

EURASIAN RUFFE

Overview

The Eurasian ruffe (*Gymnocephalus cernuus*) is a small, spiny fish in the perch family that is native to lakes and rivers in Eurasia. Introduced to North America in the mid-1980s, the ruffe was one of the first invasive fish discovered and documented as a threat to the Great Lakes ecosystem. It is presumed that introduction occurred via ballast water discharge from an ocean-going vessel into the St. Louis River Estuary (Duluth-Superior Harbor) where ruffe larvae were collected in 1986. As bottom dwellers, the ruffe became the most abundant fish species sampled in bottom trawls in the estuary. After initial introduction, their population size continued to increase, with a range expansion that extended primarily eastward to several tributaries along the southern shore of Lake Superior.



Ruffe are highly successful invaders, capable of explosive population growth and competing aggressively with native fish for habitat and food. They seem to prefer slow-moving, warm-water habitats with little to no light or vegetative cover. This invasive fish is an efficient feeder across a wide range of environmental conditions. The ruffe's diet consists mainly of aquatic insects and also is known to consume eggs of native fish species such as whitefish and perch. Another trait is their high reproductive capacity, spawning multiple times each spring. This set of characteristics enhances the ruffe's potential to become greatly abundant in newly invaded areas. Given their relatively small size, ruffe have no commercial or recreational fishing value.

Photo: Steffen Zienert

Identification

The ruffe is a small fish, generally 4-6 inches in length, and resembles several native Great Lakes fish including walleye, yellow perch, and trout perch. Distinguishing characteristics of the ruffe include a slimy texture when handled and coloration of olive-brown to golden-brown on its back with yellow-white undersides. Its fused dorsal fins are characterized by 12-19 sharp spines and 11-16 soft dorsal rays, separated by vertical rows of black spots. The pelvic and anal fins as well as the gill flaps also have one or more sharp spines. The caudal fin has 16 to 17 rays.

Size: Generally 4-6 inches in length with maximum size of 8-10 inches.

Native Range: Northern Europe and Asia, from the Arctic Circle to the Mediterranean Sea

Occurrences in the Great Lakes Basin

First discovered in 1986 with the collection of larvae in Duluth-Superior Harbor, the range of ruffe rapidly expanded eastward along the southern shore of Lake Superior. By 1993, ruffe inhabited bays and tributaries along the entire Wisconsin shoreline. Ruffe were found in Michigan waters of Lake Superior in August 1994 at the mouth of the Black and Ontonagon rivers. They since have been collected in other Michigan waters of Lake Superior, including the Misery River, the Keweenaw Waterway, Marquette Harbor, West Bay near Grand Marais, Little Lake Harbor, and the mouth of the Tahquamenon River in Whitefish Bay. In Canadian waters of Lake Superior, ruffe have been collected in the Kaministiquia, McKellar, Mission, Neebing, and Current Rivers, and in Thunder Bay. The first specimens were discovered in Michigan waters of Lake Huron in the Thunder Bay River in August 1995, and then in Thunder Bay. In Michigan waters of Lake Michigan, ruffe first were collected in 2002 in the Bays de Noc of northern Green Bay. In Wisconsin waters of Lake Michigan, ruffe were collected in southern Green Bay in 2007, near Marinette and Peshtigo Harbors.

Means of introduction and spread: Initial introduction of the ruffe likely occurred with ballast water discharged from an ocean-going vessel originating from a Eurasian port. It is possible that this introduction took place as early as 1982. Further range expansion along the southern shore of Lake Superior was due to natural migration of fish swimming along the coastline and establishing new spawning colonies in the mouths of rivers and bays. Movement to Canada's Thunder Bay and Lakes Huron, and Michigan was most likely due to ballast transport from the St. Louis River Estuary. The small size of newly hatched ruffe fry has made it possible for these fish to slip through the screens of ballast water intakes, resulting in transport upon ballast discharge. Potential spread to inland waters can occur through transport in the live wells and bilge water of recreational boats and by bait buckets.

Status: Ruffe have been established in the St. Louis River Estuary in Lake Superior since about 1988 and populations have extended in an easterly direction. By 2008, a moderate range expansion had occurred, with ruffe having spread as far southward as lower Green Bay, Wisconsin (likely a natural migration from Little Bay de Noc). As of December 2011, ruffe remains undetected in the Lower Great Lakes and in all inland lakes and streams within the Great Lakes basin.

Management and Current Regulations: Several techniques have been used in efforts to prevent the ruffe from invading specific locations (e.g., spawning areas, pathways to other water bodies, etc.), and to assist in attracting and trapping the fish. These include application of alarm and sex pheromones, alarm sperm antibodies (i.e., disruption of reproduction), and other chemical piscicides, including the commonly used lampricide TFM. Under provincial law in Ontario, it is illegal to possess or transport ruffe that are live or

dead. Ruffe is a prohibited invasive species in Illinois, Indiana, Michigan, and Minnesota (import, possession, transport, and introduction to the wild are illegal), and is a restricted species in Wisconsin (transport, transfer, and introduction are 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 Eurasian ruffe can be found online at: <http://nas2.er.usgs.gov/viewer/omap.aspx?SpeciesID=7>

Significant Contributions Provided by:

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

References:

- Busiahn, T.R., 1997. Ruffe control: a case study of an aquatic nuisance species control program. F. M. D'Itri, ed. Zebra mussels and aquatic nuisance species. Ann Arbor Press Inc., Chelsea, MI. Pages 69-86.
- Pratt, D.M., Blust, W.H., and Selgeby, J.H. 1992. Ruffe, *Gymnocephalus cernuus*: Newly introduced in North America. Can. J. Fish. Aquat. Sci. 49:1616-1618.
- Ruffe Control Program. 1993,1996. Aquatic Nuisance Species Task Force-Ruffe Control Committee <http://www.anstaskforce.gov/Species%20plans/RUFFE%20CONTROL%20PROGRAM.pdf>
- U.S. Fish and Wildlife Service, Ontario Ministry of Natural Resources. May. 2008. Summary of Ruffe Surveillance on the Periphery and Outside of the Detected Ruffe Range.

Studies, Assessments and Management Plans

Surveillance for Ruffe in the Great Lakes, 2007 (2007)

G.D. Czapinski, A.K. Bowen, and M.A. Goehle

http://www.fws.gov/midwest/ashland/Ruffe/rufprt07%20text_pg1-21.pdf

The objectives of this study were designed to address the needs of the Ruffe Control Program (see below) by defining the range of the invasive ruffe and detecting reproducing populations on the periphery of that range. Researchers sampled throughout the Great Lakes basin to determine age and size composition of ruffe (when captured) as well as the composition of other fish communities.

A comparison of habitat use and habitat-specific feeding efficiency by Eurasian ruffe (*Gymnocephalus cernuus*) and yellow perch (*Perca flavescens*) (2006)

A.H. Fullerton and G. A. Lamberti

<http://www.nd.edu/~strmeco/gary/PDF%20Files/Fullerton2006.pdf>

This study examined the feeding and habitat preferences of the invasive ruffe and the native yellow perch in the St. Louis River Estuary of Lake Superior to evaluate potential ecological overlap and competition (or lack thereof) between the two species.

Predicting habitat use and trophic interactions of Eurasian ruffe, round gobies, and zebra mussels in nearshore areas of the Laurentian Great Lakes (2006)

C.R. Bauer, A.M. Bobeldyk, and G.A. Lamberti

<http://www.nd.edu/~strmeco/gary/PDF%20Files/Bauer2006.pdf>

This study examined the interactions among the "exotic triad" of Great Lakes invaders in an effort to determine the potential for future changes in population sizes and distributions, possible impacts on native food webs, and to inform direct management and control efforts.

Potential Impacts of Invading Ruffe (*Gymnocephalus cernuus*) on Benthic and Pelagic Ecosystems of the Great Lakes (1999)

G.A. Lamberti, D. Lodge, and M. Berg

<http://www.iisgcp.org/research/ais/lamberti2.html>

This study consisted of three primary goals: (1) to determine the potential competitive interactions between exotic ruffe and native yellow perch in Lake Michigan; (2) to determine how predators and other exotic organisms affect the success of ruffe and their interactions with yellow perch in the Great Lakes; and (3) to determine the composition of benthic macroinvertebrates in Lake Michigan to generate a baseline prior to a ruffe invasion.

Ruffe Control Program (1996)

Aquatic Nuisance Species Task Force-Ruffe Control Committee

<http://www.anstaskforce.gov/Species%20plans/RUFFE%20CONTROL%20PROGRAM.pdf>

The Ruffe Control Program was submitted to the ANS Task Force as a final product on June 30, 1995. The initial goal for the program was "to contain ruffe to western Lake Superior." After ruffe were discovered in Lake Huron in August of 1995, this goal was considered obsolete. The Committee coordinated its November 1995 meeting with the Great Lakes Fishery Commission's Council of Lake Committees (CLC), a group of senior fishery administrators from all Great Lakes fishery jurisdictions. The goal was modified by the CLC to "prevent or delay the further spread of ruffe through the Great Lakes and prevent their spread to other inland lakes and watersheds." Objectives focused on population reduction, ballast water management, population investigation, surveillance, fish community management, education, bait fish management, and prevention of spread through the Chicago Sanitary and Ship Canal.

U.S. and Canadian Federal Resources

Ruffe

U.S. Army Corps of Engineers-Aquatic Nuisance Species Research Program
http://el.erdc.usace.army.mil/ansrp/gymnocephalus_cernuus.pdf

Eurasian Ruffe Fact Sheet

U.S. Geological Survey-Great Lakes Science Center
http://www.glsc.usgs.gov/main.php?content=research_invasive_ruffe&title=Invasive%20Fish0&menu=research_invasive_fish

Ruffe Fact Sheet

U.S. Geological Survey-Nonindigenous Aquatic Species
<http://nas.er.usgs.gov/queries/FactSheet.asp?speciesID=7>

Ruffe Species Profile

U.S. Department of Agriculture-National Invasive Species Information Center
<http://www.invasivespeciesinfo.gov/aquatics/ruffe.shtml>

Ruffe (*Gymnocephalus cernuus*)

National Sea Grant Network & Geographic Education Alliances-Exotic Aquatics on the Move
<http://www.iisgcp.org/exoticsp/ruffe.htm>

Ruffe

Aquatic Nuisance Species Task Force Species of Concern
<http://www.anstaskforce.gov/spoc/ruffe.php>

State and Provincial Resources

Ruffe Watch ID Card

Great Lakes Sea Grant Network
<http://www.iisgcp.org/catalog/ais/rufwach.htm>

Ruffe Fact Sheet

Indiana Department of Natural Resources
<http://www.in.gov/dnr/files/RUFFE.pdf>

Eurasian Ruffe (*Gymnocephalus cernuus*)

Michigan Sea Grant-Aquatic Invasive Species
<http://www.miseagrant.umich.edu/species/fish/eurasian-ruffe.html>

Ruffe (*Gymnocephalus cernuus*)

Minnesota Department of Natural Resources
<http://www.dnr.state.mn.us/invasives/aquaticanimals/ruffe/index.html>

Eurasian Ruffe (*Gymnocephalus cernuus*) ID Card

Minnesota Sea Grant
<http://www.seagrant.umn.edu/ais/ruffe>

Eurasian Ruffe: Keep Watch

Ohio Department of Natural Resources-Division of Wildlife
http://www.dnr.state.oh.us/Home/wild_resourcessubhomepage/dealing_with_wildlifeplaceholder/NuisanceSpecieslandingpage/terrestrialalnuisancewildlife/fishingnuisanceruffe/tabid/5828/Default.aspx

Ruffe (*Gymnocephalus cernuus*)

Ontario Federation of Anglers and Hunters-Invading Species Awareness Program
<http://www.invadingspecies.com/Invaders.cfm?A=Page&PID=5>

Eurasian Ruffe Fact Sheet

Pennsylvania Sea Grant
http://www.seagrant.psu.edu/publications/fs/Ruffe_12-2003.pdf

Ruffe

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

European Ruffe (*Gymnocephalus cernuus*) Fact Sheet

Wisconsin Sea Grant

<http://seagrant.wisc.edu/Home/Topics/InvasiveSpecies/Details.aspx?PostID=650>

Ruffe (*Gymnocephalus cernuus*)

Wisconsin Sea Grant-Fish of the Great Lakes

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