakes Research Review* 3(1):27-34.
- Jude, D. J. 2001. Round and tubenose gobies: 10 years with the latest Great Lakes phantom menace. *Dreissena!* (National Aquatic Species Clearinghouse, SUNY, Brockport, New York) 11(4):1-9, 12-14.
- Jude, D. J. and DeBoe, S. F. 1996. Possible impact of gobies and other introduced species on habitat restoration efforts. *Canadian Journal of Fisheries and Aquatic Sciences* 53:136-141.
- Jude, D. J., Janssen, J., and Crawford, G. 1995. Ecology, distribution, and impact of the newly introduced round and tubenose gobies on the biota of the St. Clair and Detroit Rivers. Pages 447-460 in *The Lake Huron Ecosystem: Ecology, Fisheries and Management* (Munawar, M., Edsall, T., and Leach, J., eds.). *Ecovision World Monograph Series*, S. P. B. Academic Publishing, The Netherlands.
- Jude, D. J., Reider, R. H., and Smith, G. R. 1992. Establishment of Gobiidae in the Great Lakes Basin. *Canadian Journal of Fisheries and Aquatic Science* 49:416-421.
- Knight, C. 1994. The round goby: Lake Erie's newest invader. *Ohio Chapter of the American Fisheries Society Newsletter* 21(3):5.
- Kovtun, I. V., Nekrasova, M. Y., and Revina, N. I. 1974. On the diet of round goby (*Neogobius melanostomus*) and utilization of food supply in the Azov Sea. *Russian Journal of Zoology* 53:728-736. (In Russian with English summary.)
- Kuhns, L. A. and Berg, M. B. 1999. Benthic invertebrate community responses to round goby (*Neogobius melanostomus*) and zebra mussel (*Dreissena polymorpha*) invasion in southern Lake Michigan. *Journal of Great Lakes Research* 25(4):910-917.
- Ludyanski, M. L. 1993. Recent introductions of *Dreissena* and other forms into North America – the Caspian Sea/Black Sea connection. Pages 699-704 in *Zebra Mussels: Biology, Impacts, and Control* (Nalepa, T. F. and Schloesser, D. W., eds.). Lewis Publishers, Boca Raton.
- MacInnis, A. J. and Corkum, L. D. 2000. Fecundity and reproductive season of the round goby *Neogobius melanostomus* in the upper Detroit River. *Transactions of the American Fisheries Society* 129:136-144.
- Marsden, J. E. and Jude, D. J. 1995. Round gobies invade North America. Fact sheet. Sea Grant at Ohio State University, Columbus, Ohio.
- Miller, P. J. 1986. Gobiidae. Pages 1019-1085 in *Fishes of the north-eastern Atlantic and the Mediterranean*, volume III (Whitehead, P. J. P., Bauchot, M. L., Hureau, J. C., Nielsen, J., Tortonese, E., eds.). United Nations Educational, Scientific, and Cultural Organization, Paris, France.
- Muzzall, P. M., Peebles, C. R., and Thomas, M. V. 1995. Parasites of the round goby, *Neogobius melanostomus*, and tubenose goby, *Proterorhinus marmoratus* (Perciformes: Gobiidae), from the St. Clair River and Lake St. Clair, Michigan. *Journal of Helminthological Society of Washington* 62:226-228.

- Pronin, N. M., Fleischer, G. W., Baldanova, D. R., and Pronina, S. V. 1997. Parasites of the recently established round goby (*Neogobius melanostomus*) and tubenose goby (*Proterorhinus marmoratus*) (Cottidae) from the St. Clair River and Lake St. Clair, Michigan, USA. *Folia Parasitologica* (Prague) 44:1-6.
- Ray, W. J. and Corkum, L. D. 1997. Predation of zebra mussels by round gobies, *Neogobius melanostomus*. *Environmental Biology of Fishes* 50(3):267-273.
- Savino, J. F., Jude, D. J., and Kostich, M. J. 2001. Use of electrical barriers to deter movement of round goby. *American Fisheries Society Symposium* 26:171-182.

Web Sites

<http://www.seagrant.wisc.edu/greatlakesfish/roundgoby.html>

Fish of the Great Lakes by the Wisconsin Sea Grant

<http://www.great-lakes.org/junjul97.html>

The Great Lakes Sport Fishing Council - Basin Report

<http://www.seagrant.wisc.edu/outreach/nis/textonly/goby.html>

Non Indigenous Species by the University of Wisconsin Sea Grant Institute

<http://sgnis.org/> (keyword "round goby")

Sea Grant Non Indigenous Species Home Page

http://nas.er.usgs.gov/fishes/accounts/gobiidae/ne_melan.html

United States Geological Survey Non Indigenous Aquatic Species

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