STATE FISH HATCHERY
ODEN, MICHIGAN

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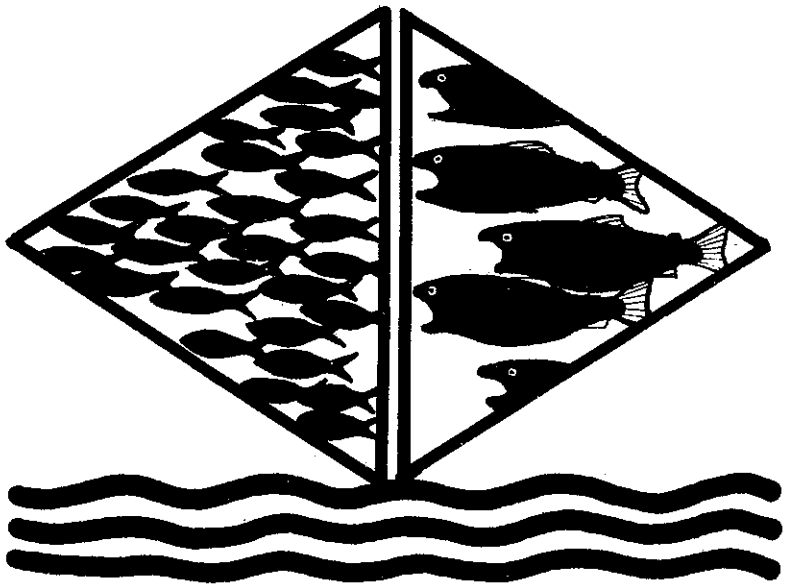

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LAKE MICHIGAN: SALMON HELP TO REDRESS THE BALANCE*

By Luther J. Carter

Last September throngs of sports fishermen showed up on Lake Michigan suffering from "coho fever," a condition which is expected to return again this fall. Young coho salmon had been planted by the Michigan Department of Conservation in two Lake Michigan tributaries some 18 months earlier, and now they were due to return as heavy, mature fish. Return they did, concentrating by the thousands in the lake waters near the mouths of the rivers in which they had been planted, then starting their run upstream to spawn. True to its nature, the coho struck savagely at the anglers' lures, and some 60,000 of them were caught. These fish weighed an average of 12 pounds or better, and excited fishermen often displayed 20-pounders in triumph.

The coho, a native of the Pacific northwest, had not been introduced in Lake Michigan simply to produce a fever in fishermen, however. Besides being a magnificent sports fish, the coho is a voracious predator that is expected to help control the superabundant alewife, a type of herring which invaded Lake Michigan about 20 years ago and recently has become the lake's dominant and least-welcome fish species. The alewife has displaced several commercially important native species (such as the lake herring) and has caused distress because of massive die-offs that pollute beaches and drive away tourists. It is hoped that, through the stocking of Lake Michigan with the coho and other predatory sports fish, the alewife will be converted from a nuisance to a valuable forage species.

The introduction of the coho is only part of a bold strategic intervention by the Michigan Department of Conservation in a lake ecology in which, for various reasons, a desirable balance has been lost. This intervention involves, in addition to the stocking of predatory fish, the rigorous control of commercial and sports fishing and an ambitious interstate and federal effort at pollution abatement. The Department of Conservation is, moreover, taking a leading part in efforts to curb the use of persistent pesticides--a particularly potent lake pollutant now suspected to have been the cause of heavy mortality of coho fry last winter in state fish hatcheries. In short, at the same time that this state agency seeks to establish a balanced and valuable new fishery, it is trying to save Lake Michigan.

The salmon-stocking program has grown steadily since the initial plantings in Lake Michigan and Lake Superior tributaries in the spring of 1966, and appears enormously successful. Several million young salmon,

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mostly cohos but also Chinook salmon (a larger, more slowly maturing fish) in substantial numbers, have now been planted in more than a score of Michigan streams.

As many as a third of the coho planted in Lake Michigan tributaries in 1966 survived and grew to maturity. Those not taken by fishermen were either allowed to complete their spawning run or were captured in weirs by the Conservation Department and stripped of their eggs, or sold for market. The coho also thrived in Lake Superior and, last fall, provided exciting sports fishing there.

However, the Lake Superior coho were much smaller than their brothers in Lake Michigan, and the percentage surviving from the 1966 planting was substantially lower. Chiefly, this is because, in Lake Superior, alewives have not attained the abundance they have in Lake Michigan. The Lake Michigan coho feeds largely on alewives, although some authorities suspect that his diet also includes lake trout, perch, and other desirable species.

Thirty years ago Lake Michigan had a well-balanced and highly productive fishery from which the alewife was totally absent. The lake trout and the burbot (a freshwater fish allied to the cod), both abundant and widely distributed, were the principal predators. Other lake fish included yellow perch and several species of chub, as well as smelt, lake herring, and other forage fish.

This fishery ecology was upset by the alewife and an earlier invader, the sea lamprey. The lamprey, a predator which attaches itself to its victim by means of its sucker-like mouth and feeds on the blood of the host fish, has inhabited Lake Ontario since post-glacial times. The opening, in 1829, of the Welland Canal, which provided a bypass around Niagara Falls, gave the lamprey access to Lake Erie and the upper Great Lakes. By the 1930's the lamprey had reached Lake Huron and Lake Michigan, and by the end of the 1940's it had nearly destroyed the lake trout and other predatory fish of both lakes. In the early 1950's the lamprey became well established in Lake Superior, again having a catastrophic effect on the lake trout and other large fish.

Significantly, the alewife, an anadromous species native to the Atlantic, was not discovered in Lake Michigan until 1949, when the predators that probably would have controlled it were nearly gone. In these favorable circumstances the alewife multiplied rapidly, its proliferation seemingly unchecked except by periodic die-offs which sometimes (as in 1967) left windrows of rotting fish along Lake Michigan beaches. The alewife has some commercial uses, as in pet food and fish meal, but the market for it has developed slowly and has been unstable.

Restoration of predatory species and a better balanced lake fishery could not have succeeded before the sea lamprey was brought under control. Such control has been achieved in Lake Superior and Lake Michigan, however, by the Great Lakes Fishery Commission--principally through treatment, with selective poisons, of the streams in which the lamprey spawns.

Decline of the lamprey has allowed Michigan's fish-stocking program to make a promising start, but continued success will depend on whether other threats are overcome. Persistent pesticides, especially dieldrin and DDT, are an immediate danger. Howard Johnson, a fishery biologist at Michigan State University, has concluded that DDT residues were the "most probably cause" of the mortalities of the coho fry. These hatchery fish were produced from eggs taken from Lake Michigan coho; the eggs had DDT residue levels from two to five times higher than the levels found in eggs taken from fish recovered in Lake Superior.

A longer-term threat is that the over-enrichment of Lake Michigan waters by phosphates and other nutrients will lead to accelerated eutrophication, similar to that found in Lake Erie where, in some areas, heavy algal growth covers the surface and washes up along the shore.

Stanford H. Smith, of the U. S. Bureau of Commercial Fisheries Biological Laboratory at Ann Arbor, believes that Lake Michigan's coho and other salmonid species might have difficulty surviving under eutrophic conditions. Such conditions have inhibited the natural reproduction of Atlantic salmon and lake trout in Lake Ontario and Lake Erie, he observes. As to how a Lake Michigan salmon fishery largely dependent on hatchery reproduction would fare under eutrophic conditions, Smith is uncertain. But he is convinced that to allow the present over-enrichment to continue is a poor gamble.

Michigan's coho-stocking program faces another uncertainty, both in the short- and long-term, in that its success depends on the continued availability of a highly abundant forage fish. It is possible that the coho, along with the lake trout and other predators which have been coming back since the decline of the lamprey, will succeed all too well in reducing the alewife population. Commercial fishermen also take significant quantities of alewives. As state fishery biologists well know, the effect on the alewife of these two factors--heavy predation and a substantial commercial catch--will have to be closely watched.

The Department of Conservation is, in fact, moving on a wide front to attack all the problems, actual and potential, facing the new coho fishery. It is a large, scientifically oriented department, and fish, game, parks, forests, and water resources are all under its jurisdiction. (Its name soon will be changed to "Department of Natural Resources," a designation deemed

more suggestive of the agency's broad mandate.) The one major natural-resource area outside the Department's ambit is agriculture. The Department has, in trying to discourage use of "hard" pesticides, clashed with agricultural interests--with people who, understandably, are more concerned about protecting crops than about protecting Lake Michigan salmon.

Ralph A. MacMullan, Director of Conservation, supported a bill introduced in the Michigan legislature this year to establish a powerful state pesticide control committee, which he would chair. If this potent body decided that a particular pesticide was too hazardous, it could not only ban use of the pesticide but also forbid its sale in Michigan--even though the pesticide had been registered and approved by the Michigan Department of Agriculture (MDA).

Opposition to this measure by MDA officials and others was sufficient to delay action, and the bill did not come to a vote. A similar bill will be introduced next year, however, and it is expected to receive strong support. Warnings by MacMullan, prior to the losses of coho fry, that pesticides posed a threat to the new salmon fishery aroused public interest last year. Following the advice of entomologists at Michigan State University, MDA later withdrew its recommendation to municipalities that DDT be used to combat Dutch elm disease and recommended that other control methods, involving some use of methoxychlor (a less persistent pesticide), be used instead.

Awareness of the pesticide problem is growing in the upper Great Lakes region generally, and, on 31 July, conservation officials of Michigan and the three other Lake Michigan states--Indiana, Illinois, and Wisconsin--pledged to seek better control of pesticides through research and other means, including the adoption of new laws and tighter water quality standards. They noted the mortalities of coho fry and warned that, unless use of pesticides is soon controlled, the consequences for Lake Michigan will be disastrous. The Michigan Department of Conservation was a prime mover behind this new four-state agreement.

However lax they may have been in the past, the Lake Michigan states now approach pollution problems with greater urgency. The agreement reached in a four-state pollution abatement conference held in Chicago early this year included a provision especially significant for the lake's fishery ecology. By the end of 1972, all cities in the watershed are to start removing from their wastes at least 80 percent of the phosphorus--a nutrient which plays a key part in the eutrophication process. Other forms of municipal and industrial pollution also are covered by the agreement, and, according to Murray Stein, chief of enforcement for the Federal Water Pollution Control Administration, abatement schedules are being followed in good faith. The Michigan Department of Conservation is campaigning for

a $335-million "clean water" bond issue proposal, which is to be voted on this November. The bonds would help finance municipal sewage treatment facilities.

Remedies far more radical than anything now planned are being advocated by some, however, For instance, the Bureau of Commercial Fisheries has taken the position--in a paper prepared by Stanford Smith of its Ann Arbor laboratory--that, ultimately, all wastes must be diverted from the Lake Michigan drainage into the Mississippi drainage. Otherwise, the Bureau says, accelerated eutrophication will be inevitable. Yet diversions from the lake on the scale suggested would affect water levels, and, as the 30-year history of Chicago's diversion of Lake Michigan water into the Illinois River attests, major political and legal problems involving all the Great Lakes states and Canada would be unavoidable.

Even though the future is clouded with uncertainty by pollution problems, the Michigan Department of Conservation is going all out in a program of fishery management believed to be unprecedented in scope and complexity. In addition to its rapidly expanding hatchery operations, the Department will improve stream habitat and build fishways for coho and other lake-run species. Further, it is trying to manage the lake fishery so as to keep a balance between predator and prey. The Department has just been given regulatory powers which, in their comprehensiveness, can be matched in only one other state (Minnesota, which has no large fishery).

A new state law authorizes the Department to limit the number of commercial fishing licenses issued; fix catch quotas; prescribe when, where, and how catches may be made; and recover up to 5 percent of the value of the catch. Moreover, several years ago the Department stood tradition on its head by deciding that development of the sports fishery, rather than the commercial fishery, was to be its primary task. This new emphasis is reflected in a variety of ways. For example, to protect the young coho, severe restrictions have been placed on the setting of gill nets. And, for the moment, commercial fishing for coho is not allowed.

Clearly, the Department is operating on a level of sophistication beyond that of the fish and game agencies in most states. MacMullan, its director since 1964, is a trained biologist who has given greatly increased emphasis to research and development. The Department's fishery research stations and laboratories, which have a reputation for scientific competence, are playing an important part in the new coho program.

The stocking of coho was preceded by a thorough review of available information about the characteristics of this salmon and its adaptability to fresh-water environments. The program is nevertheless in many respects a venture in the dark, involving as it does the introduction of an alien species

into a huge inland sea of which the physical dynamics and biology are but dimly understood.

This venture is taking place, however, when Great Lakes research is in vogue. For example, scientists from Big Ten universities and elsewhere have been exploring, with the support of the Department of the Interior's Office of Water Resources Research, the possibility of developing water-quantity and water-quality models of Lake Michigan and the other Great Lakes.

But while such investigations may not produce significant results for years, the pressing nature of Lake Michigan's fishery problems are evident, spectacularly so when a massive and revolting die-off of alewives occurs. Hence, the Department of Conservation must try to cope by manipulating nature in the raw, and in the large.