

**Effects of Commercial Fishing on an Unexploited
Lake Whitefish Population in Michigan's Waters
of Lake Superior, 1983-1989**

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Abstract.—Population parameters for a previously unexploited population of lake whitefish *Coregonus clupeaformis* at Upper Entry in Michigan waters of Lake Superior were measured in catches from a state-licensed trap-net fishery during 1983-1989 to obtain data from an unexploited population and to monitor the effect of trap-net fishing. A tribal gill-net fishery began on these lake whitefish in 1984. Annual trap-net catch decreased from 380,000 lb in 1984 to 44,000 lb in 1989. Catch per trap-net lift decreased from 690 lb in 1983 to 159 lb in 1989. Although age range of lake whitefish in catches was generally 4 to 15 years during 1983-1989, mean age decreased from 8.9 years in 1984 to 6.4 years in 1989. Modal age of lake whitefish in trap-net catches was 9 years in 1983 and 1984, 10 years in 1985, then decreased to 6 or 7 years during 1986-1989. Length-at-age of lake whitefish at Upper Entry was less than for exploited populations elsewhere in Lake Superior, and decreased during 1983-1987 as faster growing individuals of the initial stock were harvested. Lake whitefish at Upper Entry were not fully vulnerable to the 19-inch size limit until age 10. Differences in age composition and back-calculated length-at-age between lake whitefish in south and north areas of Upper Entry in 1983 suggested that they were separate stocks. Total annual mortality rates estimated using the Robson-Chapman method were 0.80 and 0.85 for age-9 and older lake whitefish from initial catches (May 1983) in south and north areas of Upper Entry, which actually represented natural mortality of these previously unexploited age groups. The Robson-Chapman total annual mortality estimate based on the total catch in 1983 was 0.75, but this method could not be used in subsequent years because fishing caused differences in survival among cohorts and strength of recruiting year classes was not constant. Total annual mortality rates estimated from survival of cohorts between ages 10 and 11 increased from 0.63 in 1983 to 0.82 in 1987. The mean mortality rate for ages 10-15 increased from 0.57 in 1983 to 0.84 in 1987. These rates were higher than rates for exploited and unexploited lake whitefish elsewhere in the Great Lakes, but were based on older age groups that represented less than half of the harvest. Fishing this previously unexploited lake whitefish population resulted in decreased biomass and growth and increased mortality, but initiation of the tribal gill-net fishery obscured the effect of the trap-net fishery. Although fishing effort by state and tribal fisheries decreased as lake whitefish biomass decreased and the population is not in immediate danger, it is recommended more representative estimates of mortality be obtained and that estimated annual quotas be used to regulate future lake whitefish harvest on the Upper Entry fishing ground.