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MAN VERSUS SEA LAMPREY: CAN WE WIN IT?

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NWRI Contribution No. 90-21

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MANAGEMENT PERSPECTIVE

This contribution is the draft of an invited contribution to the magazine Canadian Sportfishing. The magazine features a regular column called Face the Issues. The article is written in a style appropriate to a general audience and contains only information generally available. The Great Lakes Fishery Commission has been directly consulted and has generously provided illustrations for the article.

PERSPECTIVES DE LA DIRECTION

Le présent document est l'ébauche d'un article demandé par la revue Canadian Sportfishing pour sa chronique régulière intitulée Face the Issues. Écrit dans un style accessible, il présente seulement des informations généralement disponibles. La Commission des pêcheries des Grands Lacs a été directement consultée et a gracieusement fourni des illustrations.

RÉSUMÉ

Par une curieuse ironie du sort, l'homme, qui se trouve au sommet de l'évolution, est engagé dans une lutte sans merci avec la grande lamproie marine, universellement considérée comme l'une des formes vivantes les moins évoluées. Cette lutte se passe dans les Grands Lacs et vise à protéger les gros poissons de sport appréciés des pêcheurs de cette région. Il est surprenant de voir ces modestes lamproies résister avec ténacité aux efforts imposants déployés pour les éliminer et prêtes à reprendre le terrain perdu au moindre relâchement des mesures de lutte.

MAN VERSUS SEA LAMPREY: AN EPIC BATTLE

CAN WE WIN IT?

Michael E. Fox

In a strange irony, man, at the top of the evolutionary scale, has been locked in a no holds barred battle for more than thirty years with the sea lamprey, which, by anyones reckoning, must rank near the bottom. The battle -ground is the Great Lakes and the prize is large game fish. The big surprise is that the lowly lamprey is tenaciously hanging in, despite heroic efforts at elimination, and is poised to regain lost ground at the slightest letup in control efforts.

Few anglers in the Great Lakes region can be unaware of the devastation of game fish in the Great Lakes by the sea lamprey, which reached its worst in the 1950s and 60s, and the subsequent recovery to today's fine fisheries, achieved by a vigorous program of restocking and sea lamprey control. What is less widely known, is the severe problems faced by the Great Lakes Fishery Commission in even maintaining the hard-won gains in the face of severe underfunding and increasing costs. The Commission is the binational agency created and funded by Canada and the U.S.A. to improve and perpetuate Great Lakes fishery resources. Most of its budget is spent on sea lamprey control. The crisis reached a head in 1989 when the Commission announced reductions in sea lamprey control unless funding levels, frozen for several years, were increased. The reductions would leave Lake Superior lamprey control at the present level, reduce the control on Lakes Michigan, Huron and Ontario by 40%, and eliminate the recently initiated control program on Lake Erie. The Commission's scientists estimate that cuts of this magnitude, if continued, would almost entirely reverse the hard-won gains of the last thirty years and result in a doubling of the sea lamprey and a halving of the trout and salmon populations by the end of the century. Although these funding difficulties are a major headache for the Commission, other problems, associated with controlling a widely dispersed and resilient pest, are possibly even tougher and may require major rethinking of the balance between what we can realistically achieve and the undesired side effects. A summary of the history of the sea lamprey in the Great Lakes, and the control measures implemented, will help to explain these problems.

The sea lamprey was first seen in Lake Ontario in the 1830s. It may have been there since early postglacial times, but more likely came from the Hudson River via the Erie Canal which was completed in 1819. The upper lakes were entirely free from the sea lamprey

at this time and although Lake Ontario probably contained a large population by the end of the century, the effects on the fishery were not a concern. This low impact was probably a consequence of the existence of huge populations of large fish in Lake Ontario, especially Atlantic salmon, lake trout and whitefish. By the early 20th century however, the combined effects of heavy commercial fishing, loss of spawning habitat (for the Atlantic salmon) and sea lamprey predation, had lowered the population of large fish to levels such that few escaped the frequently lethal attentions of the lamprey. By this time, the adaptable sea lamprey, having found a niche to its liking, had become landlocked, in effect using Lake Ontario as its sea. In this modified lifestyle, the adult lamprey ascend tributary streams in the spring and spawn in salmon-like nests in gravelly riffles. The hatched larvae, known as ammocetes, drift to slow moving, silty areas of the stream bed and burrow into the bottom. They remain there for about three to eight years feeding on small organisms and growing to only a few inches in length. The ammocete then transforms into the adult form and drifts downstream to the lake where it immediately seeks its large fish prey. Having located a suitable victim, the lamprey attaches itself with a powerful suction disc mouth containing rasping teeth with which it penetrates the skin of the fish and consumes blood and body fluids. A mature lamprey will kill or damage many fish and grow to one to two feet in length in the brief but deadly parasitic phase which lasts for one to two years. Finally, the lamprey becomes sexually mature and migrates up a suitable tributary stream where it spawns and dies.

Once the sea lamprey had become abundant in Lake Ontario, it was only a matter of time before it conquered the remaining Great Lakes. The natural barrier of of Niagara Falls would have kept the lamprey from the upper lakes but man gave it an alternative route through the Welland Canal where it probably hitched a ride on ships hulls, and was first observed in Lake Erie in 1921. It did not not find the rather warm tributaries of Lake Erie to its liking and so took about 25 years to reach the upper lakes. Unfortunately for fishermen, the upper lakes proved to be a Mecca for sea lamprey and it exploited them so thoroughly that commercial lake trout production in Lake Superior declined from 2000 tonnes in 1950 to 200 tonnes in 1960.

The decimation of commercial and sports fisheries in the 1950s prompted action in the form of mechanical traps and electrical barriers. They were labour intensive and liable to flood damage, but the main drawback was the failure to remove the ammocetes, which could contribute parasitic adults to the lake for at least a further five years. The Great Lakes Fishery Commission was formed in 1955 and immediately started a research programme to devise a chemical lampricide which ideally would kill all of the larval lamprey in a treated stream and nothing else. After testing 6000 chemicals, a compound known as TFM stood out from the rest, being able to kill 99.9% of the larvae and not more than 25% of other fishes (usually much less) in a typical stream treatment. The TFM kills all the year classes of ammocetes, so most streams

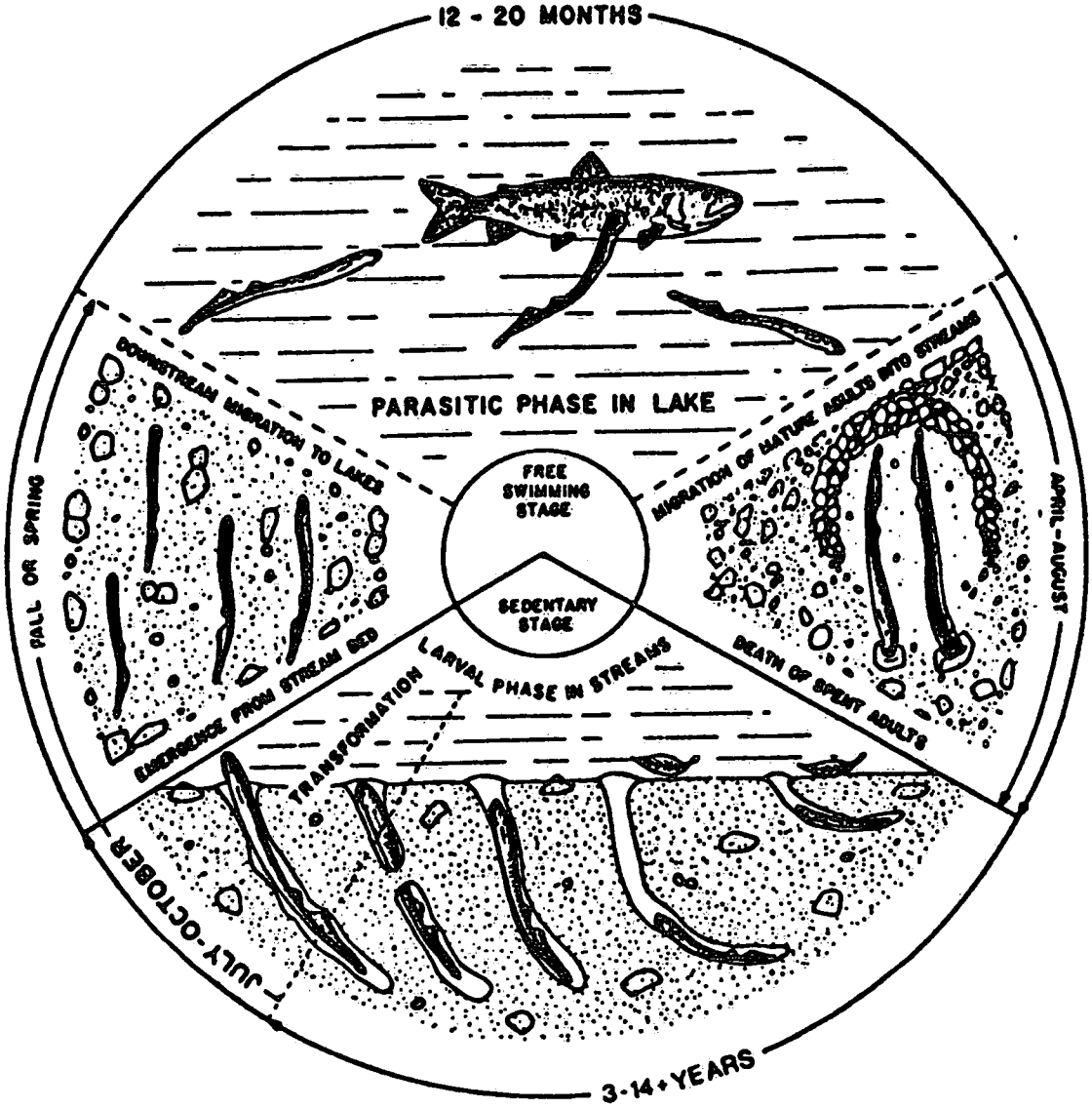
only need treatment every three to five years. Treatment started on Lake Superior in 1958. Lake Michigan was added in 1966, Lake Huron in 1970 and Lake Ontario in 1972. Lake Erie does not yet have an established treatment programme. The numbers of lake trout scarred by lamprey attack in Lake Superior fell from a high of 30% in 1960 to less than 5% in 1964 and heavy restocking allowed lake trout to reach their prelamprey population by 1970. A similar decline in scarring rates was observed in the other lakes at corresponding later dates.

This success story sounds almost too good to be true, and indeed serious problems have surfaced. Early research showed TFM to have little effect on non target fishes. However, when stream bottom animals were tested, some proved quite sensitive, with, for example, up to 94% of some caddis fly species (an important source of food for fish) dead a week after treatment. Although recolonization from untreated parts of the stream may make up the losses, this could take a full season. Fish too, are much more vulnerable to TFM when spawning, especially if the water temperature is high, and large fish kills occur occasionally. A more directly serious problem for the control programme is the recent trend of lamprey to spawn in large shallow bays, such as Lake Superior's Batchewana Bay and also in major connecting channels such as the St Marys River, the upper St Clair River and possibly the Niagara River. This trend may be the sea lampreys indirect response to successful control of their favoured streams. Whatever the reason, these new breeding grounds are almost impossible to treat successfully with TFM because of their size.

Realising the limitations of TFM, the Great Lakes Fishery Commission has developed, and successfully tested in Lake Michigan streams, a procedure to release male sea lamprey sterilized with the chemical Bizazir. With this technique, tiny amounts of the chemical are injected into large numbers of captured male lamprey. The sterile males are then released in sufficiently large numbers to interfere with the breeding success of the untreated lampreys. A sterilizing facility is planned for 1990 and the first releases of sterile males are projected for 1991.

The remaining, and most intractable problem, is the realization that the sea lamprey is here to stay. Early efforts were aimed at eradication but as early as 1982 the Commission acknowledged that elimination of the sea lamprey is at least impractical if not impossible and therefore adopted a policy known as Integrated Pest Management. This approach is a mathematically calculated level of treatment which will minimize the damage caused by the lamprey under a balanced trade off of ecological, social, and economic factors. Self sustaining lake trout populations (an early major stated goal of the Commission) may be a necessary trade off. Fortunately, this trade off may be acceptable since the success of introduced pacific salmonids appears to satisfy the sport fishery at present levels of control. The hard lesson for anglers to learn is that Great Lakes fish populations change naturally, change faster when we interfere, and as in life generally, we can never

go back to an earlier `ideal state'.



The life cycle of the Sea Lamprey

(courtesy of Great Lakes Fishery Commission)

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