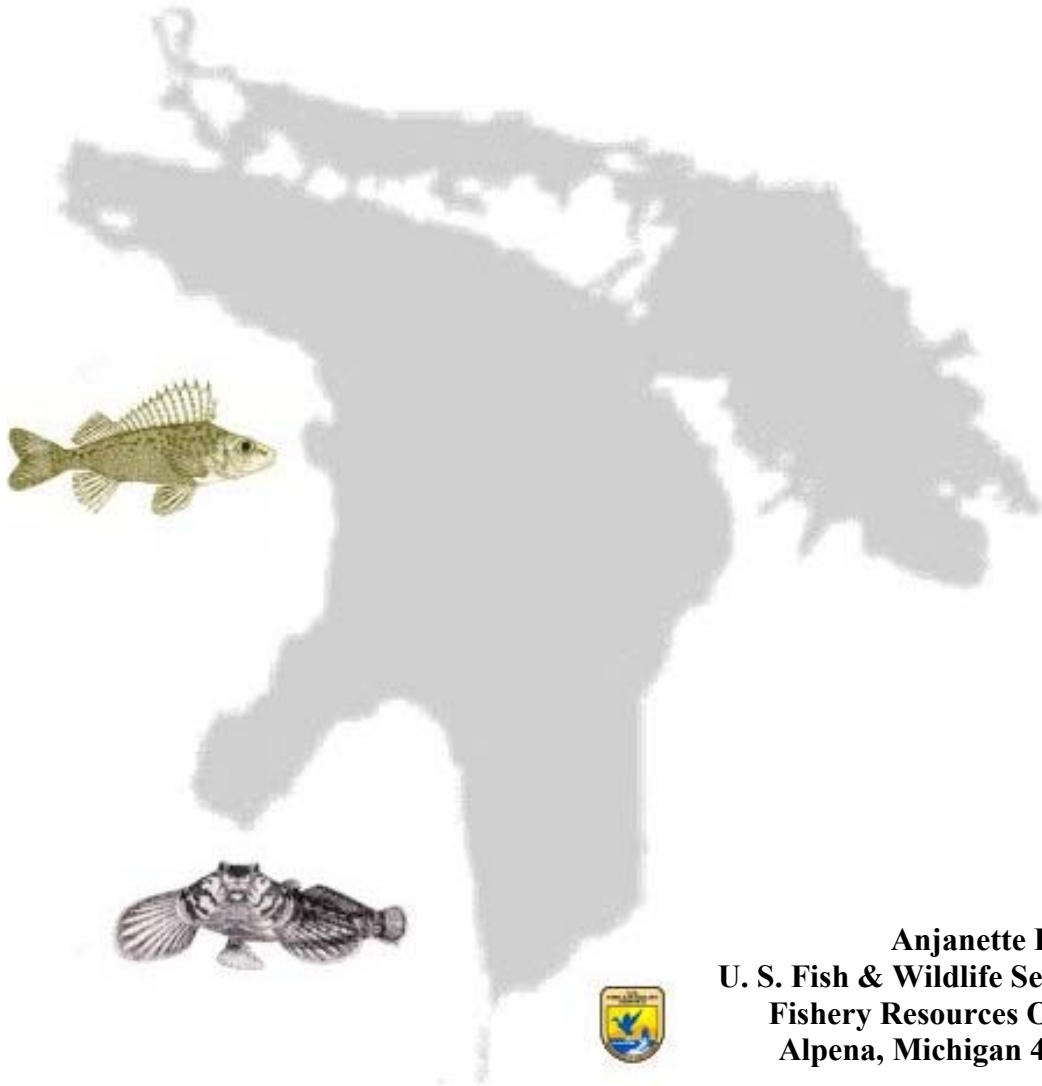


Lake Huron Exotic Fish Surveillance In 1999



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March 2000

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Provisional data, not to be cited without permission.

1. Introduction

The Eurasian ruffe *Gymnocephalus cernuus* and round goby *Neogobius melanostomus* are two exotic fish species that have invaded and expanded their range within the upper Great Lakes. Both are native to Eastern Europe and thought to have been transported to the Great Lakes in the ballast water of ocean-going vessels. They likely have a competitive advantage over native fish for food and habitat because they are frequent spawners, allowing them to become abundant quickly, and have aggressive natures (Busiahn and McClain 1995). The U.S. Fish and Wildlife Service (Service) Fishery Resources Office in Alpena, Michigan has been actively involved in surveying for new populations of these exotics and monitoring the current status of their populations in Lake Huron.

Background

Initial efforts to survey for Eurasian ruffe (ruffe) in the Great Lakes began with its invasion and subsequent proliferation in Western Lake Superior. Ruffe were first discovered in the Duluth harbor in 1986 (Pratt et al 1992) and by 1991 had become the most abundant fish captured in bottom trawling surveys in the area (Bronte et al 1998; Busiahn and McClain 1995). The increase of ruffe may have lead to the detriment of some native forage species, including yellow perch *Perca flavescens*, which showed declines in relative abundance over the same time period (Bronte et al 1998). The Great Lakes Fishery Commission designated a special task force to evaluate the problem (Ruffe Task Force 1992) and by 1992 ruffe were designated an aquatic nuisance species. A ruffe control plan was developed that included an objective to conduct surveillance to locate newly established populations (Ruffe Control Committee 1996; Busiahn and McClain 1995). Initial surveillance activities for ruffe in the upper Great Lakes, including Lake Huron, began in 1992 (Slade and Kindt 1992) and were conducted annually through 1995 by the Service Fishery Resources Office in Ashland, Wisconsin.

Ruffe were found in Lake Huron in August 1995 during ruffe surveillance efforts (Kindt et al 1995). Three ruffe were captured from the Thunder Bay River mouth in Alpena, Michigan on northwestern Lake Huron. This was the first, and only area to date, where ruffe have been found outside of Lake Superior. The Fishery Resources Office located in Alpena, Michigan (Alpena FRO) immediately began monitoring the fish community in the Thunder Bay River and equipped

a vessel to assume the lead for ruffe surveillance activities in Lake Huron beginning in 1996. Alpena FRO expanded the surveillance program in Lake Huron to include additional ports.

The round goby (goby), another exotic fish, entered the Great Lakes in 1990 (Jude et al 1992) and immediately began to extend their range. Goby were first discovered in Lake St. Clair and quickly spread to new locations. It is believed that goby range expansion within the Great Lakes was facilitated through transport in the ballast water of commercial freighters. When goby were captured in 1998 during routine ruffe surveillance in Lake Huron with bottom trawling gear, efforts to survey for the goby began. Ruffe surveillance activities were expanded and re-named "exotic fish surveillance" as a means of incorporating goby surveillance into ruffe assessment activities.

2. Study Sites

Fifteen sites, fourteen in Lake Huron and one in Lake Michigan, have been routinely sampled by the Alpena FRO (Figure 1). Lake Huron sites range from Cedarville to Harbor Beach. The Lake Michigan site is located south east of Gulliver in upper Michigan. All sites are located near shore at shipping ports or at river mouths where there is regular shipping or boating traffic.



Figure 1. Fifteen sites on Lake Huron have been surveyed for exotic fish species. Sites include: 1) Port Inland, 2) Port Dolomite, 3) Cheboygan River, 4) Calcite, 5) LaFarge Corporation, 6) LaFarge shipping channel, 7) Thunder Bay River, 8) Thunder Bay shipping channel, 9) Black River, 10) Harrisville Harbor, 11) AuSable River, 12) National Gypsum, 13) AuGres River, 14) Saginaw River, and 15) Harbor Beach.

Eleven sites are sampled annually and four sites are sampled every two to three years. Sites that are rotated are either difficult to sample or have limited commercial ship traffic. Rotational sampling will continue until ruffe are found outside of Thunder Bay. Those sites that are sampled annually include Port Inland, Port Dolomite, Cheboygan River, Thunder Bay River, Thunder Bay shipping channel, LaFarge Corporation, LaFarge shipping channel, Black River,

National Gypsum, AuGres River, and the Saginaw River. Those sites that are sampled every two to three years are Calcite, Harrisville Harbor, AuSable River, and Harbor Beach.

Problems with sampling equipment and low water in 1999 limited surveillance to nine locations: Port Dolomite, Cheboygan River, LaFarge shipping channel, Thunder Bay River, Thunder Bay shipping channel, AuSable River, National Gypsum, AuGres River, and Saginaw River.

3. Materials and Methods

Semi-balloon bottom trawling gear (4.9 m trawl, 2.5 cm mesh body with 6.4 mm mesh cod) was used to survey for ruffe and goby at shipping ports and river mouths in U.S. waters of Lake Huron. Surveys were conducted in September and October corresponding to times when ruffe were most commonly encountered, as determined from catch rate trends in Thunder Bay, Lake Huron. Approximately 30 minutes of effort was concentrated at each sampling location. Effort consisted of 3 to 6 tows of from 5 to 10 minutes in length. The deepest areas and shipping channels were targeted for sampling because ruffe prefer soft bottoms, deep habitats and dark turbid waters (Busiahn and McClain 1995). Beginning and ending water depth (m) and GPS coordinates were recorded for each tow. Bottom and surface water temperature (°C), air temperature (°C), bottom dissolved oxygen (mg/l), water transparency (m), and weather conditions were recorded at each survey location.



Figure 2. River mouth and shipping channel locations were surveyed for ruffe and goby with a 4.9 m bottom trawl pulled behind a 6.7 m Boston Whaler. Surveillance in the Thunder Bay River is pictured at left.

All fish were sorted by species and counted. Lengths were recorded randomly for 15 fish from each species, and fish were returned to the water following data collection. Relative abundance in catch per effort (CPE) per species was determined at each location. The percent of the total catch was similarly determined for each species per location. Eurasian ruffe and round goby were retained and not returned to the water. Voucher specimens were preserved in alcohol for each location where the exotics were captured. Ruffe and goby scale samples were removed,

pressed, and viewed from a sub-sample of up to 10 fish per cm length class to estimate age. Dorsal spine samples and otoliths were similarly removed to assist in verifying age estimates.

4. Results

A total of 303.5 minutes of effort was concentrated in shipping channels and river mouths of nine locations on Lake Huron to survey for exotic ruffe and goby in 1999 (Table 1). A total of 4,445 fish from 33 species were captured. Low water levels and problems with our trawling vessel prevented surveys at Port Inland (site 1) and LaFarge Corporation (site 5). The Ashland FRO assisted by lending their trawling vessel to our office for two weeks so that we could complete surveys.

Table 1. Characteristics of exotic fish surveillance in Lake Huron, 1999.

Location	Date	Depth (M)	Temp (°C)	Effort (Min.)	# of Species	Total Catch	Most Abundant Species	% of Total Catch	Ruffe	Goby
Port Dolomite	9/24	7.7	10.2	29.5	7	63	Slimy sculpin	76		
Cheboygan River	10/1	7.4	14.5	30.0	11	222	Bluntnose minnow	77		
LaFarge S.Chnl.	9/28	7.9	16.9	28.0	8	283	Round goby	77		218
Thunder Bay River	9/28&30	6.3	14.9	30.5	17	1051	Eurasian ruffe	33	344	40*
Thunder Bay S.Chnl.(in 0.6 km)	9/21	6.0	16.9	30.0	17	931	Round goby	34	126	315*
Thunder Bay S.Chnl.(out 1.5 km)	9/27	6.3	16.8	30.5	10	189	Round goby	62		117*
AuSable River	10/5	3.5	13.8	30.0	4	59	Rainbow smelt	71		
National Gypsum	10/4	6.3	13.1	30.0	4	130	Round goby	83		108*
AuGres River	10/6	3.2	17	30.0	12	456	Yellow perch	82		
Saginaw River	10/7	6.5	13.2	35.0	17	1062	Channel catfish	28		123

* Indicates new sighting.

A total of 470 ruffe and 921 goby were captured during exotic surveillance activities in 1999. Ruffe were not captured from any new locations outside of Thunder Bay in Lake Huron; however, goby were captured from 3 new locations (Table 1). Ruffe and goby continued to

persist in areas where they were formerly captured. Survey findings are listed below and detailed information on the catch for each sampling location is listed in Appendix A.

Eurasian Ruffe

Ruffe continued to be captured from two existing locations in the Thunder Bay area in 1999 (Table 1). They were not found at any new locations; however, they continued to persist in the Thunder Bay River where they were first discovered in 1995 and the Thunder Bay shipping channel where they were first discovered in 1998.

Existing populations:

Thunder Bay River - Alpena. The Thunder Bay River is located in Alpena, Michigan on Thunder Bay in northwestern Lake Huron. Salt and coal are delivered by ship to the mouth of the river for county and industrial use (Figure 3). The river is in close proximity to the LaFarge Corporation cement plant, which receives the majority of commercial ship freight traffic in the area.



Figure 3. A ship unloads salt at the Thunder Bay River port on Lake Huron. Large vessels enter the river occasionally to deliver salt or coal for use by the county and local industry.

In 1999, three hundred forty-four ruffe were captured from the Thunder Bay River (Table 1). Ruffe were the most abundant fish captured and comprised 33 % of the total catch. The average catch per unit of effort (CPE) was 11.5 ruffe per minute. Catches of ruffe in 1999 were 11.5 times greater than in 1998 (1.0 ruffe per minute) (Figure 4). Although the number of ruffe caught increased dramatically in 1999, they comprised approximately the same percent of the total catch in both 1998 and 1999 (Figure 4).

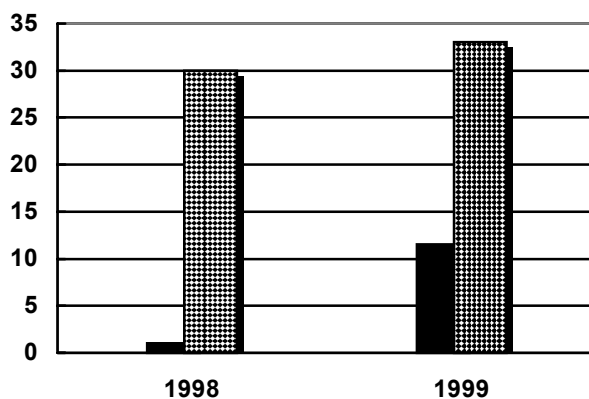


Figure 4. Relative abundance in catch/ minute (solid) and percent of total catch (cross hatch) for ruffe captured from the Thunder Bay River in 1998 and 1999. Ruffe were the most abundant fish captured from the river in fall bottom trawl surveys in both 1998 and 1999.

More than 98 % of ruffe captured from the river in 1999 (338 ruffe) were young-of-the-year. Young-of-the-year averaged 99 mm in total length and ranged 88-113 mm. The remaining ruffe captured from the river (6 ruffe) were age 1 adults. Adult ruffe averaged 142 mm in total length and ranged 135-154 mm.

Thunder Bay Shipping Channel - Alpena. The Thunder Bay shipping channel is a dredged channel in Thunder Bay that provides ship traffic to the Thunder Bay River. One hundred and twenty-six ruffe were captured from the inner 0.6 km of the Thunder Bay shipping channel in 1999 (Table 1). All ruffe were captured in 30 minutes concentrated from the river mouth out 0.6 km into the shipping channel where the water is darkened from the river plume. No ruffe were captured in 30.5 minutes of effort concentrated in the remaining outer 1.5 km of the shipping channel which has clear water and stretches farther out into the bay. From this information we assume the ruffe captured in this area belong to the Thunder Bay River population.

Ruffe was the 3rd most abundant species captured from the initial 0.6 km of the shipping channel in the river plume and comprised 14 % of the total catch in this area. The average CPE was 4.2 ruffe per minute - approximately 9 times greater than in 1998 (1.6 ruffe per minute) (Figure 5). As was the case in the Thunder Bay River, 97 % of the ruffe captured were young-of-the-year fish. Young-of-the-year averaged 98 mm in total length and ranged 82-111 mm. The remaining ruffe (4 ruffe) were age 1 adults that averaged 143 mm in total length and ranged 126-152 mm.

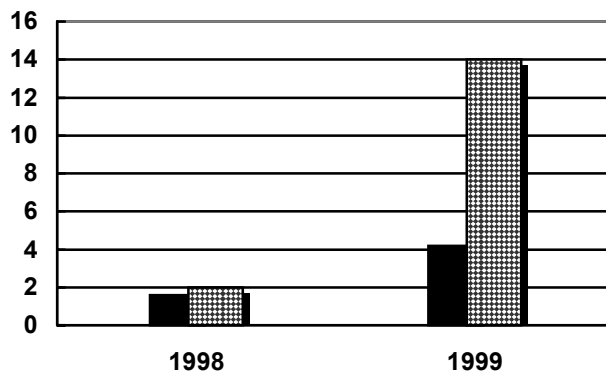


Figure 5. Relative abundance in catch / minute (solid) and percent of total catch (cross hatch) for ruffe captured from the Thunder Bay shipping channel in 1998 and 1999.

Round Goby

Goby were captured at five locations in Lake Huron (Table 1). They were found at three new locations including two locations in Thunder Bay (Thunder Bay River and Thunder Bay shipping channel) and at 1 location in Tawas Bay (National Gypsum port). Goby continued to persist in the LaFarge shipping channel in Thunder Bay -where they were first discovered in 1998, and in the Saginaw River -where they were first discovered in 1997.

New sightings:

Thunder Bay River - Alpena. Forty goby were found in the Thunder Bay River in 1999 and represents a new sighting (Table 1). Goby were first reported in the Thunder Bay area in 1997 by an angler fishing near the LaFarge Corporation and were captured during trawling surveys in the LaFarge shipping channel in 1998. In 1999 they spread to the Thunder Bay River and were

mainly captured near the river mouth. The CPE of goby in the Thunder Bay River was 1.3 goby per minute. Goby were 6th in relative abundance and comprised 4 % of the total catch. The average total length of goby captured from the river was 74 mm and ranged 43-109 mm.

Thunder Bay Shipping Channel - Alpena. A total of four hundred thirty-two goby were captured from the Thunder Bay shipping channel (in and out combined) in 1999 and represents a new location (Table 1). They were the most abundant species captured at this location and comprised 39 % of the cumulative catch. The cumulative CPE of goby in the Thunder Bay shipping channel (in and out combined) was 7.1 goby per minute. The average total length of goby captured was 64 mm and the range was 10-131 mm.

National Gypsum - Tawas City. National Gypsum is a shipping port on Lake Huron at the south end of Tawas Bay. One hundred eight round goby were captured during exotic fish surveillance from this location in 1999 (Table 1). Goby were first confirmed from Tawas Bay in November 1998 when they were captured by anglers fishing near the public launch in East Tawas. The National Gypsum port was not surveyed in 1998, so it is unknown whether goby were present there beginning in 1998 as well. Goby may have been present in 1998 because they were present in large numbers in 1999 and were the most abundant species captured. They comprised 83 % of the total catch. Large gobies, likely age 1 or older, were captured. Total lengths ranged from 35-131 mm and the average length was 93 mm. The CPE was 4 goby per minute.

Existing populations:

LaFarge Shipping Channel - Alpena. The LaFarge shipping channel is a dredged channel in Thunder Bay that provides shipping traffic to the LaFarge Corporation. A total of two hundred eighteen goby was captured from the LaFarge shipping channel in 1999 (Table 1). Goby were the most abundant species captured and comprised 77 % of the total catch - double the representation in the 1998 catch (37 % of total catch) (Figure 6). The CPE in 1999 was 10.1 goby per minute, an increase in catch over 1998 (5.7 per minute) (Figure 6). The average length of goby captured was 87.5 mm and ranged 21-115 mm.

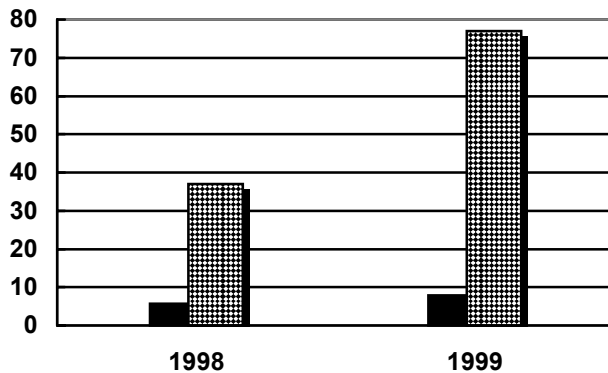


Figure 6. Relative abundance in catch/ minute (solid) and percent of total catch (cross hatch) for goby captured from the LaFarge shipping channel in 1998 and 1999. Goby were the most abundant fish captured from the shipping channel in fall bottom trawl surveys conducted in both 1998 and 1999.

Saginaw River - Essexville. The Saginaw River is a large tributary to Saginaw Bay on Lake Huron and maintains a large amount of commercial freight ship traffic to the cities of Saginaw and Bay City. Goby were first captured from the Saginaw River during ruffe surveillance

activities in October 1997. Only one goby was captured at that time. In 1999, 123 goby were captured from this same area (Table 1). Goby were 3rd in relative abundance and comprised 12 % of the total catch. The largest goby captured (190 mm) during 1999 exotic fish surveillance was found at this location. Goby ranged 43-190 mm in total length and averaged 90 mm. A CPE of 3.5 goby per minute was reported at this site. Goby were not captured during surveillance efforts in 1998; however, bottom trawling surveys conducted by the Michigan Department of Natural Resources captured large numbers of goby from the Saginaw River in 1998 (Jim Baker, MDNR, personal communication).

5. Discussion

Eurasian Ruffe

We have not detected a spread in the range of ruffe to areas outside of the Thunder Bay River to date (Table 1). The lack of range expansion may be due to the low population levels found in the Thunder Bay River prior to 1999, and/or the quick response of the shipping industry to impose interim measures to prevent the transport of ruffe in ship ballast water out of the Alpena harbor (Harkins 1996).

The Thunder Bay River ruffe population is reproducing - as seen from the large catch of young-of-the-year fish (98 % of ruffe captured) and their overall increase in relative abundance (11.5 fold increase in CPE over 1998). An increase in relative abundance was also seen for similar species such as yellow perch and spottail shiner *Notropis hudsonius* in 1999 (Figure 7). Trends in increased relative abundance for ruffe and similar species are likely due to the mild winter, early warm spring, and low water levels associated with the spring of 1999 that allowed successful reproduction and survival of young. Not only were ruffe the most abundant species present in 1999, they also comprised a strong year class that could cause a population explosion in the Thunder Bay River in the early 2000s. Increased abundance of ruffe in the Thunder Bay River may have a negative effect on native fish species and expand the range of ruffe to areas outside of Thunder Bay. An increase in ruffe abundance may also increase their use as a prey item for predatory fish.

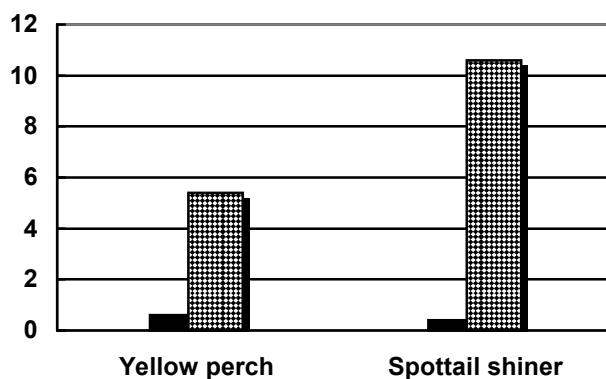


Figure 7. Relative abundance in catch/ minute of yellow perch and spottail shiner captured from the Thunder Bay River in 1998 (solid) and 1999 (cross hatch).

The large year class in 1999 may result in exponentially high numbers of ruffe in the early 2000s that may negatively affect native fish. High numbers of ruffe may out-compete native species for food and habitat and the aggressive nature of ruffe would further reinforce a competitive effect on natives. In the St. Louis River Harbor, increases in the relative abundance of ruffe from 1989 to 1995 corresponded with declines in the relative abundance of native fish species captured bottom trawling, including yellow perch and trout-perch *Percopsis omiscomaycus* (Bronte et al. 1998). Efforts are currently being made to monitor the Thunder Bay River fish community for trends and potential relationships between ruffe abundance and abundance of native species. A large increase in the relative abundance of ruffe in the early 2000s will better define potential relationships between relative abundances of ruffe and native species.

Large abundances of ruffe in the early 2000s may reach a carrying capacity for food and habitat resources in the Thunder Bay River, causing some to migrate to other areas. We have not discovered any migration of ruffe from the Thunder Bay River since their discovery in 1995 (Table 1). The lack of movement may have been due to low numbers associated with the new and growing population. Continued close monitoring of nearby locations and the current population in 2000 will better define at what abundance ruffe begin to migrate to other areas. Exotic fish surveillance around Lake Huron will be important in future years to document the baseline fish community and discover locations where ruffe and other exotics have spread.

Increased abundance of ruffe in the early 2000s may also be reflected in prey selection by predatory fish. The introduction of predatory fish was proposed as a means to decrease the abundance of burgeoning ruffe populations in the St. Louis River Harbor beginning in 1989 (Mayo et al. 1998). The Thunder Bay River supports a large number of natural predatory fish including walleye *Stizostedion vitreum*, northern pike *Esox lucius*, smallmouth bass *Micropterus dolomieu*, and brown bullhead *Ameiurus nebulosus*. A predator dietary study conducted in the Thunder Bay River at low 1997-98 ruffe abundances (0.4 ruffe/minute and 1.0 ruffe/minute respectively) did not reveal ruffe to be a prey item for predators (Hintz 2000). The larger numbers of ruffe currently found in the river (11.5 ruffe/minute) may provide a food base for Thunder Bay predators, as may larger abundances in the future. Predator diet analysis in the St. Louis River, Lake Superior in 1991-94 indicted that walleye, northern pike, brown bullhead, smallmouth bass and yellow perch consumed ruffe following the predator stocking (Mayo et al. 1998). A predator dietary study will be continued in 2000 to monitor this interaction.

Round goby

In 1999, the range of goby expanded in Lake Huron and their populations rapidly increased in number in areas where they were present prior to 1999. It is likely that the goby range is expanding to new locations in Lake Huron due to intra-lake ship traffic or transfer by anglers as bait.

Beginning in 1997, the range of goby rapidly expanded along the U.S. Lake Huron coast to areas that are relatively separate from each other. Goby were discovered in Thunder Bay, Tawas Bay, and the Saginaw River, three very separate areas along the Lake Huron coast, over the past 3 years (A.Hintz, USFWS, survey data). This is interesting, as goby have not been detected in the AuSable River, which separates Thunder Bay from the Tawas area, or the AuGres River, which separates Tawas from the Saginaw River (Figure 1 & Table 1). It seems likely that there would

be a progressive movement from one area to another if the goby had spread to these areas unassisted. Active shipping ports are located in goby infested areas of Thunder Bay, Tawas Bay, and the Saginaw River and all three of these locations are also primary fishing locations. These new sightings may be the product of ballast water transfer from intra-lake shipping or accidental release of goby used as bait.

Although some measures have been taken to limit ballast transport of exotic fish in the Great Lakes, and bait vendors and fishermen have been educated about these invaders, their range continues to expand. The Lake Carriers' Association imposed interim measures to reduce the risk of transfer of ruffe in ballast from the Alpena harbor to other areas of the Great Lakes following the discovery of ruffe in the Thunder Bay River in 1995 (Harkins 1996.) The quick response of the shipping industry to the ruffe population in Alpena may be one of the reasons that ruffe have not spread to other areas of Lake Huron or the Great Lakes. To date this is the only area in Lake Huron where measures have been imposed to limit ballast transfer of exotic fish species, and goby may have spread from port to port in other areas where these measures were not in place.

Anglers may also be accidentally spreading goby as some have been found to use goby as bait for predatory sportfish in certain areas of the Great Lakes where goby are very abundant, such as the St. Clair River. Their success at using goby for bait in areas where they are abundant may encourage them to use goby in other areas where goby have not been found; thus essentially spreading the range of this exotic through bait release. Goby are thought to have been introduced into the headwaters of the Shiawassee River, the upper reaches of the Saginaw River watershed, through the release of goby used as bait (Jude 1997).

In the Thunder Bay area, and possibly the Tawas Bay area, goby extended their range unassisted within local area once they were established. Goby were first reported in October 1997 by an angler fishing at the LaFarge Corporation at the north end of Thunder Bay (F.Rose, MDNR, personal communication). In 1998 they were found nearby in the LaFarge shipping channel (A.Hintz, USFWS, survey data) and in 1999 further south in the Thunder Bay shipping channel and Thunder Bay River (Table 1). In Tawas Bay, goby were first reported by anglers fishing from the city dock in East Tawas in 1998 (A.Hintz, USFWS, confirmed sighting). It is unknown whether the goby found in 1998 originated from shipping at the nearby National Gypsum port because the port was not surveyed in 1998 due to poor weather. Goby may have been established at the port via shipping and spread into East Tawas where they were discovered, or they may have originated in East Tawas via bait and spread to the National Gypsum port where they were found in 1999. From either location they likely spread locally to the other area.

In areas where goby have become established, their populations have grown quickly. Goby were the most abundant species at 3 of 5 known locations in 1999 - all within 1-3 years of discovery. They were the most abundant species collected from the LaFarge shipping channel, Thunder Bay shipping channel, and National Gypsum port (Table 1) -comprising greater than 75% of the total catch at 2 of those locations. Goby were among the 6 most abundant species at the remaining locations where they were found (Appendix A). Goby are batch spawning fish that can have multiple broods in a season (Jude et al. 1992), which may be why goby increase in abundance quickly. They also aggressively and actively guard their nest increasing survival of their young

and further reinforcing the abundance of the population. This activity may be detrimental to native nest building species who may lose crucial spawning habitat to this aggressive exotic. Goby may also out-compete native fish for food resources as they are aggressively curious and frequently the first fish to prey on food (Ghedotti et al. 1995). This is a problem for fishermen as well, as goby are indiscriminate and quick to feed on bait preventing fishermen who catch large numbers of goby from catching their target sport species.

Acknowledgements

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Appendix A

1999 Lake Huron Exotic Fish Surveillance Catches Numbers

LOCATION	SPECIES																																		
	EURASIAN RUFFE	ROUND GOBY	Alewife	Black crappie	Bluegill	Bluntnose minnow	Brown bullhead	Carp	Channel catfish	Emerald shiner	Freshwater drum	Gizzard shad	Goldfish	Golden shiner	Johnny darter	Largemouth bass	Logperch	Mimic shiner	Ninespine stickleback	Pumpkinseed	Quillback carpsucker	Red sucker	Rockbass	Sand shiner	Slimy sculpin	Smallmouth bass	Rainbow smelt	Spottail shiner	Trout-perch	Walleye	White perch	White sucker	Yellow perch	TOTALS	
Port Dolomite									1						3				7					48		2	1	1							63
Cheboygan River				2		170			1							1	17			4		2			2		10	10						3	222
LaFarge S. Chnl.		218	50												3								2	1		3		5						1	283
Thunder Bay River	344	40	2	22		58			2						1	2	7		2			5						318	8	4	2	71	163	1051	
Thunder Bay S. Chnl.	126	432	18	1	1	3	1	2							9	1		6				2	4			1	9	262	122	4		72	44	1120	
AuSable River			1																					7			41	10							59
National Gypsum		108							2						4													16							130
AuGres River			9	25	1	11		1					1	3								1						2		13		15	374	456	
Saginaw River		123	1		2	3		9	301	1	118	53			1						59	1					12	17		277	3	81	1062		
Overall totals	470	921	81	50	4	245	1	12	302	6	118	53	1	3	21	1	3	30	7	6	59	2	13	9	49	3	55	631	163	21	279	161	666	4446	