Western Lake Erie
Juvenile Lake Sturgeon Assessment

Emily C. Zollweg, Tracy D. Hill, Jerry R. McClain
Alpena Fishery Resources Office, U. S. Fish and Wildlife Service
145 Water St., Alpena, MI 49707

Christopher Lowie, Kofi Fynn-Aikins
Lower Great Lakes Fishery Resources Office, U. S. Fish and Wildlife Service
405 N. French Rd., Amherst, NY 14228

September 2001

Introduction

There are 27 species of sturgeon worldwide, nine are endemic to North America; however, only the lake sturgeon, *Acipenser fulvescens*, is native to the Great Lakes basin. Lake sturgeon is one of the few sturgeon species which lives its entire life in freshwater (Auer 1999). Lake sturgeon once ranged throughout the Mississippi River, Hudson Bay and the Great Lakes basin (Harkness and Dymond 1961; Scott and Crossman 1973). Once an abundant member of the Great Lakes fish community, lake sturgeon were, and continue to be, commercially valuable and can provide tremendous sport fishing opportunities (Auer 1999). This species has and continues to represent an important biological component of the Great Lakes fish community. By the early 1900's many populations of lake sturgeon throughout their range had been greatly reduced or extirpated as a result of overfishing, habitat loss, the construction of dams, and pollution (Ono et al. 1983). Lake sturgeon are listed as either threatened or endangered by 19 of the 20 states within its original range in the United States (Auer 1991). The American Fisheries Society considers lake sturgeon a threatened species in North America (Williams et al. 1989). Considered relicts, fossil evidence suggests sturgeons existed one hundred to two hundred million years ago (Auer 1999).

Sturgeon retain many characteristics of primitive fishes. They possess a shark-like heterocercal tail, bony scutes along their head, back and sides, a cartilaginous skeleton, and a toothless, protrusible mouth (Auer 1999). Lake sturgeon are the largest freshwater fish in the Great Lakes basin. They feed on chironomid larvae, molluscs, mayfly nymphs, caddisfly larvae, crustaceans, and fish (Harkness and Dymond 1961; Thomas and Haas 1999). Lake sturgeon are late maturing, slow-growing, long-lived fish that

reach ages of 100-150 years (Guenette et al. 1993). Unlike many fishes, lake sturgeon require fifteen to twenty-five years to reach sexual maturity and are intermittent spawners (Priegel and Wirth 1977).

320 mm Lake Sturgeon

In 1995, the U.S. Fish and Wildlife Service (Service) began developing an interagency partnership approach for the collection of status and trend data on lake sturgeon in the central Great Lakes, including Lake Huron, St. Clair River, Lake St. Clair, and western Lake Erie. Agency biologists from the Service, Ontario Ministry of Natural Resources (OMNR), Michigan Department of Natural Resources (MDNR), and Ohio Division of Wildlife (ODOW) began pooling resources for this collaborative effort. In 1995, an Ontario commercial fisher reported significant catches of small juvenile lake sturgeon as by-catch in his nets in northwestern Lake Erie. Simultaneously, sport anglers in Ohio waters of Lake Erie began reporting substantial numbers of juvenile sturgeon as by-catch in the yellow perch, *Perca flavescens,* fishery. In an effort to collect biological and genetic information on these small fish, the Alpena Fishery Resources Office (ALPFRO), Alpena, MI, and the Lower Great Lakes Fishery Resources Office (LGLFRO), Amherst, NY established a program with the Ontario commercial fisher (Mr. Gerry Penner), whereby he collected lengths and weights from all by-caught lake sturgeon, as well as fin rays for age and fin tissue for genetic analysis. The genetic analyses conducted by The Ohio State University (OSU) indicated that these juvenile lake sturgeon being encountered in western Lake Erie were unique compared to other populations in Lake Huron and the St. Clair system (Porter et al. 1995).

Objectives

Collection of biological data from by-caught lake sturgeon continued with the assistance of Penner through 1998, with data indicating that strong year classes of lake sturgeon were produced in 1993 and 1994 but were not followed up with similarly robust cohorts. The source of this recruitment was undetermined but thought to be associated with the Detroit River (Hill and Manny 1999, McClain and Manny 2000). A survey of lake sturgeon spawning sites identified by Goodyear et al. (1982) was conducted in the Detroit River in 1999 but failed to identify active spawning at those sites, nor any evidence of recent recruitment to that population (McClain and Manny 2000).

Lake sturgeon are known to be intermittent spawners with the periodicity of those spawning events affected by environmental and physiological factors (Auer 1999). This study was undertaken to further examine the recruitment of lake sturgeon in western Lake

Erie and help determine the periodicity of those events. Correlation of recruitment with environmental or climatic factors will be important for managers and researchers involved in efforts to protect remnant stocks and promote restoration efforts for this depleted native species.

In addition to the recruitment aspects of the Lake Erie lake sturgeon population(s), this study was intended to continue expansion of the inter-basin tagging program that has been ongoing since 1996 and better define the inter-basin movement and distribution patterns of lake sturgeon in the central Great Lakes. Fish tagged in this study may be recaptured in ongoing surveys on the Niagara, Detroit and St. Clair Rivers, Lake St. Clair, or Lake Huron.

Methods

In 1996-1998, Canadian commercial fisher Gerry Penner recorded biodata and tagged incidentally caught lake sturgeon. In 2001, one U. S. Fish and Wildlife Service employee went with Penner as part of his crew.

Gerry Penner

When a lake sturgeon was captured, the USFWS employee measured length, girth, and weight and tagged incidentally caught lake sturgeon. Sturgeon data collection occurred from 16 April to 8 June 2001.

Monofilament gill nets in 6.3 cm to 11.4 cm mesh sizes were set on the bottom or suspended 10 feet below the surface. Nets were pulled within three days of set. In 2001, water depths varied from 7.0 to 11.3 meters.

We used individually numbered Floy T tags as an external identifier. We also used PIT tags as a long term identifier. The FLOY tags were placed in the anterior musculature under the last dorsal scute directly in-front of the dorsal fin. PIT tags were scanned prior to and after insertion to check tags operation. PIT tags were inserted using the designed needle with the blunt end of the tag inserted into the fish first. PIT tags were placed on the dorsal side between the 4^{th} and 5^{th} dorsal scutes back from the head (directly underneath the 4^{th} scute, initially inserted in a 45 degree angle and then brought to a more horizontal level). All serial numbers were double checked prior to release. All fish were measured, weighed, and left pectoral fin ray was taken for age estimation. All fish captured alive were released alive. Three lake sturgeon were found dead in the nets, but were determined to have died before entering the nets.

Jeff Diers, USFWS Lower Great Lakes FRO, and Lake Sturgeon

Results

Approximately 165 lake sturgeon have been captured during the course of this study. Twenty-five were caught in 2001. In 2001, total length ranged from 320 to 970 mm (Table 1). Length frequency of fish caught in 2001 was similar to length frequency of fish caught in 1996-1998 (Figure 1). Age estimates are not available at this time.

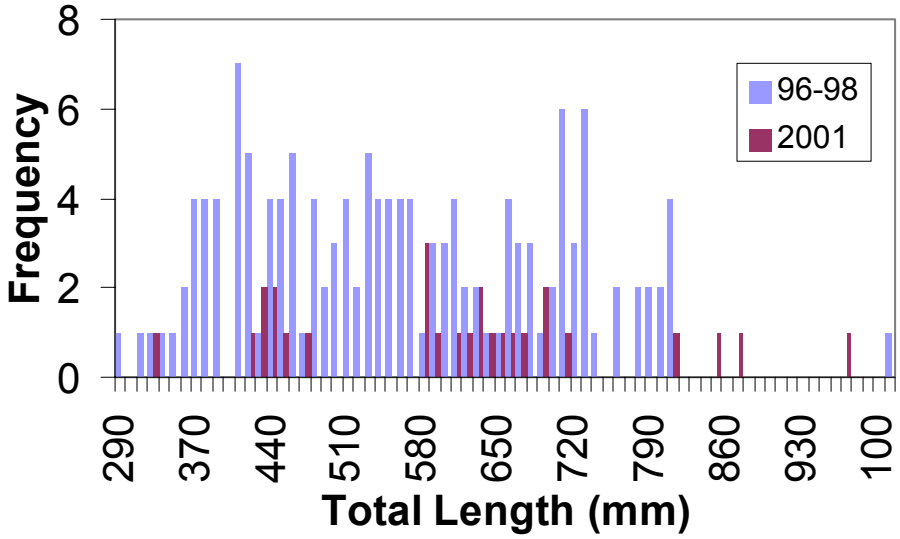

Figure 1. Length frequency of western Lake Erie lake sturgeon 1996 to 1998 compared to 2001.

Table 1. Biostatistics on lake sturgeon caught and tagged in 2001.

	Girth (mm)	Total Length (mm)	Weight (kg)
Mean	237	611	1.53
Minimum	115	320	0.06
Maximum	390	970	5.00

Length and other biostatistics indicate that this is a population of juvenile and sub-adult fish. In 1996-1998, 26 lake sturgeon less than 420 mm were captured, in the spring of 2001 only one lake sturgeon less than 420 mm was captured. The smallest juvenile fish are no longer represented in our sampling efforts. These lake sturgeon would have been spawned in the last 1-5 years. We need to determine spawning periodicity and factors affecting survival of the smallest juvenile lake sturgeon including climatic and other environmental events. The adults in this stock may reside elsewhere or may be too large for the gear. Further investigation will determine these factors.

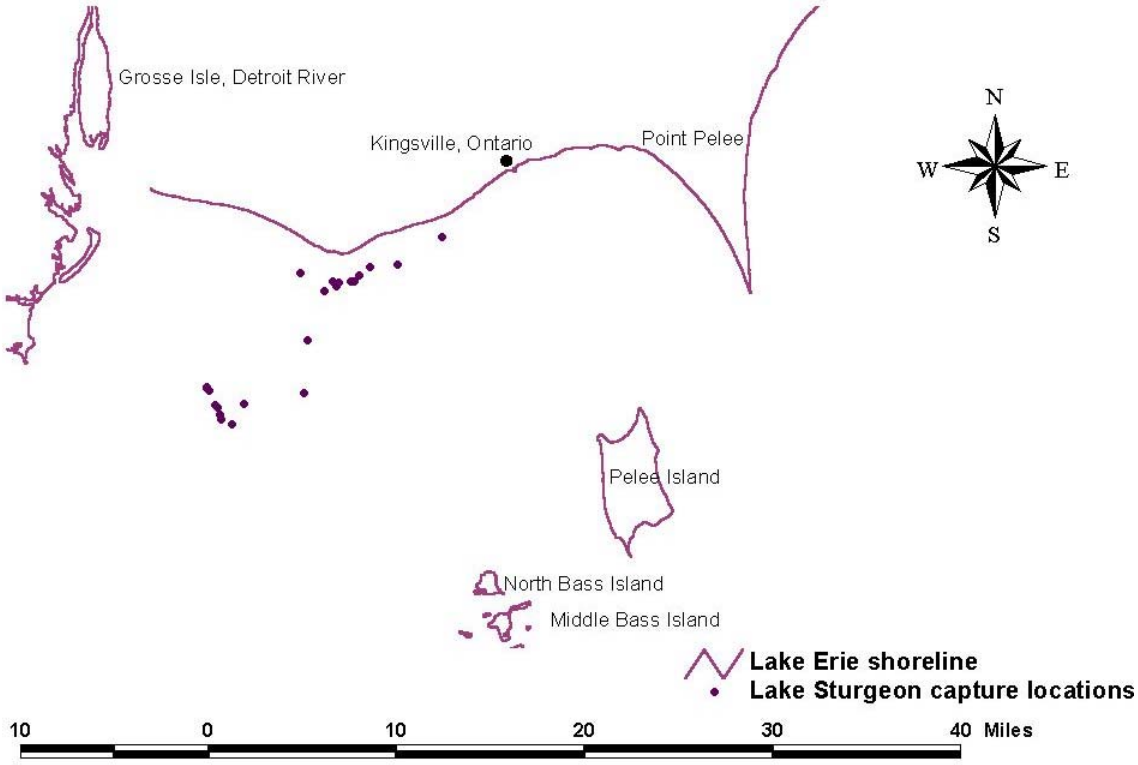

Figure 2. Locations of lake sturgeon caught and tagged in spring 2001.

As more fish are tagged and as these fish are recaptured in future years, we will be able to determine where the western Lake Erie lake sturgeon are spawning and whether or not they migrate out of the area (Figure 2). This information will be invaluable in protecting this stock and others throughout the Great Lakes.

Jacob Cordonnier, USFWS Alpena FRO, and Lake Sturgeon

Acknowledgements

This project was made possible by funds provided by the National Fish and Wildlife Foundation's Great Lakes Conservation Fund. Our special thanks to the following: Don MacClennan, Lake Erie Management Unit, Ontario Ministry of Natural Resources; the crew of the Edith Marie II, Kingsville, Ontario; and U. S. Fish and Wildlife Service employees: Heather Enterline, Jacob Cordonnier, Jeff Diers, Dan DeRoos, and Matt Lochner.

Literature Cited

Auer, N. A. 1999. Lake Sturgeon: A unique and imperiled species in the Great Lakes. Pages 515-536 *in* W.W. Taylor and C.P. Ferreri, eds. Great Lakes Fisheries Policy and Management: A Binational Perspective. Michigan State University Press, East Lansing, Michigan.

Auer, N. A. 1991. Conservation of the threatened lake sturgeon. Michigan Department of Natural Resources, Nongame Wildlife Fund and Living Resources Small Grants Program. Final Report, Lansing.

Baldwin, N. S., R. W. Saalfeld, M. J. Ross, and H. J. Buettner. 1979. Commercial fish production in the Great Lakes 1867-1977. Technical Report No. 3. Great Lakes Fishery Commission, Ann Arbor, MI 48105. 187 pp.

Goodyear, C. S., T. A. Edsall, D. M. Ormsby-Dempsey, G. E. Moss, and P. E. Polanski. 1982. Atlas of the spawning and nursery areas of the Great Lakes fishes. Volume 8: Detroit River. U. S. Fish and Wildlife Service, Washington, D. C. FWS/OBS82/52

Guenette, S., R. Fortin, and E. Rassart. 1993. Mitochondrial DNA variation in lake sturgeon (Acipenser fulvescens) from the St. Lawrence River and James Bay drainage basins in Quebec, Canada. Canadian Journal of Fisheries and Aquatic Sciences 50:659-664.

Harkness, W. J. K. and J. R. Dymond. 1961. The lake sturgeon. Ontario Department of Lands and Forests, Toronto, Ontario.

Hill, T. D., and J. R. McClain, eds. 1999. Activities of the Central Great Lakes Bi-National Lake Sturgeon Group in 1997-1998. Alpena Fishery Resources Office, Alpena, MI. 63 pp.

McClain, J. R. and B. A. Manny. 2000. Evaluation of lake sturgeon habitat in the Detroit River. Completion report #GL 98105. U. S. EPA-GLNPO. 24 pp.

Ono, R. D., J. D. Wagner, and A. Wagner. 1983. Vanishing Fishes of North America. Stone Wall Press, Washington.

Porter, B., T. Cavender, P. Everest, and T. Nichell. 1995. The genetic status of lake sturgeon in Lake Erie and other populations in the Laurentian Great Lakes. Ohio Department of Natural Resources, Fish Division, Museum of Zoology, Columbus, OH 43224-1329. Contribution No. 1, 45 pp.

Priegel, G. R. and T. L. Wirth. 1977. The lake sturgeon: Its life history, ecology and management. Wisconsin Department of Natural Resources Publications 4-3600(77).

Scott, W. B. and E. J. Crossman. 1973. Freshwater fishes of Canada. Fisheries Research Board of Canada. Bulletin 184. Ottawa, Ontario.

Thomas, M. V. and R. C. Haas. 1999. Capture of lake sturgeon with setlines in the St. Clair River, Michigan. North American Journal of Fisheries Management 19:610-612.

Williams, J. E., J. E. Johnson, D. A. Hendrickson, S. Contreras-Balderas, J. D. Williams, M. Navarro-Mendoza, D. E. McAllister, and J. E. Deacon. 1989. Fishes of North America, endangered, threatened, or of special concern. Fisheries 17(6):2-20.

Budget

Category	Amount Budgeted	Amount Spent
Equipment: Avid PIT tag readers and tags, FLOY tags and applicators, sampling boxes and equipment, shipping	4550	4254.66
Travel: 1 person for 8 weeks of sampling	4700	4671.94
Fuel, Photo processing		323.40
Total	9250	9250