

Maritime Shipping on the Great Lakes and the Lake Erie Water Snake

Background Information on Lake Erie water snake and round goby:

Lake Erie water snake: *Nerodia sipedon insularum*

From LEWS (Lake Erie water snake) NEWS, June 2003, Volume VII, a publication of the U.S. Fish & Wildlife Service and Ohio Dept. of Natural Resources (Division of Wildlife) and:

http://www.oplin.org/snake/fact%20pages/water_snake_lake_erie/water_snake_lake_erie.html



Appearance:

- Adult body length: 18 - 42 inches
- Length at birth: 8 - 12+ inches
- Breeding period: late spring - early summer
- Young per year: probably 10 to 25 or 30
- Typical foods: mainly fish, including dead or dying individuals; reportedly the Lake Erie Water Snake avoids frogs, although it may eat some.
- This snake interbreeds with the Northern Water Snake producing what are called intergrades, individuals that show characteristics of both snakes.

The Lake Erie Water Snake is large, heavy bodied, and more uniform in color than its close relative the [Northern Water Snake](#). Its ground color is usually gray, which often is greenish or brownish, and the dark markings that one sees on the Northern Water Snake are greatly reduced or completely lacking. The undersurface is uniformly white or yellowish white.

Overall Range

The islands of western Lake Erie, in Ontario, Ohio, and perhaps Michigan.

Range in Ohio

The islands of western Lake Erie.

Nearby Pelee Island in Ontario is the place where the original specimen of this subspecies was found, what specialists call its "type locality."

Local Habitat

Cliffs, ledges and loose rock around edges of the islands.

Lifestyle

As with the [Northern Water Snake](#) this snake favors basking in sunshine on surfaces near the water's edge. Sometimes they hide under rocks. Lake Erie Water Snakes are accomplished swimmers. When fleeing pursuit they often swim at the surface, but sometimes dive to the bottom and hide under rocks. These snakes also are accomplished biters and will defend themselves vigorously both on land and under water.

Movement patterns and hibernation sites

Research aimed at determining Lake Erie water snake movement patterns and hibernation sites was wrapped up during the spring and summer of 2003. Since 2000, radio transmitters have been surgically implanted in 63 adult Lake Erie water snakes from Kelley's Island, South Bass Island, Middle Bass Island, North Bass Island, and Gibraltar Island. By monitoring the movements of these snakes, information on the amount of shoreline used during summer and the extent of inland movements during summer and to and from winter hibernation sites has been obtained.

Impact of Round Gobies

Round gobies, a fish native to the Baltic Sea, were inadvertently released into the Great Lakes in the early 1990s and are now well established in the island region of Lake Erie. Gobies were first documented in the diet of Lake Erie water snakes in 1996. During 2003, research efforts focused on determining the importance of gobies as food for the snakes. Water snakes that have recently eaten sometimes spontaneously regurgitate when handled. Alternatively, they can be induced to force food items out- a technique known as "barfing" to snake biologists. In this way, researchers will determine to what degree Lake Erie water snakes feed on gobies, whether gobies are consumed equally by juveniles and adults, and whether goby consumption varies from location to location.

Round Goby *Neogobius melanostomus*



From Wikipedia, the free encyclopedia

Round Goby	
/wiki/Image:Roundgoby.jpg/wiki/Image:Roundgoby.jpg	
Round goby	
Scientific classification	
Kingdom:	Animalia
Phylum:	Chordata
Class:	Actinopterygii

Order:	Perciformes
Family:	Gobiidae
Genus:	Neogobius
Species:	<i>N. melanostromus</i>
<u>Binomial name</u>	
<i>Neogobius melanostromus</i> Pallas, 1814	

The **Round goby** (*Neogobius melanostromus*) is a freshwater bottom-dwelling fish native to central [Eurasia](#) including the [Black Sea](#) and [Caspian Sea](#). A type of [goby](#), it is typically 4-10 inches in length and has grey, black, and brown coloring.

Characteristics

While young, its coloring is grey with a distinctive black spot on the front dorsal fin. Upon maturation the coloring becomes spotted with gray, black, brown, and olive green markings. The eyes protrude slightly from the top of the head and it has a suction disk on its pelvic fins.

Feeding

It feeds [nocturnally](#) and is believed to detect prey only while stationary. Its primary diet includes [mollusks](#), [crustaceans](#), [worms](#), fish eggs, small fish, and insect larvae.

Reproduction

Females [spawn](#) multiple times during spawning season which spans from April to September. The males guard nest eggs and newly hatched young. Its eggs are 4 by 2.2 mm in size. Female Round gobys reach maturity in 1-2 years while males do so in 3-4 years.

Invasive Species

The species was accidentally introduced into the North American [Great Lakes](#) by way of the ballast water of cargo ships. First discovered in the [St. Clair River](#) in 1990, the Round goby is considered an [invasive species](#) with significant ecological and economic impact.

An unintended benefit of the introduction is that the [Lake Erie Watersnake](#), an endangered species, has found the Round goby to be a tasty addition to its diet. A recent study found the Round goby now accounts for up to 90% of the snake's diet. The new food supply means that the water snake is now staging a comeback. [\[1\]](#)

An aggressive fish, the Round goby feeds off of competitor fish such as the [sculpin](#) and longperch, substantially reducing their population size. It also consumes other aquatic resources such as [snails](#) and [mussels](#), thereby reducing the availability of food for native species. In areas where the Round goby has become established, the populations of native aquatic life has declined. Its robust ability to survive in degraded environmental conditions has increased its competitive advantage compared to native species. The Round goby is also considered invasive in parts of [Europe](#) including the [Gulf of Gdansk](#).

References

- [CRS Report for Congress: Harmful Non-Native Species](#)

- [Integrated Taxonomic Information System](#)
- *The Round Goby, Neogobius melanostomus, a Fish Invader on both sides of the Atlantic Ocean* (2004) in *Biological Invasions*, Springer Science+Business Media B.V., Volume 6, Number 2, 173-181.

Retrieved from "http://en.wikipedia.org/wiki/Round_Goby"

Category: [Gobiidae](#)

Graphing Activity:

Use the data below to make a graph on graph paper supplied by your teacher. The graph is to be a bar graph and should include the names of the species on the *x-axis* and the percent of diet composition on the *y-axis*. This data has been collected at 4 different time periods: 1948, 1989-92, 1996-98, and 2003-04. It may be helpful to make four different smaller graphs or you may combine it all on one graph using different colors for the different time periods indicated. Make sure to make a key if using different colors.

Data from: King, R.B., Ray J.M., and Stanford, K.M. 2006. Gorging on gobies: beneficial effects of alien prey on a threatened vertebrate. *Can. J. Zool.* 84: 108-115.

Data for Lake Erie Water Snake diet:

1948

Item in Diet	% of diet
mudpuppy	4.3%
frog & toad	43.5%
native fish	47.8%
unknown fish	4.4%

1989-1992

Item in Diet	% of diet
mudpuppy	19.4%
frog & toad	3.2%
native fish	64.5%
unknown fish	12.9%

1996-1998

Item in Diet	% of diet
mudpuppy	33.3%
native fish	44.5%
round goby	22.2%

2003-04

Item in Diet	% of diet
mudpuppy	5.7%
frog & toad	0.33%
native fish	1.7%
round goby	92.3%

Questions after Graphing Data

1. What is the major change in the Lake Erie water snake's diet from 1948 to 1989-92?

2. What is the new item that is added to the Lake Erie water snake's diet in 1996-98?

3. When was the round goby (invasive species) introduced to the Great Lakes and when was it first noticed in the diet of the Lake Erie water snake?

4. What is the major diet item for the Lake Erie water snake in the 1948 and 1989-92 time periods?

5. Which two diet items decreased the most from 1948 to 1996-1998? Why?

6. Which diet item decreased the most from 1996-98 to 2003-04? Why?

7. How do invasive species USUALLY effect native populations?

8. What are some possible results that the addition of the round goby in the diet of the Lake Erie water snake may produce?

9. Suggest reasons for the change in the diet of the Lake Erie water snake from 1996-98 to 2003-04?

10. How might the change in the diet of the Lake Erie water snake effect native fish as a result of the 2003-04 data?

Answer Key

1. The major change in Lake Erie water snake (LEWS) diet from 1948 to 1989-92 were the reduction of frogs and toads in the diet. These diet items were replaced by mostly all native fish and mudpuppies.
2. The new item in LEWS diet is the round goby.
3. The round goby was first discovered in 1990 in the St. Clair River. It was first noticed in the diet of LEWS in 1996-98.
4. The major diet item for LEWS in 1948 and 1989-92 was native fish.
5. Frogs and toads decreased the most from 43.5% (1948) to 0% (1996-98) and native fish decreased slightly from 47.5% to 44.5%. In 1996-98, the round goby was added to the diet of the LEWS and this may be the reason especially for the reduction of frogs and toads in their diet.
6. Native fish decreased the most. Round goby is the most significant food source in 2003-04.
7. Invasive species usually take over the habitat of native species and can threaten or endanger native species.
8. The addition of the round goby to the diet of LEWS may have temporarily prevented the snake from going extinct. More abundant food means greater growth and body size in a shorter time period. This may at least temporarily provide LEWS with greater survival rate.
9. LEWS may have more access to gobies as a food source. They are superabundant in the western basin of Lake Erie. They are also the right size and habitat (bottom dwellers) for the snake to consider as a food source. They are also relatively easy to catch for the snake, mainly due to their superabundance.
10. Less native fish eaten by LEWS may allow more native fish to survive which may increase their population over time. NOTE: Native fish had been on the decline in the western basin of Lake Erie and may have nothing to do with LEWS. More research would be required to determine the true reason for population changes in native fish.