AN HISTORICAL STUDY OF THE LAKE TROUT (SALVELINUS NAMAYCUSH) WITHIN THE CANADIAN WATERS OF LAKE SUPERIOR

A PROPOSAL FOR A MASTER OF SCIENCE THESIS

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Once the most valuable of the commercially caught fish species, the lake trout of Lake Superior now exist at but a fraction of their former abundance. Of all the Great Lakes, however, Lake Superior, on the whole, undoubtedly still has the most viable natural trout stocks. In addition, recent artificial restocking programmes seem to have met with some success (Great Lakes Fishery Laboratory, 1975). If comprehensive policies for rehabilitation and restoration are to be planned more knowledge is required about population strengths and locations, and the processes that have led to depletion. These are best revealed by trend-through-time data.

It has been customary to manage fish species on a whole lake basis, imposing uniform close seasons, catch limits, and gear restrictions. Planting attempts have generally given little consideration to regional variations of strain within a species. It has been recognized for some years, however, that Salvelinus namaycush may exist as separate spawning populations, or stocks, within a lake. When this is the case, it may be necessary to tailor management policies to the conditions of individual stocks, which may be varyingly susceptible to the different population-controlling pressures. Such an approach is being adopted for some salmon stocks on the east and west coasts of North America.

Discreteness of fish stocks may be characterized by longitudinal or vertical separation, or by differences in spawning time or location. It has been demonstrated that lake trout possess homing behaviour and may return to the same stream or shoal to spawn year after year (Martin, 1960). Smith (1968) has mapped 150 unique, former spawning grounds in Lake Huron based upon the recollections of fishermen.

Four varieties of lake trout are most commonly recognized by fishermen -- leans, fats, humpers, and half-breeds (hybrids between fat and lean trout). The fat trout or siscowet has been classified as a subspecies by taxonomists, i.e. Salvelinus namaycush siscowet, Agassiz (Khan and Qadri, 1970). Classification and stock identification is considerably complicated, however, by the fact that lake trout tend to show wide meristic and morphological variations with differing environmental conditions. These are not necessarily accompanied by genetic differences or spawning segregation. Nick Martin (at the M.N.R. laboratories at Maple), in an unpublished manuscript, has identified 36 common English names that have been applied to lake trout, and approximately 120 changes of scientific nomenclature. It is uncertain

how many of these may be interpreted as referring to discrete stocks -- probably only a small percentage. Historical records are plagued by confusion of identification. The objectives of my thesis therefore include,

1. the identification, where possible, of stocks of lake trout within the Canadian waters of Lake Superior, past and present. Closely linked to this objective is,

2. the mapping of spawning sites, and fishing ground locations, past and present, and the description of their changes through time. The Fisheries Research Board (1967) has compiled a large list of recent fishing grounds, but few researchers have taken any kind of an historical perspective in assessing their locations and relative importances.

Lake Superior lake trout populations showed massive losses in the 1950's under the combined effects of increased fishing pressure, changes in types of fishing gear, and the introduction of the sea lamprey. The process of decline, however, had undoubtedly begun long before. Lawrie and Rahrer (1973) suggest that the species' widespread distribution in a multitude of quasi-discrete stocks lent themselves to a sequential fishing-up process during the development of the fishery. Thus the third objective of my thesis will involve,

3. the investigation of the patterns of commercial and recreational exploitation of the lake trout stocks, past and present. It may also be possible

4. to identify secondary factors affecting trout survival (such as pollution, modification of spawning grounds, interspecific competition).

Towards realizing the above objectives a number of information sources are presently known to exist, including,

a) historical documents such as
   - Hudson Bay Company records
   - explorers' diaries
   - fisheries Overseers' reports
   - surveyors' reports
   - The Jesuit Relations

b) commercial catch data presented in the annual reports of the Department of Marine and Fisheries (or the Department of Fisheries) of Canada from 1867 to 1908, and in the annual reports of the Game and Fisheries Department of Ontario from 1909 to 1937. Data will be assembled on a yearly basis in terms of both total poundage of lake trout caught and catch per unit effort (employing total yardages of net, or number and tonnage of boats and vessels as measures of effort). Catch and C.P.E. will be plotted versus time for the various stations (or groups of stations) included in the reports. When possible maps showing changes in fishing patterns will be drawn (perhaps by ten year intervals).

c) monthly CF - 1 form catch records, which permit intensive analyses of fishing from 1947 to the present. Fishermen usually report their daily catch by precise fishing location allowing this data to be incorporated

NATIVE LAKE CHARR (*Salvelinus namaycush*) STOCKS IN THE CANADIAN WATERS OF LAKE SUPERIOR PRIOR TO 1955 - SUMMARY

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- 1978-80 - commercial fishermen interviewed and historical records examined
- fishermen traditionally recognized four categories of lake charr: lean, paperbellies or humpers, halfbreeds, fats or siscowets. (See Lawrie and Rahrer 1973.)
- fishermen also distinguished specific forms of lean lake trout on the basis of these criteria (see Table 2 of text):
  1) Spawning location and time (see Figs. 1-3 of text)
     - trends in spawning periods may be latitudinal - spawning begins later as one moves south from the Pukaskwa River or along the Black Bay Peninsula
     - local variations can relate to spawning site - river, shore, or shoal; windward or leeward zones; deep or shallow water
     - different breeding groups (runs) may sequentially utilize single grounds
  2) Body weight and form (see Table 3 of text)
     - later runs tended to contain larger (heavier) fish
     - pulses of different size classes arrived on certain spawning grounds
     - inter-shoal variations in avg. size occurred (e.g. between Caribou and Michipicoten I^{S}.)
  3) Flesh colouration
     - generally an unreliable stock indicator
     - may, in some cases, suggest mechanisms ecologically separating charr groups during some portion of their lives (e.g. different feeding niches)
     - differences, remaining consistent through time, existed between certain spawning runs or grounds
  4) Skin colouration
     - body colour may have represented spawning period responses of certain groups - used by fishermen to distinguish them at this time.

5) Non-spawning movements
   - discrete groups were less obvious in non-spawning seasons
   - vertical and horizontal segregation of small and large charr (different age classes?)
   - large fish became pelagic in June or July and some moved inshore; at a few locations (e.g. Thunder Cape) a second, smaller "summer run" occurred mid-Aug.

- forms of lean trout were usually named after a distinctive feature
- in some cases phenotypic plasticity under local environmental variations may have caused fishermen to erroneously presume a unique form.

However, the above criteria can also imply degrees of isolation between lake charr groups, and it is possible to infer the former existence of discrete or semi-discrete stocks. Historical records reveal that such stocks have been recognized for many years.

1) Blacks - early, shallow, inshore spawners
   - some were silver-gray and called "regular trout" or "small grays"; others were very dark and called "blacks"
   - avg. wt. 1-2.7 kg - blacks of Slate I^S., Batchewana Bay, and Nipigon Bay were smaller than those of the main lake
   - south of Coppermine Pt. blacks were red-fleshed; between Port Coldwell and Rossport generally white-fleshed
   - river-spawners made up the most obvious stocks of blacks
     - common south of Pic R., absent west of Nipigon Bay
     - size variations existed between rivers
     - evidence of stock depletion prior to 1945
   - Caribou I.- discrete stock: dark-coloured, white-fleshed
   - Bateau Rk. and Superior Sh. - stocks similar in appearance: mottled, dark backs, red fins, red flesh
   - high incidence of deformity, cannibalism at Superior Sh.

2) Redfins and Yellowfins - heavier fish of second runs
   - term yellowfin heard more often west of the Pic R.
   - occasionally redfins and yellowfins were distinghished by spawning depth and slight differences in body form
   - perhaps larger fish were more likely to display yellowfins
   - coloured fins seldom seen before Aug. except at Superior Sh.

3) Late runs
   - more charr runs tended to be reported by fishermen west of Port Coldwell. This may relate, in part, to a later fishing season. But a greater number of sheltered bays and islands may have encouraged later spawning
   - charr of late runs called salmon-trout, grays, red trout, or big blacks - up to 27 kg
   - many groups of large trout spawned at greater depths than earlier varieties - 9 to 20 m
   - spawning over algae ("moss") reported at same locations

4) Sand trout - slender, small, silver-colour, red flesh
   - mostly found in summer. These may have represented a seasonal phenotypic variant or younger age classes

- siscowet - high fat content, generally deeper than 55 m
  - morphologically different stocks may have existed
  - gradations in body form may have occurred (Eddy and Surber 1960)
  - movements to top of shoals at spawning time reported
  - spawning reported from July (Superior Sh.) to Dec. (south of Port Coldwell)
  - majority of grounds were between Michipicoten Bay and Jackfish
  - spring inshore movements at some locations (e.g. Pic R. area according to Hudson Bay Co. records)
- halfbreeds - may be young siscowet (Khan and Qadri 1970)
  - shallower than fats, more common on certain grounds
- paperbellies (see Eschmeyer and Phillips 1965; Rahrer 1965)
  - common on banks between Caribou and Michipicoten I^{S}., Superior Sh.