

***Neogobius melanostomus*** 正體中文

**System:** Freshwater

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Actinopterygii	Perciformes	Gobiidae

**Common name** babka bycha (Polish), guvid (Romanian), trevno popche (Bulgarian), bychok kruglyak (Russian), babka okragla (Polish), chornorotyj bychok (Russian), stronghil (Romanian), round goby (English), black spotted goby (English), Kruglyak (German), Schwarzmundgrundel (German), gobio pintato (Spanish), grundel (German), gobie à taches noires (French), babca neagrâ (Romanian)

**Synonym** *Gobius cephalarges*, Pallas, 1814  
*Gobius chilo*, Pallas, 1814  
*Gobius exanthematosus*, Pallas, 1814  
*Gobius melanio*, Pallas, 1814  
*Gobius sulcatus*, Eichwald, 1839  
*Gobius lugens*, Nordmann, 1840  
*Gobius weidemanni*, Kessler, 1874  
*Apollonia melanostoma*, Iljin, 1927  
*Neogobius cephalarges*, Berg, 1949  
*Neogobius melanostomus*, Berg, 1949  
*Neogobius melanostomus*, affinis Berg, 1949  
*Neogobius cephalarges*, Vasil'yeva & Vasil'ev, 1994  
*Gobius melanostomus*, Pallas, 1814  
*Gobius virescens*, Pallas, 1814  
*Gobius affinis*, Eichwald, 1831

**Similar species**

**Summary** *Neogobius melanostomus* is a bottom dweller found in rivers and near the shore of lakes, preferring rocky habitats with many places to hide. It preys on small fish, such as darters and the eggs of lake trout, and many other fish. Adult *Neogobius melanostomus* aggressively defend spawning sites and will occupy prime spawning areas, preventing native species from utilising these sites. This fish may out-compete native fish for food resources, due to its ability to feed in darkness. *Neogobius melanostomus* often eats bivalves that filter water and becomes a vector of bioaccumulation, with contaminants becoming passed on to the larger game fish or humans that eat them. There is little information on successful management options for this species.



[view this species on IUCN Red List](https://www.iucnredlist.org/species/11621/11621)

## Species Description

Charlebois *et al.* (1997) state that, "*N. melanostomus* is a small, soft-bodied fish. It is most readily distinguished from all other freshwater fish in North America by the presence of a fused pelvic fin that forms a suction disk on the ventral surface. The body is brownish gray with dark brown lateral spots. Mature males are completely black during spawning and nest guarding, with yellowish spots on the body and median fins fringed in yellow or white. A large, oblong, black spot is usually present at the end of the first dorsal fin, beginning at the fifth ray. This spot is distinct but not unique, as sculpins often have a dark mark in this location. *N. melanostomus* without this spot have been found in Lake Erie (Cavender, Ohio State University, pers. comm.). Juveniles have a light border around the black spot."

Charlebois *et al.* (1997) describe *N. melanostomus* in detail as, "scaled on the parietal region, nape, back (all), throat (all or most), abdomen, pectoral fin peduncles, and one quarter of the gill covers. Scales on the middle and anterior nape are cycloid (as are scales on the greater part of the gill covers and throat, pectoral peduncles, and part of the abdomen [Rudnicka, personal communication]). The head is as wide as or wider than deep; depth is 0.9-1.2 times the width. Head length is 22-23% of total body length. There are usually six, rarely seven, transverse suborbital series of pit organs. Ventral fins reach or almost reach the vent. The pelvic disk is 0.6-0.8 times the abdomen length. If present, the anterior membrane width is very shallow, with rounded, lateral lobes. The caudal peduncle depth is about two-thirds its length. The anterior dorsal fin has five to seven spines, usually six, and the posterior dorsal fin has one spine and 13-16 soft rays. The anal fin has one spine and 11-14 soft rays, and the pectoral fins have 17-20 soft rays. *N. melanostomus* possesses upper and lower pharyngeal teeth, and the posterior teeth are smaller than anterior teeth (Pinchuk, 1992; Ghedotti *et al.*, 1995). *N. melanostomus* lacks a gas bladder and chemoreceptors."

## Lifecycle Stages

The Animal Diversity Web (2002) states that, "Female *N. melanostomus* mature by 1-2 years of age and males at 3-4 years." Studies have shown that newly colonized round gobies in brackish waters and lakes are smaller, mature earlier, have a male biased sex ratio and are more short-lived compared with round gobies from marine (native) habitats (Corkum *et al.* 2004).

## Uses

*Neogobius melanostomus* is fished commercially in the Black and Caspian seas. The species also is used as a bait fish, although this practise is often not permitted in regions where the fish is non-indigenous.

## Habitat Description

*Neogobius melanostomus* is a bottom dweller in the nearshore region of lakes and in rivers, and prefers rocky habitat that provides lots of hiding opportunities. Although juvenile and adult round goby prefer rocky substrates, the fish also is found in fine gravel and sandy substrates in which they may burrow (Ray and Corkum 2001, in The Animal Diversity Web, 2002). Successful maintenance of all stages of the round goby in the laboratory requires vigorous aeration and a flow-through system (Corkum, personal observation). Steingraeber *et al.* (1996) report that, "*N. melanostomus* prefer to reside among macrophytes or rocky substrate in littoral areas (Jude *et al.* 1992; Jude *et al.* 1995) but are not restricted to these habitats (Jude and DeBoe, 1996).\" Charlebois *et al.* (1997) go into great detail on the specific habitat preference of *N. melanostomus*. The authors state that, "*N. melanostomus* occur on coarse gravel, shell, and sand in inshore areas to depths of 20m in the Black Sea and the Sea of Azov (Miller, 1986). In the Caspian Sea, *N. Melanostomus* occur to 70 m, and are often associated with eelgrass (*Zostera* sp.) (Moskal'kova, 1996). In the Kuybyshev Reservoir, *N. Melanostomus* occur in silted sand at depths of 5-10m and in river beds to 30m (Tsyplakov, 1974). *N. Melanostomus* also occur in lower and middle reaches of rivers, but only in slightly brackish or fresh water (Miller, 1986, but see \"Physiology\" section). During spring-autumn in the Black Sea, *N. Melanostomus* is found in slowly flowing rivers, lagoons, and brackish coastal water to 20m (Jude and DeBoe, 1996), but it migrates to deeper water (50-60 m) in winter (Miller, 1986). During spring, *N. Melanostomus* migrates to inshore areas of the northern Caspian Sea even while these areas are still partially frozen (Nikol'skii, 1954). *N. Melanostomus* prefers littoral areas where wave action maintains high dissolved oxygen levels and reduces the amount of decaying material. In the Gulf of Gdansk, *N. Melanostomus* is associated with stone/sand areas, mussel beds, marine structures, and sunken objects. In Puck Bay, Gulf of Gdansk, *N. Melanostomus* inhabits areas with a humus/mud/sand substratum overgrown with benthic flora (Skora, 1996)\".

Charlebois *et al.* (1997) state that in its introduced range, \"In the St. Clair River, *N. Melanostomus* are associated with large cobble to depths of 3m and macrophytes (e.g., *Elodea canadensis*, *Myriophyllum* spp. And *Potamogeton* spp.) in depths of 1.5-4.6 m. They also have been impinged on industrial screens at 6m depth (Jude *et al.* 1992; Jude *et al.* 1995; Jude and DeBoe, 1996). Fry were collected in *Chara* beds presumably where spawning occurred (Jude *et al.* 1995). Macrophytes and cobble provide large interstices for refuge and spawning (Jude and DeBoe, 1996), but *N. Melanostomus* apparently is not restricted to these habitats (Jude *et al.* 1992; Jude and DeBoe, 1996; MacInnis and Corkum, 2000). In Calumet Harbor (Illinois), *N. Melanostomus* were abundant on both cobble and sand, although adults were less abundant on sand than juveniles. *N. Melanostomus* also will move onto sandy beaches to feed at night (Jude *et al.* 1992). In the St. Clair River, there is an inverse relationship with depth and number of *N. Melanostomus*, but a direct relationship with depth and length of individuals, which may be due to gear bias (Jude *et al.* 1995). *N. Melanostomus* were not collected in shallow near shore areas of Lake St. Clair until May 8 in 1993 (T. Water = 7.8°C), but were abundant from shore to 5m on November 5, and in December trawls at 3, 5, and 7 m.\"

## Reproduction

Murphy *et al.* (2001) state that, "Males migrate from deeper waters to spawning areas in the spring, establish territories prior to arrival of females, defend a nest site to which females are attracted for spawning, and care for single or multiple batches of eggs (Moiseyeva and Rudenko, 1976; MacInnis and Corkum, 2000). As with other male gobiids [e.g., *Bathygobius soporator* (Tavolga, 1956)], male round gobies use visual displays (colouration changes and posturing) and acoustical signals when courting females (Protosov *et al.* 1965; Moiseyeva and Rudenko, 1976)." The Animal Diversity Web (2002) states that, "Female *N. melanostomus* spawn repeatedly (approximately every 20 days) from April until September while males guard the eggs and young." The authors go on to state that, "Five hundred to three thousand eggs are deposited by the female on a hard substrate and are then guarded by the male until hatching." Pheromone signalling is crucial to mating behaviour in *N. melanostomus* (Corkum, 2004). Gill ventilation by reproductive males in response to steroids and to gonadal extracts from gravid females is dependent upon olfactory sensory input (Belanger *et al.* 2003). Accessory nasal sacs have the capacity to "regulate the flow of odorant molecules over the sensory surface of the olfactory sensory neurons, possibly through a pump-like mechanism driven by opercular activity associated with gill ventilation" (Belanger *et al.* 2003). Arbuckle *et al.* (2005) discovered that 5- $\beta$ -reduced androgens are produced in the islets of steroid-synthesizing glandular tissue of male round goby testes. The male round goby releases a sex attractant to which gravid females respond (Belanger *et al.* 2004). In a laboratory flume, gravid females spent significantly more time than non-reproductive females near the source of the reproductive male donor water (Belanger *et al.* 2004).

## Nutrition

The Animal Diversity Web (2002) states that, "*N. melanostomus* are voracious feeders, with a penchant for stealing the worms off an angler's hook. They also prey on zebra mussels, another Great Lakes exotic from the same native region. Young and eggs of other fishes, and even their own, as well as aquatic insects and invertebrates are choice prey. A complete lateral line system (a sensory system) allows them to feed in complete darkness."

Charlebois *et al.* (1997) state that, "*N. melanostomus* is a benthic feeder. Its diet is composed primarily of crustaceans and molluscs, including zebra mussels. Polychaetes, small fish, goby eggs, and chironomid larvae also are eaten (Berg, 1949; Miller, 1986). In the Sea of Azov, *N. melanostomus* was the primary consumer of benthos, consuming up to 13% of the annual production. Its diet during the primary feeding period (spring-fall) was 90% molluscs, and during winter was 11-41.8% fish (mainly *Clupeonella*; Skazkina and Kostyuchenko, 1968). *N. melanostomus* of all sizes eat molluscs and crustaceans. Small- and medium-sized *N. melanostomus* also eat worms (presumably polychaetes), but only larger individuals eat other fish (Skazkina and Kostyuchenko, 1968; Kovtun *et al.* 1974). In North America, *N. melanostomus* also primarily consume benthic organisms. Other items in the stomachs were *Gammarus*, *Ceratopogonidae*, *Ephemeroptera* (*Caenis*, *Stenonema*, *Ephemera*, *Hexagenia*, *Baetis*), *Odonata* (*Macromia*), *Diptera* (*Atherix* pupae and larvae), *Oligochaeta*, *Ostracoda*, *Decapoda* (crayfish), and *Trichoptera*. Larger fish contained more chironomids and zebra mussels than smaller fish. *N. melanostomus* ingests zebra mussels intact; divers in the St. Clair River have observed *N. melanostomus* wresting zebra mussels from the substratum and swallowing them whole (Johnson and Lashbrook, 1993). *N. melanostomus* generally crushes the zebra mussels with its pharyngeal teeth, and shells are discarded before the soft body is swallowed (Ghedotti *et al.* 1995)."

## General Impacts

For details on the impacts of *Neogobius melanostomus* of this species please see [general impacts](#)

## Management Info

For details on management of this species please see [management information](#)

**Principal source:** [Fuller \*et al.\* 2005 \*Neogobius melanostomus\*](#)  
[The Animal Diversity Web, 2002. \*Neogobius melanostomus\*](#)

**Compiler:** National Biological Information Infrastructure (NBII) & IUCN/SSC Invasive Species Specialist Group (ISSG)

**Review:** Dr. Lynda D. Corkum, Professor Department of Biological Sciences University of Windsor Canada

**Publication date:** 2006-04-27

## ALIEN RANGE

[1] ARAL SEA  
[1] BELARUS  
[1] LAKE ERIE  
[1] LAKE SUPERIOR

[2] ATLANTIC - NORTHEAST  
[2] CANADA  
[1] LAKE HURON  
[10] UNITED STATES

## BIBLIOGRAPHY

52 references found for *Neogobius melanostomus*

### Management information

[Aquatic Invaders of Belarus., 2007. Alien Species Database \*Neogobius melanostomus\*](#)

**Summary:** This database is of alien aquatic animals inhabiting waterbodies of the Republic of Belarus. It allows to search the species by scientific taxonomy and to get information on their origin, distribution and potential ecological impacts. The database was composed in result of the analysis of literature published during the last century and authors unpublished data. One can find some general information on Belarusian waterbodies, history of construction and functioning of the interbasin shipping canals, links to related sites, etc. The site is under testing and only an English version is available, a Russian version is expected shortly.

The database is available from: <http://www.aliensinbelarus.com/content/view/12/28/>.

This page is available from: [http://www.aliensinbelarus.com/index.php?option=com\\_database&Itemid=27&id=63&task=one\\_dat](http://www.aliensinbelarus.com/index.php?option=com_database&Itemid=27&id=63&task=one_dat) [Accessed 28 May 2007]

[Centre for Environment, Fisheries & Aquaculture Science \(CEFAS\), 2008. Decision support tools-Identifying potentially invasive non-native marine and freshwater species: fish, invertebrates, amphibians.](#)

**Summary:** The electronic tool kits made available on the Cefas page for free download are Crown Copyright (2007-2008). As such, these are freeware and may be freely distributed provided this notice is retained. No warranty, expressed or implied, is made and users should satisfy themselves as to the applicability of the results in any given circumstance. Toolkits available include 1) FISK- Freshwater Fish Invasiveness Scoring Kit (English and Spanish language version); 2) MFISK- Marine Fish Invasiveness Scoring Kit; 3) MI-ISK- Marine invertebrate Invasiveness Scoring Kit; 4) FI-ISK- Freshwater Invertebrate Invasiveness Scoring Kit and AmphISK- Amphibian Invasiveness Scoring Kit. These tool kits were developed by Cefas, with new VisualBasic and computational programming by Lorenzo Vilizzi, David Cooper, Andy South and Gordon H. Copp, based on VisualBasic code in the original Weed Risk Assessment (WRA) tool kit of P.C. Pheloung, P.A. Williams & S.R. Halloy (1999).

The decision support tools are available from:

<http://cefas.defra.gov.uk/our-science/ecosystems-and-biodiversity/non-native-species/decision-support-tools.aspx> [Accessed 13 October 2011]

[The guidance document](#) is available from [http://www.cefas.co.uk/media/118009/fisk\\_guide\\_v2.pdf](http://www.cefas.co.uk/media/118009/fisk_guide_v2.pdf) [Accessed 13 January 2009].

[Clearwater, Susan J.; Chris W. Hickey and Michael L. Martin. 2008. Overview of potential piscicides and molluscicides for controlling aquatic pest species in New Zealand. Science for conservation 283. March 2008, New Zealand Department of Conservation](#)

**Summary:** Available from: <http://www.doc.govt.nz/upload/documents/science-and-technical/sfc283entire.pdf> [Accessed 20 March 2008]

[Copp, G.H., Garthwaite, R. and Gozlan, R.E., 2005. Risk identification and assessment of non-native freshwater fishes: concepts and perspectives on protocols for the UK. Sci. Ser. Tech Rep., Cefas Lowestoft, 129: 32pp.](#)

**Summary:** The discussion paper presents a conceptual risk assessment approach for freshwater fish species that addresses the first two elements (hazard identification, hazard assessment) of the UK environmental risk strategy. The paper presents a few worked examples of assessments on species to facilitate discussion.

Available from: <http://www.cefas.co.uk/publications/techrep/tech129.pdf> [Accessed 1 September 2005]

[Hayes, K., Sliwa, C., Migus, S., McEnulty, F., Dunstan, P. 2005. National priority pests: Part II Ranking of Australian marine pests. An independent report undertaken for the Department of Environment and Heritage by CSIRO Marine Research.](#)

**Summary:** This report is the final report of a two year study designed to identify and rank introduced marine species found within Australian waters (potential domestic target species) and those that are not found within Australian waters (potential international target species).

Available from: <http://www.marine.csiro.au/crimp/reports/PriorityPestsFinalReport.pdf> [Accessed 25 May 2005]



[Mendoza, R.E.; Cudmore, B.; Orr, R.; Balderas, S.C.; Courtenay, W.R.; Osorio, P.K.; Mandrak, N.; Torres, P.A.; Damian, M.A.; Gallardo, C.E.; Sanguines, A.G.; Greene, G.; Lee, D.; Orbe-Mendoza, A.; Martinez, C.R.; and Arana, O.S. 2009. Trilateral Risk Assessment Guidelines for Aquatic Alien Invasive Species. Commission for Environmental Cooperation. 393, rue St-Jacques Ouest, Bureau 200, Montréal \(Québec\), Canada. ISBN 978-2-923358-48-1.](#)

**Summary:** In 1993, Canada, Mexico and the United States signed the North American Agreement on Environmental Cooperation (NAAEC) as a side agreement to the North American Free Trade Agreement (NAFTA). The NAAEC established the Commission for Environmental Cooperation (CEC) to help the Parties ensure that improved economic efficiency occurred simultaneously with trilateral environmental cooperation. The NAAEC highlighted biodiversity as a key area for trilateral cooperation. In 2001, the CEC adopted a resolution (Council Resolution 01-03), which created the Biodiversity Conservation Working Group (BCWG), a working group of high-level policy makers from Canada, Mexico and the United States. In 2003, the BCWG produced the Strategic Plan for North American Cooperation in the Conservation of Biodiversity. This strategy identified responding to threats, such as invasive species, as a priority action area. In 2004, the BCWG, recognizing the importance of prevention in addressing invasive species, agreed to work together to develop the draft CEC Risk Assessment Guidelines for Aquatic Alien Invasive Species (hereafter referred to as the Guidelines). These Guidelines will serve as a tool to North American resource managers who are evaluating whether or not to introduce a non-native species into a new ecosystem. Through this collaborative process, the BCWG has begun to implement its strategy as well as address an important trade and environment issue. With increased trade comes an increase in the potential for economic growth as well as biological invasion, by working to minimize the potential adverse impacts from trade, the CEC Parties are working to maximize the gains from trade while minimizing the environmental costs.

Available from: English version: [http://www.cec.org/Storage/62/5516\\_07-64-CEC%20invasives%20risk%20guidelines-full-report\\_en.pdf](http://www.cec.org/Storage/62/5516_07-64-CEC%20invasives%20risk%20guidelines-full-report_en.pdf) [Accessed 15 June 2010]

French version: [http://www.cec.org/Storage/62/5517\\_07-64-CEC%20invasives%20risk%20guidelines-full-report\\_fr.pdf](http://www.cec.org/Storage/62/5517_07-64-CEC%20invasives%20risk%20guidelines-full-report_fr.pdf) [Accessed 15 June 2010]

Spanish version: [http://www.cec.org/Storage/62/5518\\_07-64-CEC%20invasives%20risk%20guidelines-full-report\\_es.pdf](http://www.cec.org/Storage/62/5518_07-64-CEC%20invasives%20risk%20guidelines-full-report_es.pdf) [Accessed 15 June 2010].

## General information

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**Summary:** Information on introduction and distribution of the round goby in the Baltic Sea.

Available from: [http://www.corpi.ku.lt/nemo/alien\\_species\\_directory.html](http://www.corpi.ku.lt/nemo/alien_species_directory.html) [Accessed 9 July 2007]

Belanger, A.J., W.J. Arbuckle, L.D. Corkum, D.B. Gammon, W. Li, A.P. Scott & B. Zielinski. 2004. Behavioural and electrophysiological responses by reproductive female *Neogobius melanostomus* to odours released by conspecific males. Journal of Fish Biology. 65:1-14.

Belanger, R. M., and L. D. Corkum., 2003. Susceptibility of tethered round gobies (*Neogobius melanostomus*) to predation in habitats with and without shelters. *Journal of Great Lakes Research*. 29(4): 588-593. [Accessed 24 July 2004]

**Summary:** Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

Belanger, R.M., C.M. Smith, L.D. Corkum, & B. Zielinski. 2003 Morphology and histochemistry of the peripheral olfactory organ in the round goby, *Neogobius melanostomus* (Teleostei:Gobiidae). J. Morphology 257:62-71.

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**Summary:** This paper details the range extension of round gobies in Lake Michigan.

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**Summary:** This paper summarises details about the invasion of round goby and its impacts in Poland and the USA.

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**Summary:** This paper gives information about the introduction of the round goby to Canadian waters.

[DAISIE \(Delivering Alien Invasive Species Inventories for Europe\) 2006. DAISIE News Two new invasive species arrived the North Sea basin.](#)

**Summary:** DAISIE is a project supported by the European Commission under the Sixth Framework Programme for Research, Technological Development and Demonstration Activities, contributing to the Specific Programme Integrating and Strengthening the European Research Area, area of Policy-oriented research, Sub-priority 1.1.6.3 Call 2 Global Change and Ecosystems, Topic III.4.3 Create an inventory of invasive species. The DAISIE Portal provides access to: The DAISIE Home Page with information about the DAISIE project and participants; The European Expertise Registry provides information about experts on invasive alien species; The European Alien Species Database (under construction, delivery date November 2006); The Invasive Alien Species Accounts (under construction, delivery date June 2007); Distribution Maps and Spatial Analysis (under construction, delivery date August 2007)

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Eryilmaz, L. 2002. A new fish record for the Aegean Sea: Round goby *Neogobius melanostomus* (Pallas, 1814) (Gobiidae). *Israel Journal of Zoology*. 48 (3): 251-252.

**Summary:** Information regarding a new record of the round goby in the Aegean Sea.

[Finnish University and Research Network. 2004. \*Neogobius melanostomus\*. \[Online Taxonomic Database\]](#)

**Summary:** Synonyms of species.

Available from: <http://www.funet.fi/pub/sci/bio/life/pisces/actinopterygii/perciformes/gobiidae/gobiinae/neogobius/> [Accessed 24 July 2004]

[FishBase, 2005. Species profile \*Neogobius melanostomus\* Round goby](#)

**Summary:** FishBase is a global information system with all you ever wanted to know about fishes. FishBase on the web contains practically all fish species known to science. FishBase was developed at the WorldFish Center in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and many other partners, and with support from the European Commission (EC). Since 2001 FishBase is supported by a consortium of seven research institutions. You can search on [Search FishBase](#)

This species profile is available from:  
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**Summary:** Impact of the round goby on amphipod abundance in the Great Lakes.

Gulyugin S Y and Kunitskiy D F, 1999. New data on range extension of three species of gobies: *N. fluviatilis*, *N. melanostomus*, *N. gymnotrachelus*. Abstracts of the International scientific-technical conference, 17-19 November 1998, p. 5. Kaliningrad

[ITIS \(Integrated Taxonomic Information System\), 2005. Online Database \*Neogobius melanostomus\*](#)

**Summary:** An online database that provides taxonomic information, common names, synonyms and geographical jurisdiction of a species. In addition links are provided to retrieve biological records and collection information from the Global Biodiversity Information Facility (GBIF) Data Portal and bioscience articles from BioOne journals.

Available from:

[http://www.cbif.gc.ca/pls/itasca/taxastep?king=every&p\\_action=containing&taxa=Neogobius+melanostomus&p\\_format=&p\\_ifx=plglt&p\\_lang=](http://www.cbif.gc.ca/pls/itasca/taxastep?king=every&p_action=containing&taxa=Neogobius+melanostomus&p_format=&p_ifx=plglt&p_lang=) [Accessed March 2005]

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.

**Summary:** This paper gives information on the decline of the mottled sculpin in Calumet Harbour, southern Lake Michigan, and the role played by the round goby in its demise.

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.

**Summary:** This paper gives information about the impacts of the round goby on invertebrate communities in Lake Michigan.

Lauer, T.E., Allen, P.J., and McCornish, T.S. 2004. Changes in mottled sculpin and johnny darter trawl catches after the appearance of round gobies in the Indiana waters of Lake Michigan. *Transactions of the American Fisheries Society*. 133 (1): 185-189.

**Summary:** This article gives information about the impacts of round gobies on fish populations in Lake Michigan.

MacInnis A. J., and L. D. Corkum. 2000. Age and growth of round goby *Neogobius melanostomus* in the upper Detroit River. *Transactions of the American Fisheries Society*. 129 (3): 852-858.

**Summary:** This paper gives details of the age and size of the round goby population in the upper Detroit River.

MacInnis A. J., and L. D. Corkum. 2000+D36. Fecundity and Reproductive Season of the Round goby *Neogobius melanostomus* in the Upper Detroit River. *Transactions of the American Fisheries Society*. 129(1):136-144.

**Summary:** Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

Morrison, H.A., Whittle, D.M., and Haffner, G.D. 2000. The relative importance of species invasions and sediment disturbance in regulating chemical dynamics in western Lake Erie. *Ecological Modelling*. 125: 279-294.

**Summary:** Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

Murphy, C.A., Stacey, N.E., and Corkum, L.D. 2001. Putative steroidal pheromones in the round goby, *Neogobius melanostomus*: Olfactory and behavioral responses. *Journal of Chemical Ecology*. 27 (3): 28pg.

**Summary:** Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

Nichols, S.J., Kennedy, G., Crawford, E., Allen, J., French, J., Black, G., Blouin, M., Hickey, J., Chernyak, S., Haas, R., and Thomas, M. 2003. Assessment of lake sturgeon (*Acipenser fulvescens*) spawning efforts in the lower St. Clair River, Michigan. *Journal of Great Lakes Research*. 29 (3): 383-391.

**Summary:** This paper gives information about the impacts of the round goby on lake sturgeon populations in the St. Clair River.

Philips, E.C., Washek, M.E., Hertel, A.W., and Niebel, B.M. 2003. The round goby (*Neogobius melanostomus*) in Pennsylvania tributary streams of lake Erie. *Journal of Great Lakes Research*. 29 (1): 34-40.

**Summary:** Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

Ray, W.J., and Corkum L.D. 2001. Habitat and site affinity of the round goby. *Journal of Great Lakes Research*. 27 (3): 329-334.

**Summary:** This paper gives information about the habitat preferences of the round goby in three sites in the Great Lakes.

Sapota, M.R. 2004. The round goby (*Neogobius melanostomus*) in the Gulf of Gdansk - a species introduction into the Baltic Sea. *Hydrobiologia*. 514: 219-224.

**Summary:** This paper gives detailed information about the introduction of the round goby into the Baltic Sea.

Simonovic, P., Paunovic, M., and Popovic, S. 2001. Morphology, feeding, and reproduction of the round goby, *Neogobius melanostomus* (Pallas), in the Danube River basin, Yugoslavia. *Journal of Great Lakes Research*. 27 (3): 281-289.

**Summary:** This paper gives information about the biology and distribution of the round goby in the tributaries of the Danube River.

Skora, K.E. 1997. *Neogobius melanostomus*. In: Olenin, S., and Daunys, D. (eds). *Baltic Research: Network on Ecology of Marine Invasions and Introductions*.

**Summary:** Detailed information about the introduction and distribution of the round goby in the Baltic Sea.

Available from: [http://www.corpi.ku.lt/nemo/alien\\_species\\_directory.html](http://www.corpi.ku.lt/nemo/alien_species_directory.html) [Accessed 9 July 2007]

Skóra, K.E. 2001. Round goby (*Neogobius melanostomus*) - new invader on the Baltic. *Hel Marine Biological Station: Workshop 18-19.06.2001*.

**Summary:** Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

Available from: [http://www.ocean.univ.gda.pl/neogobius/neogobius\\_rap.html](http://www.ocean.univ.gda.pl/neogobius/neogobius_rap.html) [Accessed 14 January 2004]

Skora, K.E., and Rzeznik, J. 2001. Observations on the diet composition of *Neogobius melanostomus* Pallas 1811 (Gobiidae, Pisces) in the Gulf of Gdansk (Baltic Sea). *Journal of Great Lakes Research*. 27 (3): 290-299.

**Summary:** This paper gives information on the diet and habitat preferences of the round goby in the Baltic Sea.

Snyder, F.L. 2004. Aquatic invasive species impacts upon the Lake Erie Sport Fishery. In Abstracts: 13th International Conference on Aquatic Invasive Species, September 20-24, 2004. Lynch West County Hotel, Ennis, County Clare, Ireland.

**Summary:** Report on the impact of invasive species on fished species in Lake Erie.

Somers, C.M., Lozer, M.N., Kjos, V.A., and Quinn, J.S. 2003. The invasive round goby (*Neogobius melanostomus*) in the diet of nestling double-crested cormorants (*Phalacrocorax auritus*) in Hamilton Harbour, Lake Ontario. *Journal of Great Lakes Research*. 29 (3): 392-399.

**Summary:** This article gives information about the round goby in Lake Ontario.

Steingraeber, M., Runstrom, A., and Thiel, P. 1996. Round Goby (*Neogobius melanostomus*) Distribution in the Illinois Waterway System of Metropolitan Chicago. U.S. Fish and Wildlife Service, Fishery Resources Office: 555 Lester Avenue Onalaska, WI 54650.

**Summary:** Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

Available from: <http://midwest.fws.gov/LaCrosseFisheries/reports/goby.pdf> [Accessed 14 January 2004]

Steinhart, G.B., Marshall, E.A., and Stein, R.A. 2004. Round goby predation on smallmouth bass offspring in nests during simulated catch-and-release angling. *Transactions of the American Fisheries Society*. 133 (1): 121-131.

**Summary:** Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

[The Animal Diversity Web](http://www.umich.edu/~animaldiversity/neogobius_melanostomus). 2002. *Neogobius melanostomus, Round Goby*. University of Michigan, Museum of Zoology, Animal Diversity Web.

**Summary:** Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

Available from: [http://animaldiversity.ummz.umich.edu/accounts/neogobius/n\\_melanostomus\\$ narrative.html](http://animaldiversity.ummz.umich.edu/accounts/neogobius/n_melanostomus$ narrative.html) [Accessed 14 January 2004]

The Aquatic Nuisance Species Research Program (ANSRP). 2003. *Neogobius melanostomus - Round Goby*. US Army Corps of Engineers: Engineer Research and Development Center.

**Summary:** Information on description, economic importance, distribution, habitat, history, growth, and impacts and management of species.

Available from: [http://www.wes.army.mil/el/ansrp/neogobius\\_melanostomus.htm#Impacts](http://www.wes.army.mil/el/ansrp/neogobius_melanostomus.htm#Impacts) [Accessed 14 January 2004]

Vanderploeg, H.A., Nalepa, T.F., Jude, D.J., Mills, E.L., Holeck, K.T., Liebig, J.R., Grigorovich, I.A., and Ojaveer, H. 2002. Dispersal and emerging ecological impacts of Ponto-Caspian species in the Laurentian Great Lakes. *Canadian Journal of Fisheries and Aquatic Sciences*. 59 (7): 1209-1228.

**Summary:** Information on the interaction between invasive species, including the round goby, in the Great Lakes ecosystem.

Wolfe, R.K. and Marsden, J.E. 1998. Tagging methods for the round goby (*Neogobius melanostomus*). *Journal of Great Lakes Research*. 24 (3): 731-735.

**Summary:** This paper outlines the various methods which can be used for tagging round gobies.