The Lamprey in New York Waters

NEVER has a silent, secretive, dull-colored creature caught the public eye more completely than the lamprey. From the virtual obscurity of being known only to a few fishermen and biologists the so-called "lamprey eel" has squirmed its way into a favorite subject for discussion by fish and game clubs, has touched off innumerable letters to the Conservation Department and has become a frequent choice for theme papers by school children. The recent increase of the sea lamprey in the upper Great Lakes has been widely publicized for this is a dramatic story, fraught with suspense, action and danger. By attacking the valuable lake trout resources of Lake Michigan, Lake Huron and Lake Superior the sea lamprey has proven itself a public enemy of powerful stature and a co-ordinated program to decrease its depredations is in progress with both the United States and Canada participating.

Our own New York State lamprey situation is less crucial as we have had lampreys since time immemorial. Still it is exciting enough. According to a recent newspaper in the Finger Lakes region a mother called up and said she never realized such things inhabited our waters and wanted to know whether it was safe for her children to play along the creeks as they had done last season. There is a growing tendency for our fishermen to notice every wound or scar in the hide of a fish as indicative that lampreys are getting started or to send in for identification specimens of fish leeches, which look like a small edition of a lamprey. In the relatively few of our waters where there actually are lampreys many sportsmen seem to feel that "the menace" is spreading. Fortunately there is no evidence of a general increase in New York lampreys; they have decreased in some areas and increased in others. Like all wild populations they have their ups and downs.

Before going very far into this, suppose we consider for a moment what lampreys are and how they operate. Many persons assume because of their name, that they are some kind of eel. As a matter of fact they are not even distantly related to eels, which are fishes. Lampreys belong to that class of vertebrates known as *Cyclostomes,* a group considered more primitive than fishes and having, unlike fishes, no bones or paired fins comparable to front and hind limbs. They are somewhat like sharks in having separate gill slits but they have no jaw bones. The word Cyclostome is derived from Greek roots meaning "circle" and "mouth." This sucking disc, which lampreys use in moving stones to build spawning nests in the riffles of streams and which the parasitic species use in extracting blood from fish is unique in having teeth arranged in concentric rows.

Pepacton Reservoir at spillway. More than 800 million gallons a day overflow when this photo was taken, April 18, 1956

Our New York lampreys represent no less than six species, four of which are non-parasitic. Two of them, of which the sea lamprey is by far the best known, are parasitic and feed upon fish blood.

All species of lampreys have a larval stage before transformation to the final and more easily recognizable stage. The lamprey larvae (also called *ammocoetes)* are eyeless, toothless and worm-like. They live in mud banks or similar hiding places where they can strain out small organisms brought to them by the stream and pass several years in this fashion. Unless dug out to be used as bait they are rarely seen. The various species look much alike at this stage and are difficult to identify. When about the size of lead pencils lamprey larvae undergo a transformation the most conspicuous features of which are the development of eyes and of the sucking disc. The non-parasitic species at this time also have well developed reproductive organs and do not feed after transformation. The parasitic species never are mature at transformation and they feed upon fish blood until they grow to maturity. Lampreys of both types have similar spawning habits, building nests in the gravel riffles of streams. After breeding lampreys invariably die.

As bearing upon the economic status, it is evident that the non-parasitic species, usually called brook lampreys, do no harm to fish life. This fact requires emphasis. Many persons have heard about the damage that the Great Lakes lampreys have caused and become alarmed when any lampreys are found in their vicinity. Without bothering you with details as to the relatively minor structural differences between lampreys, it is helpful to remember that the brook lampreys seldom exceed eight inches as breeding adults. **If** you find breeding lampreys, from April to June, that are very small they would be one of the non-parasitic species

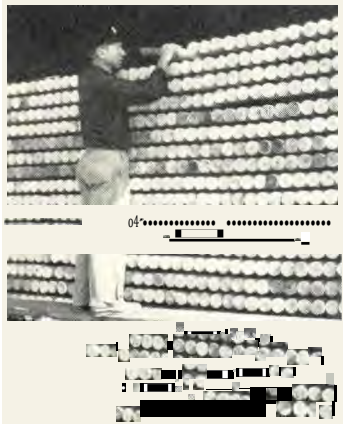
Coming to the parasitic species, there are two in New York waters representing two genera, *Ichthyomyzon* and *Petromyzon*. The silvery lamprey, *Ichthyomyzon concolor* is pretty much of a "collector's item," being represented by only a few distribution records in New York from Lake Erie to Lake Champlain. It is relatively small, rarely over a foot long, and by reason of this as well as by reason of its few numbers is not troublesome to fish or fishermen. We should give it a passing mention though, as some of the scars noticed on fish in Lake Erie, Lake Ontario or Lake Champlain could be its trade mark. However, by far the most numerous and largest predatory lamprey is the sea lamprey *Petromyzon marinus.* From here on, suppose we concentrate on it.

The sea lamprey, like the salmon and smelt, is adaptable to life in lakes or what are generally called landlocked popula-

Billet is shaped on lathe, calipered to proper dimension

Weight and balance is most important

Ash billets piled for seasoning at McLaughlin-Millard Co., Dolgeville



Splitting rough billets from ash logs at the Dolgeville plant

Flame-treating a bat is thought to toughen it

one, so there would be no uniformity in the grain.

Timber scouts select the specimens that have achieved the right age and size. They preserve the growth of the younger stand to the fullest extent. The tree selected for processing has a diameter of 12 to 15 inches. From one tree ordinarily 60 bats can be fabricated.

The McLaughlin-Millard Company, Inc., at Dolgeville, is right in the heart of the Adirondack stands of ash. The firm's famed "Adirondack" trade mark has been stamped on many World Series home-run-hitting bats.

The firm fells ash trees within a 40 mile radius of Dolgeville. After being hauled to the mill yard, the tree is cut into 42-inch lengths, then split by hand into pie-shaped wedges. In the mill, cutting machines shape the wedges into billets. These are stored under shelter for 18 months to "cure" the wood. Then wood lathes trim and curve the billets down to bat size and shape. In the final stages the wood is dipped in a solution that further protects the grain. The bat then emerges, smooth and shining—a precision instrument, stamped with the name of the maker, and often with the name of a particular player, ready for its mission.

Bat-makers admit to at least one fetish —to get the trademark on the "up" side of the stick, parallel with the grain. To avoid a pair of stinging hands and a possible broken bat, every youngster on his first trip to the plate gets one emphatic admonition—"Keep the trade-mark up."

A Dolgeville Little Leaguer approves the final product

Bobby Thompson smacks the bat he used for his pennant winning home run in the 1951 race with the Giants

tions. Large, deep lakes are the preferred habitat of the landlocked sea lamprey, which is either native to many New York lakes or has been present a long, long time. Biologists at Cornell University noticed this lamprey in Cayuga Lake as early as 1875. Due to the lack of early exploration in our lakes it is impossible to be sure whether or not it was native in our waters but many of our lakes have had lampreys beyond the memory of any living observer. These include Seneca Lake, Lake Ontario, Oneida Lake and Lake Champlain. As an adult this lamprey is from one to two feet long, averaging smaller than the sea-run populations.

Recently, with the background of known spread of the sea lamprey to the upper Great Lakes, many of our sportsmen assume that the New York waters are in the zone of a spreading lamprey menace. Actually the shoe is on the other foot. We have the somewhat dubious honor of having had lampreys as early as any state. From our waters they went "that away" or, more specifically, in a western direction.

Niagara Falls, a famous cataract on many counts, also is a barrier against upstream migration of lampreys. Left to their own resources, no doubt our lampreys would have remained in Lake Ontario without colonizing the upper lakes. But, in 1833 the Welland Canal was constructed linking Lake Ontario to the upper lakes. No one can say for certain when the first pioneer lampreys used it to swim into Lake Erie but the first specimen recorded was in 1921 (J. R. Dymond). This is a big lake, mostly shallow but with a small area of deep, cold water and is not ideal for the rapid increase of lampreys. Perhaps this explains why it required many years for the invasion to reach Lake Michigan. The rapid spread of the invaders in Lake Michigan, Lake Huron and Lake Superior and its correlation with a crash decline of lake trout production is well known. These deep lakes, with many good spawning streams have shown a phenomenal build up of the sea lamprey.

Lake Erie, on which we have many miles of frontage, never produced many lake trout; hence, the correlation between lamprey abundance and decline of lake trout production is not similar to that of Lake Michigan or Lake Huron, where the former production of several million pounds of lake trout has dropped to insignificance. Careful search has shown only a few spawning streams. Lake Erie is not only the most productive one of the Great Lakes but also has a wide variety of species of fish. Fortunately, the angling and commercial fisheries of Lake Erie have shown no overall drop in abundance attributable to the sea lamprey.

Getting back again to the areas east of Niagara Falls, where lampreys are an old story, we come first to Lake Ontario which is a deep, cold lake, relatively unproductive except in its shallower parts. Lampreys have long been numerous but what their effect has been on Lake Ontario fish resources is difficult to evaluate. In view of the outstandingly productive smallmouth bass fishing of the eastern end of Lake Ontario, lampreys do not seem to be a general threat to all game fish. The lake trout, a species which is particularly vulnerable, has had its ups and downs in Lake Ontario over the years. At present an experimental planting program, in progress on a co-operative basis with Ontario and New York (CONSERVATIONIST, February-March, 1956) indicates an encouraging survival of planted lake trout.

Seneca Lake, where both lampreys and lake trout have long maintained high populations has been the scene of considerable controversy concerning the effect of lampreys. This lake whose principal inlet, Catharine Creek, is world famous for its large rainbow trout is considered a good fishing area. In fact, so numerous are the lake trout that Seneca is the principal spawn-taking area for our hatcheries. At the time these trout are netted for eggs there is excellent opportunity to observe the amount of evidence of lamprey attack. A careful study of the percentage of scarring and weights of both scarred and unscarred lake trout was published by W. F. Royce *(Transactions American Fisheries Society,* 1949). Although the scarring was very high (88 per cent) there was no evidence of any effect on the weight of the trout. These fish grow rapidly and perhaps this may be a factor since large, fast growing fish may be expected to stand the loss of blood from lampreys rather well. Moreover, Seneca Lake is heavily stocked with lake trout every year and this is considered an important factor in maintaining their numbers. Although many anglers object to seeing occasional lampreys on lake trout or to finding the healed scars of previous attack, the Seneca Lake lamprey situation does not appear serious from a fish production standpoint.

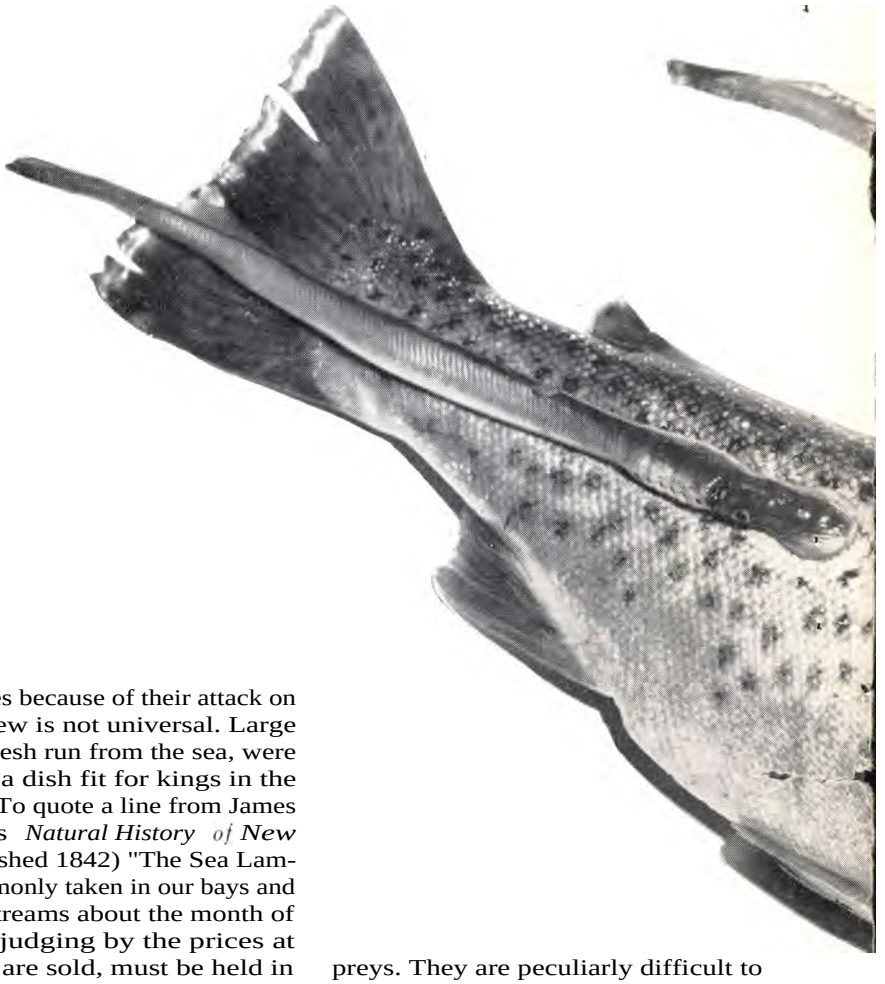
Cayuga Lake, too, has been the scene of many observations on lampreys. Their depredations on fish there resulted years ago in unsuccessful efforts by the U. S. Fish Commission and Forest, Fish and Game Commission to eliminate or reduce them by means of a trap weir. This work, in charge of Professor H. A. Surface resulted in considerable information and is reported in the 1904 report of the Forest, Fish and Game Commission (precurser of our Conservation Department). Over a long period of years much information about Cayuga Lake fish management in general and on lampreys in particular has been built up by many individuals. Professor S. H. Gage over a long period of years found the lamprey a remarkable subject for anatomical and histological studies and in the 1927 Biological Survey Report published by the Conservation Department gave a thorough round-up of knowledge on the life history and economic status. Later R. L. Wigley made the lamprey the subject of a comprehensive thesis. Meanwhile, over a long period of years progress has been made by Professor D. A. Webster and others in study of the lake trout in Cayuga Lake. To sum up the situation, Cayuga Lake has responded very favorably to lake trout planting even with some evidence of lamprey damage to trout. It also supports a productive fishery for smallmouth bass and other species.

Lake Champlain, a lake with considerable deep, cold water is recognized as an outstandingly productive fishing lake, with unusual diversity of fishing. It is not, however, a lake trout lake even though a few were reported present there in early times. It is an outstanding producer of smelt (locally called Lake Champlain ice fish). As to lampreys, this lake has a fair number.

Oneida Lake, somewhat like a small edition of Lake Erie is shallow and very productive of wall-eyed pike, bass and many other fish, mostly of warm-water type. Lampreys are by no means scarce but they do not seem to be the subject of much complaint by Oneida Lake anglers. There is relatively little deep, cold water and no lake trout are present. A species of the whitefish family, locally known as tullibee, is frequently found dead with scars of lamprey wounds. In their 1928 *Report on Ecology and Economics of Oneida Lake Fishes,* C. C. Adams and T. L. Hankinson reported eleven species as showing some evidence of lamprey attack.

As already mentioned, it is the landlocked sea lamprey in our lakes which is of most concern in attacking fish but mention should be made of several areas in New York which have sea-run populations. Salt water life must agree with lampreys as they are sometimes three feet long. The spawning runs come up the Delaware, lower Hudson tributaries and Long Island streams. The Susquehanna formerly had a similar run but dams have eliminated this migration. Delaware River bass fishermen like to use sea lamprey larvae as bait. The spawning lampreys, which migrate well up the Beaverkill and other Delaware

Lake Lamprey
Female



tributaries, attract little notice and it is remarkable that so many of these big ones can spawn and die unseen. The small recently-transformed lampreys resulting from previous spawning usually make their way to the ocean *before* feeding upon fish. They disappear from sight so completely in the ocean that comparatively few are ever seen in our waters outside of an occasional one seen by commercial fishermen handling large numbers of fish. They migrate to sea from our streams at about the diameter of a lead penci1 and return almost as thick as your wrist and perhaps as long as your arm. To grow this large they must consume the blood of marine fish in some quantity. While the occasional observations of ocean lampreys on fish indicate they attack many species, including sharks, there is no evidence that they concentrate on any desirable species in particular or do any material damage, there being many fish in the sea.

A very interesting exception to normal sea lamprey behavior has recently taken place in the Pepacton and Rondout reservoirs. The run of sea lampreys formerly spawned well up in the East Branch of Delaware River. Since the completion of the Pepacton dam they can no longer do this but the transforming lampreys from previous spawning have been dropping down into the reservoir and have been attacking the large brown trout which inhabit this body of water. A part of the lampreys have run out of the reservoir via the long tunnel to the Rondout Reservoir and have attacked trout there. So far, evidence of fatal attacks on trout in these waters has been lacking; most of the scars are the work of relatively small lampreys and it is possible that these attacks represent only temporary feeding before the lampreys resume downstream migration. By reason of the long period of larval existence (believed to be 4 or 5 years in some waters but not known with certainty in the East Branch of the Delaware) several annual crops of lampreys are likely to be produced even without more spawning. It is considered unlikely that the lampreys will mature and maintain a spawning population for, in several other rivers where sea lampreys have been blocked by dams there has been no permanent landlocking of resident populations.

Although most people consider lampreys as thoroughly undesirable, repulsive creatures because of their attack on fish, this view is not universal. Large lampreys, fresh run from the sea, were considered a dish fit for kings in the Old World. To quote a line from James E. De Kay's *Natural History of New York* (published 1842) "The Sea Lamprey is commonly taken in our bays and salt-water streams about the month of April, and judging by the prices at which they are sold, must be held in high esteem by the epicures."

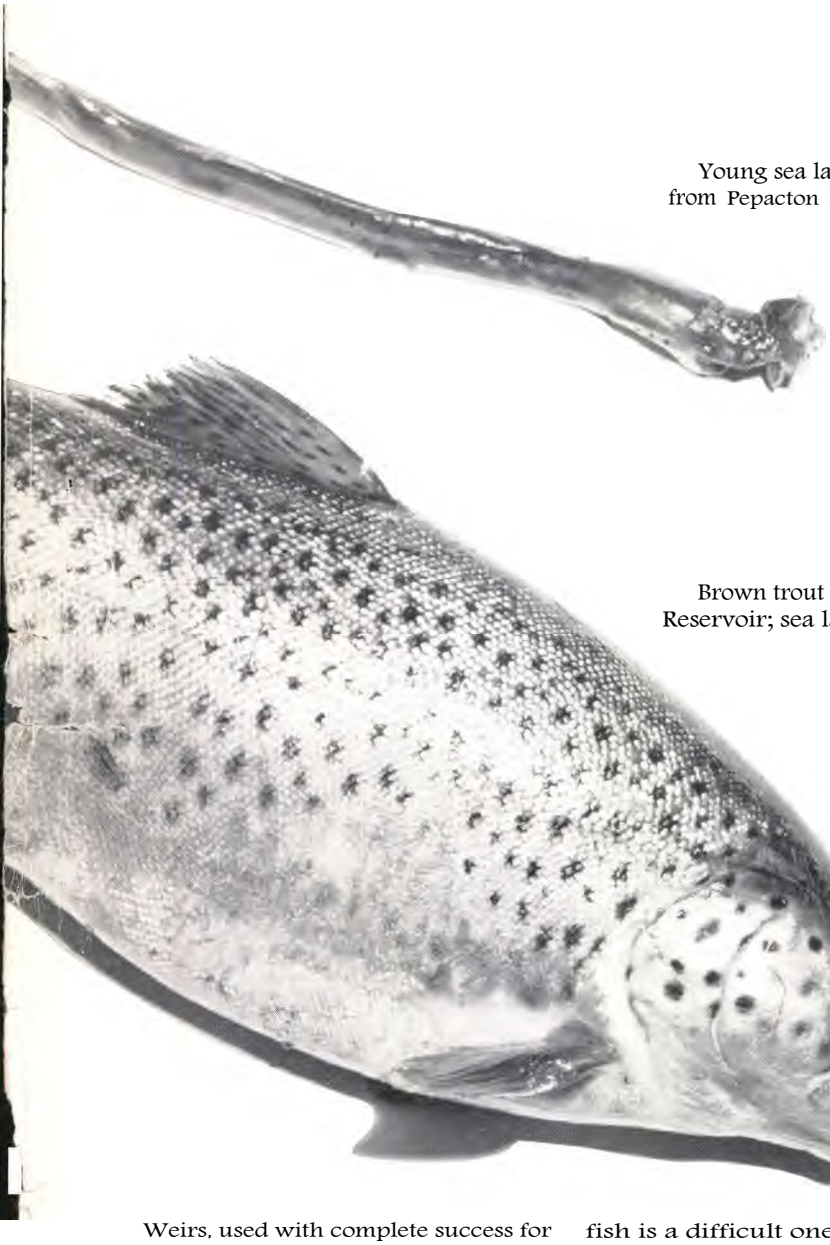
In New York waters today comparatively few persons are interested in lampreys as food but the use of the larvae as bait is popular in some areas as many game fish bite well on them. They are a lively, durable bait.

The recent drastic decline of the lake trout resource of the upper Great Lakes region and the mobilization of efforts to combat the lamprey in these waters has led to many demands that control be attempted in our New York waters. This subject is usually approached with considerable heat; many sportsmen hate the very idea of lampreys and would like to see them all killed or at least as many killed as possible. Naturally, they want action.

But, where the expenditure of money is involved it is desirable to evaluate very carefully what could be accomplished for the outlay of the large sum needed for any material reduction in lampreys. They are peculiarly difficult to exterminate or even reduce because of the many age groups providing a sort of "defense in depth." If you could exterminate the entire breeding population of lampreys during the current season before they can deposit a single egg you would still have immature lampreys in the lake and behind that several-year classes of larvae living in the mud.

Electric weirs, used at the mouth of breeding streams have been shown to be effective in blocking or trapping a large number of lampreys. This method does not, however, give a directly proportionate reduction. A female sea lamprey produces many eggs, about 25,000 being not unusual, and it is possible for a few breeding lampreys to produce an excellent crop of young. Cutting the breeding population in half would not necessarily cut survival in half any more than cutting out half your garden seeds would result in a 50 per cent reduction in crop.

Lake Lamprey
Male



Young sea lamprey
from Pepacton Reservoir

Brown trout from *Pepacton*
Reservoir; sea lamprey attached

Weirs, used with complete success for a long period of years could be expected to dry up the lampreys at the source for, when all age groups mature and are blocked from spawning grounds there would be no more lampreys. But electric weirs, like most devices are subject to troubles not the least of which is temporary failure of electric power. They are dangerous and require foolproof safeguards to protect humans and domestic animals. Moreover, the problem of stopping lampreys without detriment to game fish is a difficult one. This would be especially difficult to solve in Catharine Creek where an unobstructed run of rainbow trout is annually something for anglers to look forward to with anticipation.

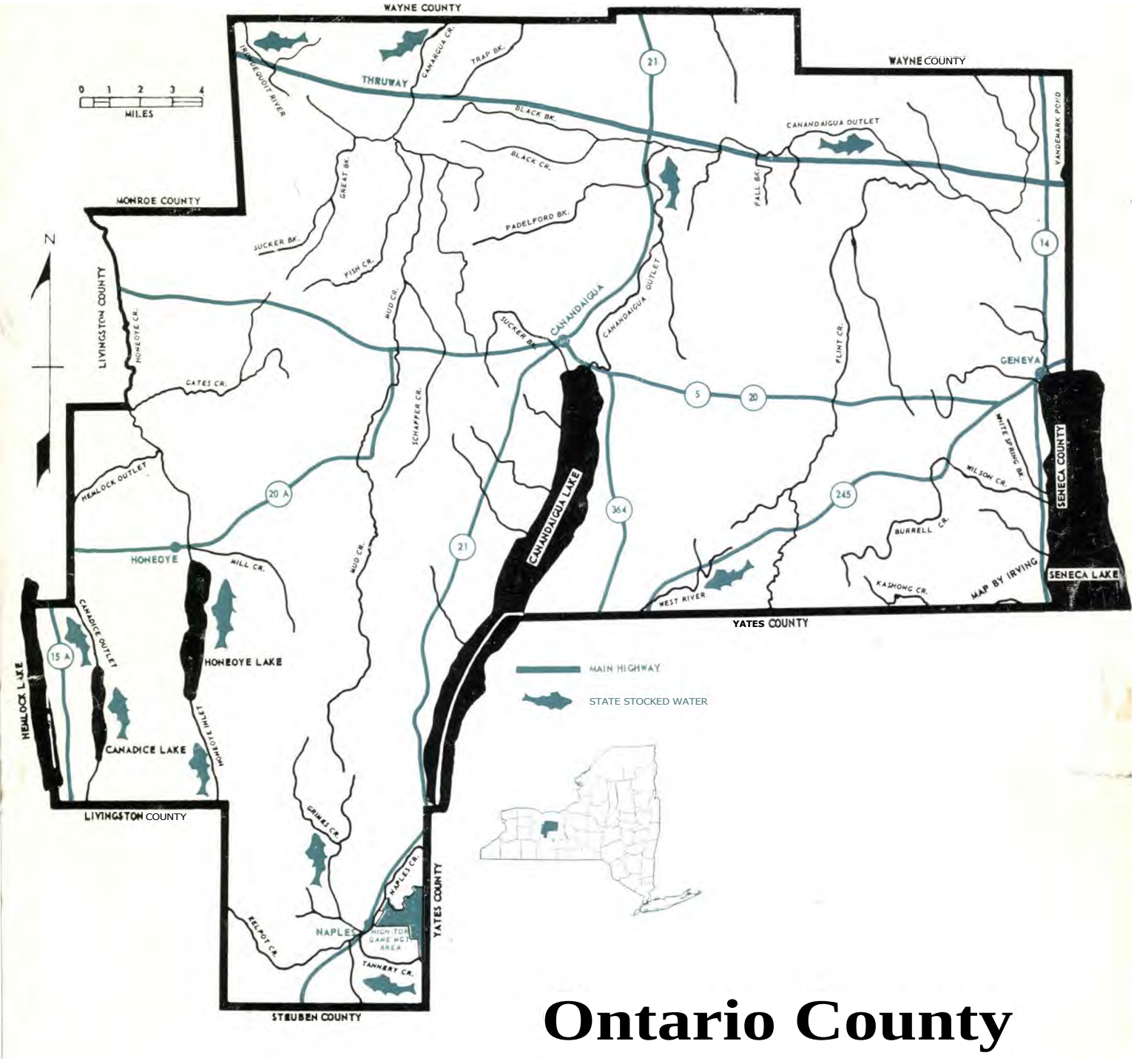
Control of the immature lampreys instead of the adult egg-laying stage, is less of a win or lose proposition. Whereas, the destruction of an adult lamprey does not prevent any damage to fish life by this individual as it has already reached the end of its parasitic life, the killing of immature lampreys before they begin to feed on fish affords a means for proportionate reduction of damage. Unfortunately, the downstream migration of the recently-transformed young lampreys, now having become ready to attack lake fish, is spread out over many months from Fall to Spring. So far, devices to catch them during migration have not been perfected. However, attacking the larvae in the mud banks along streams by means of poisons is considered a fertile field for research and the U. S. Fish and Wildlife Service has discovered several promising chemicals, toxic to lampreys at concentrations which are safe for fish. Unfortunately, these chemicals are thus far very expensive. Electric shockers are somewhat successful in stirring up lamprey larvae so that they can be netted but this method is expensive in labor costs.

To sum up our New York lamprey situation: (1) Many of our waters have long had lampreys; (2) in most of these waters the situation is relatively stable although a wide variety of fish are subject to attack; (3) damage to lake trout seems possible to counteract by heavy stocking; (4) there are no methods known by which complete extermination is in sight; (5) local evaluation of the amount of damage caused by lampreys and of the costs of reducing such damage are necessary steps in the planning of any control program.

The lamprey situation should be viewed as just one phase of the whole fish management problem. After all, good fishing is the primary objective and the most important things to do are the ones that will actually help make fishing better. In most of our waters control of lampreys does not seem to be the top priority job but we could do with a few less of them than we have. The development of economical and practical methods is well worthwhile, even though we must face the fact that partial control involves an expenditure for an indefinite period.

Concentrated work on methods of control is in progress in the upper Great Lakes area and is being watched with interest. Meanwhile, we are proceeding on a program of finding out how much damage our local lampreys are doing and trying to find ways to hold such damage to a minimum.

—JOHN R. GREELEY,
Chief Aquatic Biologist



Ontario County

N. Y. S. Conservation Department Offices

District Game Manager	2130 Scottsville Rd., Scottsville
District Forester	5 E. Steuben St., Bath
District Fisheries Manager	2130 Scottsville Rd.. Scottsville
District Game Protector	2130 Scottsville Rd., Scottsville

Farm Service Offices

County Agricultural Agent	Court House, Canandaigua
Ontario Co. Soil Conservation District	74 S. Main St., Canandaigua

—ROY IRVING