Influence of lotic and nearshore habitats on fish populations in Great Lakes and inland lake ecosystems, with emphasis on walleye

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Background

Rehabilitation of walleye in northern Green Bay (Lake Michigan) started in the early 1970s with intensive stocking of fry and fingerlings. These efforts and natural reproduction by the walleye population have led to a substantial walleye fishery. Fisheries Division's ability to assess and manage this fish population has been limited by a lack of data concerning natural reproduction and contribution of hatchery fish to present walleye populations.

Generally, linkages between key river and nearshore habitats and populations of important Great Lakes fishes, such as walleye, are poorly understood. Walleyes are important game fish in Michigan, and dominant predator in Great Lakes nearshore habitats. Extensive effort is expended annually by the Fisheries Division to rear and stock walleye, often with the goal of developing self-sustaining inland and Great Lakes populations. In many instances, young fish production (recruitment) is thought to be the factor limiting recovery of populations. However, our understanding of the degree to which populations can be improved is limited by our lack of understanding of, or control over, many recruitment-related factors. These include the contribution of tributary and nearshore spawning areas to recruitment (historically and currently), the extent and significance of habitats changes (for example, dams on spawning tributaries), and key characteristics of habitat where juvenile fish live. These data are needed to effectively manage walleye populations, and protect and rehabilitate key habitats. Because these are statewide issues, such information should be ideally collected from many areas and lead to development of a broadly applicable knowledge base for understanding linkages between river and nearshore habitat and Great Lakes fish populations.

The objectives of this study are: 1) to assess the extent of natural reproduction of walleye in the Michigan waters of Green Bay via marking stocked fish with oxytetracycline (OTC – Photo 1) and describe contributions of stocked fish to walleye year classes; and 2) to assess the relative influence of river spawning habitat, estuary conditions, juvenile-adult growth habitat, and supplemental stocking on spawning runs of walleye (and estimates of percent natural reproduction) in various river-influenced systems in Michigan.

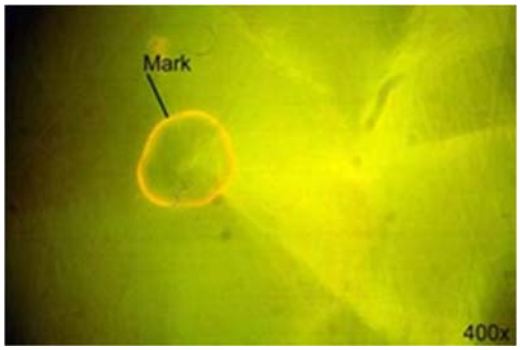

Photo 1. Image of a walleye otolith under a microscope showing oxytetracycline ring indicating the fish was of hatchery origin.

Recent study results

During 2004–2009, approximately 823,000 walleye fingerlings were stocked into Little Bay de Noc (LBDN), and 1,017,000 fingerlings were stocked into Big Bay de Noc (BBDN). We captured and examined walleye during these years and found that 76% of 2,194 walleye from LBDN were naturally reproduced and 62% of 763 walleyes from BBDN were naturally reproduced. Except for age-0 walleyes in BBDN, we saw no significant difference in abundance of walleyes from stocked and unstocked year classes at age-0, age-1, or age-2, based on electrofishing and gill-net catch rates (Photo 2). We saw significantly higher catch rates of age-1 and age-2 walleyes in LBDN compared to BBDN using either type of sampling gear. In LBDN, age-0 walleyes persisted to age-3, but in BBDN they declined after age-0 and were not caught at age-3. Lack of older aged walleyes in catches in BBDN may be due to poor survival, offshore migration, or both. Our findings indicated stocked walleyes were detectable in both bays at age-0, and in LBDN, they likely persisted to contribute to the sport fishery. The fate of walleyes stocked into BBDN was less clear, and their contribution to the BBDN walleye fishery was uncertain. The management potential of BBDN for walleyes differs from that of LBDN.

Photo 2. Assessment gill netting to evaluate walleye abundance and collect juvenile walleye to examine for hatchery marks.

To accomplish Objective 2 of the study, we estimated river spawning walleye populations by conducting electrofishing surveys in the Cedar, Menominee, Ford, Escanaba, Whitefish, Rapid, and Tahquamenon rivers. We will combine these estimates with those from similar surveys elsewhere in Michigan, and examine aspects of river, estuary, and Great Lakes habitat to determine the influence of these habitat features and stocking on walleye spawning populations.

Additional detailed information on this study can be found at
http://www.michigan.gov/dnr/0,4570,7-153-10364_52259_19056-333302--,00.html.