

## Fish Population Survey of Saginaw Bay, Lake Huron, 1989-97

David G. Fielder, James E. Johnson, and John R. Weber<sup>1</sup>

Michigan Department of Natural Resources  
Alpena Fisheries Research Station  
160 East Fletcher  
Alpena, MI 49707-2344

Michael V. Thomas and Robert C. Haas

Michigan Department of Natural Resources  
Mt. Clemens Fisheries Research Station  
33135 South River Road  
Mt. Clemens, MI 48045

*Abstract.*—In this study we investigated the overall fish community, and the population dynamics of yellow perch *Perca flavescens* and walleye *Stizostedion vitreum* in Saginaw Bay, Lake Huron. Field sampling was conducted from 1989 through 1997. Sampling was done by gill net, and bottom trawl. Spawning walleye were tagged in a bay tributary. In spite of the resurgence of walleye in the 1980s, Saginaw Bay remains an ecosystem characterized by an over abundance of forage fish and an under abundance of top predators. Trawl catch rates suggested that zebra mussel colonization of the bay in the early 1990s was accompanied by a shift in much of the forage fish community from pelagic planktivores towards benthic species. Despite this shift, abundance of walleye in Saginaw Bay did not change appreciably during the study. Declines in gill-net catch-per-unit-effort may be attributed to confounding effects of migration and changes in vulnerability to the gear, probably fueled by increased water clarity. No changes in distribution of walleye within the bay were evident as a result of zebra mussel colonization. Since the 1980s, walleye age structure has shifted towards older fish. Walleye growth was extremely fast and the population did not appear to be food limited. Walleye recruitment was relatively weak in 1992, 1993, and 1996. The latter two year classes corresponded to years of no stocking. This pattern of year class strength held up in the sport fishery and in the spawning run to the Tittabawassee River. Walleye exploitation was low, averaging 8.5%. Walleye total annual mortality for this time period was just 28.3%. We found evidence of both walleye immigration and emigration from the bay making interpretation of these statistics more difficult. During the study period, trawl catch rates documented a shift in yellow perch from high density and poor growth to a lower density with improved growth. Explanations for this shift may include decreased recruitment, improved food resources (larger, more abundant benthic invertebrates) as a result of zebra mussel colonization, and reduced infection by parasites. Walleye did not select yellow perch for a primary food source, but principally consumed alewife *Alosa pseudoharengus* and gizzard shad *Dorosoma cepedianum*, so the decline in yellow perch was not caused by

<sup>1</sup>Deceased

walleye predation. Work towards full walleye recovery (population at carrying capacity) remains the single best means by which to restore balance to the bay's aquatic ecosystem. Other recommendations include dam removal or fish passage, to encourage natural reproduction of walleye and other river-spawning species.

Knowledge of the history of the fisheries of Saginaw Bay, Lake Huron is important for successful management. During 1912-40, Saginaw Bay accounted for over 28% of Lake Huron's commercial fish yield (Baldwin and Saafeld 1962). Commercial harvest in the bay dates back to the 1830s (Lanman 1839). Commercial harvest records indicate that the fish community was composed of walleye (see Appendix 1 for a complete list of all scientific and common names of fishes and aquatic organisms mentioned in this report), yellow perch, channel catfish, white sucker, northern pike, and several centrarchid species (Keller et al. 1987). In addition, harvest of lake trout, lake herring, and lake whitefish occurred both seasonally and in the outer portion of the bay (Baldwin and Saafeld 1962, Keller et al. 1987). Fishery production peaked in 1902 and declined steadily through the 1970s.

Historically, Saginaw Bay produced the second largest walleye fishery in the Great Lakes (Schneider and Leach 1977) but declined by the mid 1900s. Deterioration of habitat due to siltation, eutrophication, and industrial pollution have been identified as primary causes. Loss of spawning habitat was attributed principally to sedimentation of substrate. Construction of dams, which blocked spawning migrations, also contributed to loss of habitat. The invasion of exotic planktivores, such as rainbow smelt and alewives, further suppressed walleye recruitment. In the face of these perturbations, the remaining fishery was over-harvested during the 1940s by commercial operations (Schneider 1977; Schneider and Leach 1977). Attempts to stock walleye fry in the 1940s failed to establish significant recruitment. Many native species, such as lake herring, also declined with the loss of top predators and the invasion of exotics (Keller et al. 1987).

Recovery of the bay's fisheries began with passage of the Federal Clean Water Act in 1972.

Partial control of exotic planktivores was achieved through stocking of salmonids in Lake Huron. The deteriorating commercial walleye fishery was formally closed in 1970, although this was primarily in response to concerns about mercury contamination. Commercial fishing in Saginaw Bay continues today for some species including yellow perch, common carp, lake whitefish, and channel catfish. Stocking of fry and fingerling walleye was resumed in 1972 by the Michigan Department of Natural Resources (MDNR). Fingerling stocking developed in earnest by 1982 and annual plantings approached 1 million fish during the 1990s (MDNR 1982).

Since the early 1980s, a major sport fishery has developed in the bay, largely in response to the re-establishment of walleye. From 1991-97, there was an annual average of 287,500 angler trips during the open water months of April through October (Rakoczy 1992; Rakoczy and Svoboda 1994; and G. Rakoczy, MDNR, personal communication). The average annual harvest during this period was 1,237,000 fish. Yellow perch dominated the harvest in numbers, making up over 90% in most years. The Saginaw Bay fishery accounted for 58% of the total fishing effort on the Michigan waters of Lake Huron for 1991-92. Saginaw Bay accounted for 86% of all the sport harvest by number on the Michigan waters of Lake Huron during that same time period (Rakoczy and Svoboda 1994).

Since 1980, large runs of spawning walleye have developed in the Tittabawassee River and other tributaries of the Saginaw River system. A current MDNR research priority is to determine the source of walleye recruitment to the bay. Three techniques have been employed to measure evidence of natural reproduction: fry sampling prior to stocking dates; interruptions in stocking in 1993 and 1996; and marking with oxytetracycline. All three approaches have indicated that at least some natural reproduction