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Lake Trout Assessment and Management in Michigan Waters of Lake Superior, 1993-97

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Abstract.–Lean and siscowet lake trout *Salvelinus namaycush* population data for Michigan management areas 2-7 during 1993-97 are presented and analyzed. Wild fish made up over 80% of populations in all areas. Relative abundance (number of fish per 1,000 feet of gill net) was either without trend or increasing during 1993-97 and higher than during 1988-92 in most areas. Relative abundance of commercial-sized leans (≥ 17 in, total length) was highest in MI-5 and lowest in MI-3. Abundance of lake trout 25 inches and larger increased in MI-3, MI-4, and MI-5 and was without trend in MI-6 and MI-7. Sea lamprey wounding (number of wounds per 100 fish) on commercial-sized leans fluctuated without trend during 1993-97 and was highest (6.9) in MI-3 and MI-7 and lowest (2.6) in MI-5. Wild commercial-sized leans in assessment samples ranged in age from 4 to 25 years, with age 7 being modal in most areas in most years. Total annual mortality rates estimated from catch curves of age-9 and older leans averaged less than 0.50 in all areas during 1993-97. Relative abundance of pre-recruit (< 17 in, total length) wild leans increased or was without trend in all areas except MI-4 and MI-6 during 1993-96. Pre-recruit leans ranged in age from 2 to 9 with age 5 being modal. Status of siscowets improved even more than leans during 1993-96. Relative abundance of siscowets in the pre-recruit assessment increased in all areas. Pre-recruit siscowet relative abundance was highest in MI-3 and lowest in MI-2. Ages ranged from 2 to 15 years, with age 8 being modal in the overall sample. In assessments of predator composition by depth strata in June 1996 and September 1997, siscowets were the dominant predator and outnumbered leans by 12:1 and 48:1, respectively. Siscowets were not captured at depths less than 60 feet but increased in abundance with increasing depth and outnumbered leans in depths greater than 180 feet. Siscowets ranged in age from 3 to 30 years, with modal ages of 15 in 1996 and 16 in 1997. Fish, mainly coregonines, contributed most to the diet of siscowets and leans. The number of hatchery leans stocked annually in Michigan waters decreased dramatically in 1996-97 when Michigan and other member agencies of the Great Lakes Fishery Commission Lake Superior Committee agreed to end stocking in most management areas. Fisheries harvested more leans than siscowets during 1993-97. Sport catch fluctuated without trend and annual catches (number of fish) ranged from 15,900 to 26,600 for leans and from 4,400 to 19,400 for siscowets. Tribal commercial catch (pounds dressed weight) decreased during the period and ranged from 123,000 to 244,000 for leans and from 46,000 to 142,000 for siscowets. We recommend continuation of current net and creel assessments (in cooperation with state-licensed commercial fishers and tribal agencies), location of siscowet spawning grounds, expansion of assessments of siscowet populations, and refinement of methodology for using otoliths to age lake trout. Management recommendations include completion of age-based population models for determining total allowable catches, continuance

of inter-agency cooperation in data collection and analysis and management of lake trout, supporting efforts to reduce sea lamprey abundance and contaminant input, and emphasis on stewardship of the rehabilitated self-sustaining wild lake trout populations in Lake Superior.

Lake Superior is home to at least three lake trout *Salvelinus namaycush* phenotypes, or forms, and an unknown number of genotypes (Burnham-Curtis 1993). The three forms are the shallow water-dwelling lean lake trout (leans), and the deeper-dwelling siscowet lake trout (siscowets) and humper lake trout (humpers). Some genotypes of the three forms may have been lost in the 1950s or early 1960s when populations were most severely impacted by the sea lamprey *Petromyzon marinus* and commercial fishing. Although deep-dwelling lake trout resembling siscowets and humpers may have existed in the other Great Lakes, they are now present only in Lake Superior (Burnham-Curtis 1993). Consequently, Lake Superior contains the most genetically diverse lake trout populations in the Great Lakes. Leans in Lake Superior are generally most abundant at depths less than 240 feet in inshore waters and offshore around islands and shoals such as Isle Royale and Stannard Rock. Commercial-sized leans (≥ 17 in, total length) have been assessed in Michigan waters since 1959 to monitor success of sea lamprey control and lake trout management actions, especially closure of fisheries and stocking of hatchery-reared fingerlings and yearlings (Pycha and King 1975; Peck and Schorfhaar 1991; Peck and Schorfhaar 1994; Curtis et al., unpublished report). These assessments have been expanded over the years to include spawning leans and pre-recruit segments of lean and siscowet populations. Siscowets are the most widespread lake trout in Lake Superior, occupying a greater depth range than leans or humpers (Burnham-Curtis 1993). They are generally most abundant at depths greater than 240 feet. They are called “fat trout” or “fats” because they contain a high flesh-fat content (Eschmeyer and Phillips 1965). This high fat content has affected their marketability as a food fish because the fat accumulates higher levels of contaminants. The State of Michigan currently prohibits commercial sale and advises anglers against retention of siscowets 18 inches and larger because of high chlordane levels. Humper lake trout (humpers) are small (< 25 in, total length) and in Michigan waters are found only in the vicinity of offshore reefs at Isle Royale (MI-1) and south of Caribou Island (MI-7) at depths generally ranging from 120 to 270 feet (Rahrer 1965; Patriarche and Peck 1970). Humpers have a flesh-fat content slightly higher than leans but lower than siscowets (Eschmeyer and Phillips 1965). Due to the humpers’ remote location and small size, they have received little attention from commercial and sport fisheries. Siscowets have been assessed annually in the summer pre-recruit assessment in Michigan inshore waters (Peck and Schorfhaar 1991; Peck and Schorfhaar 1994). Siscowet and humper populations at Isle Royale and Caribou Island have been assessed periodically (Patriarche and Peck 1970; Curtis 1990; Bronte 1993).

In this report, we present results from lean and siscowet lake trout assessments conducted by the Michigan Department of Natural Resources (MDNR) Marquette Fisheries Research Station (MFS) during 1993-97, and make recommendations for future assessment and management of these populations. We also document stocking of hatchery-reared leans in Michigan waters and harvest of leans and siscowets in the sport and tribal commercial fisheries.

Methods

Data in this report are presented by lake trout management area (Figure 1). Management area boundaries generally follow those of statistical districts described by Hile (1962), except that MI-3 and MI-4 represent east and west portions of statistical district MS-3, and MI-5 and MI-6 represent east and west portions of MS-4. Boundaries have also been adjusted to contain whole statistical grids, except where grids are divided by state or international