*Michigan Department of Natural Resources*
*Fisheries Research Report No. 2020, 1997*

# Dynamics of a Bluegill, Walleye, and Yellow Perch Community

**James C. Schneider**

*Michigan Department of Natural Resources*
*Fisheries Division*
*212 Museums Annex Building*
*Ann Arbor, MI 48109*

*Abstract*.– The addition of bluegill *Lepomis macrochirus* to an experimental community of walleye *Stizostedion vitreum* and yellow perch *Perca flavescens* in Jewett Lake provided an opportunity to evaluate species interactions and fisheries potential. Abundance, size and age structure, growth, mortality, and recruitment of each species were monitored in 1987-95 and compared to walleye and yellow perch data collected in 1975-83. Angler harvest was monitored by voluntary catch survey. Diet studies provided information on predation and potential competition. Models were constructed to simulate populations and the effects of fishing regulations, especially catch-and-release regulations. With the addition of bluegill to the community, total fish biomass doubled to 71 kg/hectare, of which 52% was bluegill. Walleye biomass increased by 11% and yellow perch biomass decreased by 20%. The abundance of large fish changed dramatically: +54% for walleye >356 mm and -76% for yellow perch >178 mm. The biomass gain by walleye was attributed to the utilization of bluegill as food. The biomass loss by yellow perch, mainly by sizes >126 mm, was attributed to competition with bluegill for large zooplankton and benthos. Competition was evidenced by declines in population biomass and individual growth, and diet overlap and shift. Recruitment of YOY perch was unaffected by bluegill, but recruitment of walleye began to fail when bluegill biomass exceeded 50 kg/hectare. Bluegill effects on walleye most likely took place while walleye were in the egg stage (predation) and fry stage (predation and competition for zooplankton). Those stages were not sampled at the lake, but laboratory experiments confirmed that bluegill were capable predators. Large temperature fluctuations during walleye egg incubation were correlated with walleye recruitment failure also, but water temperature variations were probably too small to directly effect egg survival. Changes in the species populations caused a 7% gain in walleye harvest and a 71% loss in yellow perch harvest. Walleye, as predators, maintained the stability of both communities and the good growth of both bluegill and yellow perch. It is feasible to manage small lakes with either combination of species and to use walleye as a tool to improve growth and size structure of stunted populations of bluegill or yellow perch.

In 1966 a series of experiments of progressively increasing complexity were begun at Jewett Lake concerning the dynamics of yellow perch *Perca flavescens* populations and communities. The goals were to understand and predict the processes of recruitment, growth, and mortality; determine population and community stability; and evaluate fisheries potential, which is principally the abundance of fish large enough to interest anglers.