

ABSTRACT

ESTIMATION OF LAKE TROUT (*Salvelinus namaycush*) ABUNDANCE AND MORTALITY DUE TO SEA LAMPEYS (*Petromyzon marinus*) AND FISHING IN THE MAIN BASIN OF LAKE HURON, 1984-1993

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Sea lamprey (*Petromyzon marinus*) parasitism and overfishing have been cited as the causes of the collapse of lake trout (*Salvelinus namaycush*) populations in Lake Huron during the 1950s. The goal of the ongoing lake trout rehabilitation program is aimed at reducing sea lamprey abundance, controlling fishing mortality, and restocking lake trout to establish self-sustaining populations. In order to rehabilitate lake trout, the magnitude of sea lamprey parasitism and fishing mortality must be determined in order to gauge progress towards the goal. With reliable estimates of lake trout deaths due to sea lampreys and fishery harvest, managers can adjust sea lamprey control programs and fishing regulations to reach rehabilitation objectives. I analyzed data on sea lamprey wounding of lake trout, from 1984-1994, to assess patterns in sea lamprey parasitism according to length of lake trout, geographic distribution, and year. Lake trout population models, calibrated by statistical catch-at-age analysis, were constructed to estimate abundance, fishery harvest, and numbers killed by sea lamprey during 1984-1993 for the main basin of Lake Huron.

Sea lamprey wounding rates on lake trout increased with length of lake trout and were higher in central Lake Huron than in the south for lake trout >533 mm. Although sea lamprey wounding of lake trout varied by year, no overall temporal trends were observed during 1984-1994 in the central and southern main basin of Lake Huron. Comparisons with northern Lake Huron were not possible because of insufficient data.

Abundance of mature lake trout, an index of potential natural recruitment, was estimated to be highest in southern Lake Huron and lowest in the north. For lake trout ages most selected by sea lampreys and fishing (ages 3-10), total annual mortality rates were highest in northern Lake Huron and have exceeded the Great Lakes Fishery Commission (GLFC) target maximum total annual mortality rate of 45% in all years from 1984-1993. Total annual mortality rates in central and southern main basin of Lake Huron were below the GLFC target maximum during the same time period. Sea lamprey-induced mortality accounted for most lake trout deaths in central and southern Lake Huron, whereas commercial fishing and sea lamprey parasitism both were responsible for the high number of lake trout deaths in the north. Recreational fishing was not a significant source of lake trout mortality in the main basin of Lake Huron.

The lack of success in re-establishing self-sustaining populations of lake trout in the main basin of Lake Huron was due in part to the mismatching of reproductive biomass and spawning habitat. In central and southern Lake Huron, lack of sufficient spawners and insufficient spawning habitat are possible reasons that rehabilitation has not progressed in these areas. In northern Lake Huron, where the amount of spawning habitat is greatest, excessive sea lamprey-induced and

commercial fishing mortality at premature ages has limited the abundance of spawners. In order to successfully rehabilitate lake trout, total mortality rates must be reduced in northern Lake Huron.