



Great Lakes Fishery Commission

ESTABLISHED BY CONVENTION BETWEEN CANADA AND THE UNITED STATES TO IMPROVE AND PERPETUATE FISHERY RESOURCES

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Contacts:
Dr. John Casselman (Queen's University)
613-533-6000 x 75371

Dr. Marc Gaden (Great Lakes Fishery Commission)
734-662-3209 x 14

NEW RESEARCH EXPLAINS RELATIONSHIP BETWEEN COMMERCIAL PRICE, AMOUNT OF HARVEST, AND ALARMING DECLINE IN AMERICAN EEL

ANN ARBOR, MI—Researchers from Queen's University have analyzed commercial American eel harvest and price data from the period 1950 to 2004 from across the range of the species to gain a better understanding of possible factors leading to the dramatic decline of the key native species. The research concluded that an increase in the value and price of the American eel, along with high abundances in the early days of commercial exploitation, heavy exploitation, and expanded and integrated markets, created a demand that contributed to a permanent reduction in the reproductive capacity of the species. This inability of the species to replenish itself subsequently led to severe declines in recruitment and population size. Scientists are interested in learning as much as possible about the American eel given that populations have undergone a major long-term decline over much of its range, quite precipitously in the Great Lakes Basin. This research project was supported by the Great Lakes Fishery Commission, Ontario Ministry of Natural Resources, and Fisheries and Oceans Canada.

Up through the 1980s, Lake Ontario, the most easterly of the Great Lakes, supported one of the largest aggregations of large, fecund female eels in North America. American eels are uniquely catadromous, spawning in the ocean and maturing in brackish and fresh water, and are one genetic, or spawning, stock. This species has an unusual life history involving larval, several juvenile, and adult life stages, and its life cycle plays out over an extraordinarily large range. Larvae, spawned in the Atlantic Ocean's Sargasso Sea, disperse northward along the American Continental Shelf from as far north as the Maritimes to Florida and beyond. Juveniles migrate into coastal rivers and lakes along the Atlantic seaboard to develop and mature into adults, which head back to the Sargasso Sea to spawn. Eels were once so plentiful in Lake Ontario that they constituted an important part of the lake's biodiversity. Now they are faced with imminent extirpation—the number of young eels migrating upstream through a passage facility to Lake Ontario has declined by three orders of magnitude from the peak levels of the 1980s. No single cause of the population decline has been identified, though upstream and downstream barriers to migration such as hydroelectric dams, turbine mortality, overfishing, loss of critical habitat, environmental changes in rivers and the ocean, and other factors may have played a role. This research project aimed to understand the relationship between the commercial price of eels, levels of harvest, and decline in abundances.

“We analyzed harvest and landed value data dating back to the 1950s from provincial and state jurisdictions across the North American range of the eel,” said Dr. John Casselman of Queen's University, the study's principal investigator. “Price, deflated and standardized in terms of 1950 Canadian dollars, led to a better understanding of harvest and changing abundance. We learned that

2100 Commonwealth Blvd. • Suite 100 • Ann Arbor, MI 48105-1563

Phone (734) 662-3209 • FTS (734) 741-2077 • FAX (734) 741-2010 • www.glfc.org

standardized price of eels increased two-to-threefold over the period, but because of reduced harvest, the value of the fishery is no greater now than in the 1950s.”

“Significant deviations from synchronicity between harvest and price were first associated with high harvest at low price for emigrating silver [mature] eels in the lower St. Lawrence River in the 1950s, possibly related to lower turbine mortality prior to installation of the Moses-Saunders hydroelectric dam in the upper St. Lawrence River,” Casselman continued. “In the late 1960s and early 1970s, a disproportionately high harvest of eels initiated an unprecedented rate of regional harvest in the Gulf region of the St. Lawrence River and to a lesser extent in Newfoundland and the sea fishery in Quebec. This harvest appeared to be related to increased abundance, possibly caused by reduced elver [juvenile] immigration up the St. Lawrence River system and a backing-up downstream from Moses-Saunders dam, which created a partial obstruction—for 17 years, 1958-1973—before a ladder was installed to facilitate eel passage in 1974.”

According to the research report, commercial harvest was extremely high in the late 1960s to the early 1980s in both Canada and the United States and continued into the early 1990s in Canada. Said Casselman: “During the late 1970s and early 1980s, heavy exploitation in both countries resulted in declining catch and smaller eels, with a substantial increase in price near the end of the period. These sequential declines followed heavy exploitation of the 1970s and subsequent declining recruitment in the late 1970s. If harvest in some areas was previously underestimated by either underreporting or non-reporting, recent decreases in commercial harvest would be more severe than trends suggest.”

“Regulations and management did not greatly curtail harvest until the mid-to-late 1990s, well after declines had begun, and contaminants and closures were generally short-term, local, and relatively minor,” said Casselman. “The combination of increasing and high price with decreasing and low harvest in the presence of minimal regulations indicates decreased abundance of eels, since price is inversely related to abundance, confirmed in the upper St. Lawrence River and Lake Ontario, where price paid was inversely correlated with size of the harvestable stock.”

Casselmann concluded: “When harvest was examined in relation to price, it was apparent that a combination of high early abundance, possibly accentuated by obstruction, heavy exploitation, expanded and integrated markets, created a demand. Along with increased value and price, these major factors worked in unison to increase harvest significantly, permanently reducing reproductive capacity of the species and subsequently creating declines in recruitment and population size, most apparent at the extremities of the range.”

Information about this and other research completion reports is available online at www.gllfc.org/pubs_out/communi.php.

The Great Lakes Fishery Commission is an international organization established by the United States and Canada through the 1954 Convention on Great Lakes Fisheries. The commission has the responsibility to support fisheries research, control the invasive sea lamprey in the Great Lakes, and facilitate implementation of A Joint Strategic Plan for Management of Great Lakes Fisheries, a provincial, state, and tribal fisheries management agreement.