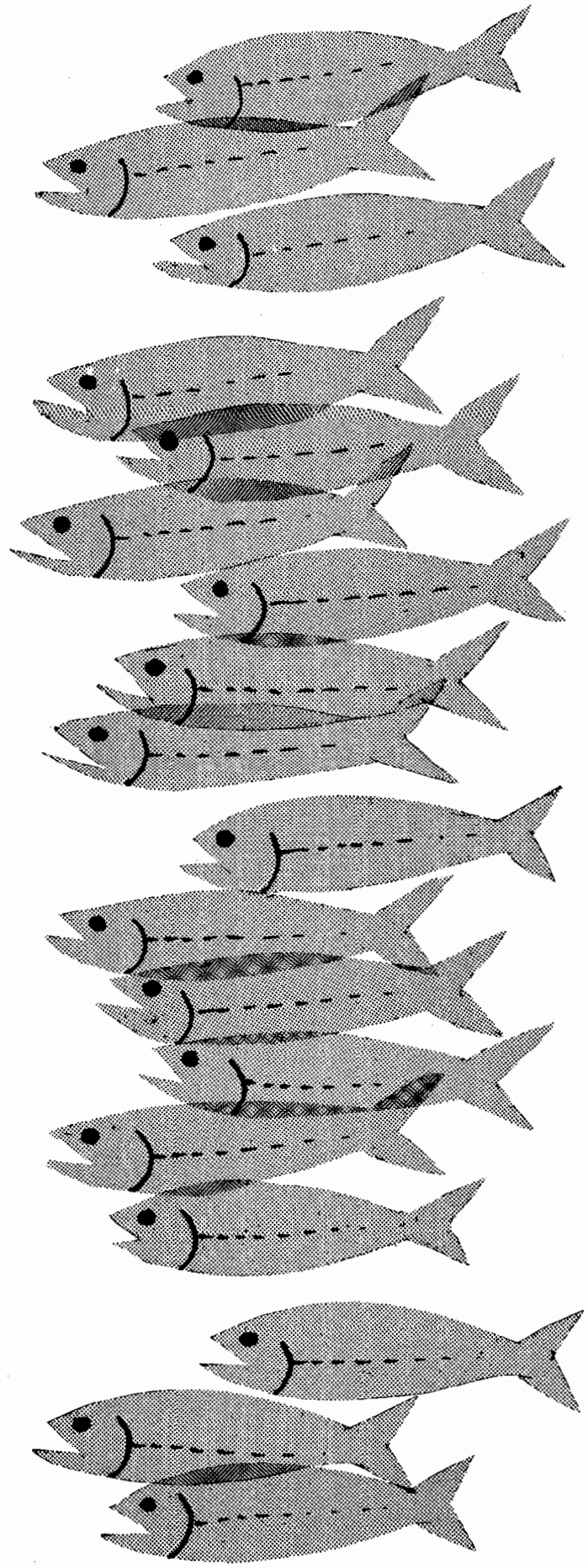


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STATUS REPORT ON GREAT LAKES FISHERIES 1967

**FISH DIVISION
MICHIGAN DEPARTMENT
OF CONSERVATION**

Fish Management Report No. 2

**March, 1967
Lansing, Michigan**

**S T A T U S R E P O R T
O N
G R E A T L A K E S
F I S H E R I E S**

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CHINOOK SALMON, Oncorhynchus tshawytscha (Walbaum)

Chinook (or king, spring, quinnat, tye), the largest of the pacific salmon, will soon join the ranks of Michigan fishes. Mature 4 year old chinook average about 20 pounds in weight, 40 pounders are not uncommon, and fish in excess of 100 pounds have been recorded. Two year old jacks typically weigh about 3 pounds.

Fall chinook (the strain chosen for Michigan introduction) prefer large streams and migrate and spawn in the fall. Unlike the coho salmon however, the young leave the rivers the following spring as soon as flows increase and temperatures rise. They usually return as 3, 4, and 5 year olds, less commonly at age 2 and 6. One year old jacks and 7 year old adults are not unheard of. Among salmon, chinook are second only to the sockeye as a food fish. They are excellent fresh, smoked or canned. Because of its awesome size and strength, the chinook is rated by most anglers as king of the Pacific Salmon. It is most commonly taken by trolling from mid-summer through November.

PREFACE

Few events in Michigan conservation have stirred more public excitement and imagination than recent developments on the Great Lakes, particularly sea lamprey control and the introduction of Pacific salmon. A part of the story is related in this booklet. In a way this is an unusual report. It was written by a hard working group of fish men who took out a little time to pass on a message to the people of Michigan and, according to their interest, people across the continent. It is an attempt to depict the Great Lakes challenge and document man's efforts to meet it.

The challenge in fisheries management for the Great Lakes is a big one--tough and dramatic. It involves changing, by human endeavor, the world's largest bodies of fresh water from a biologic wasteland to a great source of natural wealth. We know it's possible, we think we know how to do it, and it's worth all the best efforts of our present generation of people.

The 50 million acres of the upper Great Lakes have been (and the process is continuing) dealt a series of staggering blows. We have felt the effects of overexploitation of the fisheries, an invasion of a super parasite--the sea lamprey, a population explosion of still another invader--the small but pestilential alewife, and worst of all, the start of a degrading of these sparkling deep blue waters by pollution.

To save, restore, and enhance the fisheries of the Great Lakes we must apply positive action--research, planning, investment, and management. The rewards can be great from a resource with the magnitude of the Great Lakes. The product will be an assurance now and for the future of food, recreational opportunity, and a large economic gain. Perhaps tens or even hundreds of millions of dollars will be added to Michigan's economy in the next few years if a trout and salmon recreational fishery can be developed to meet an overwhelming public demand.

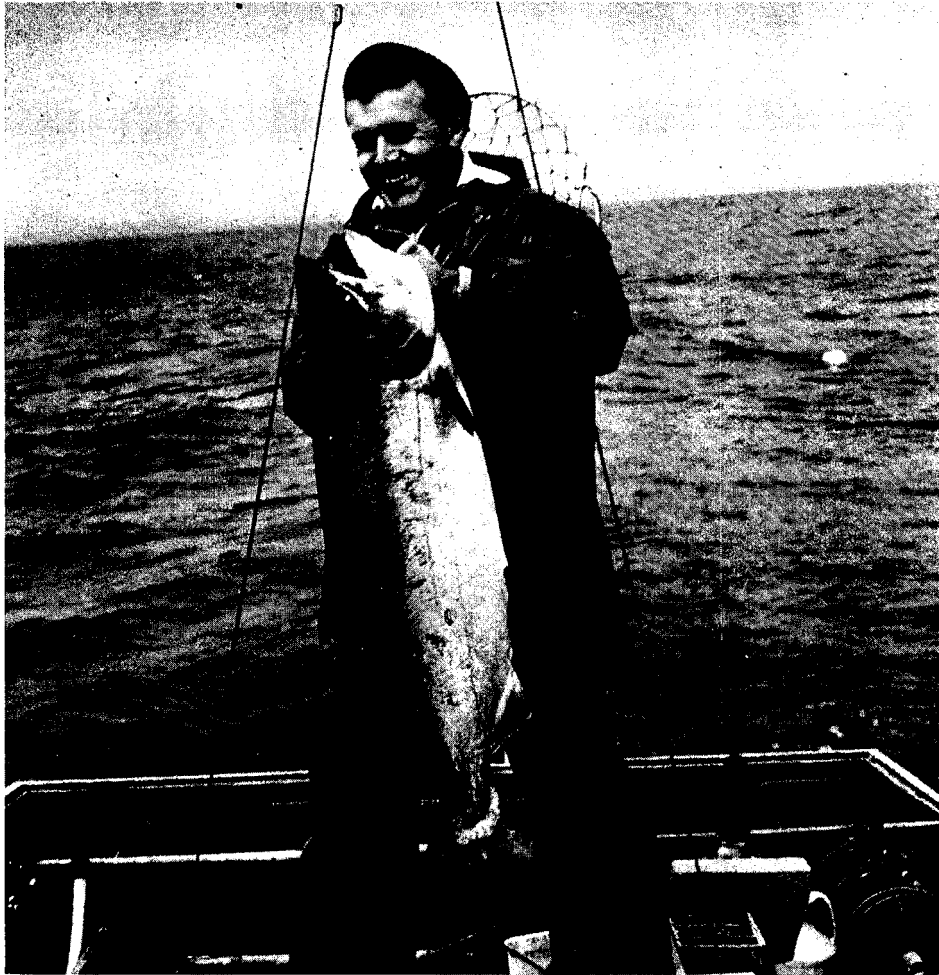
This report, then, is a status report of the Michigan Conservation Department's fisheries program. It relates to several of the important fish species, their present status, and their outlook for the future. It touches briefly on some of the facilities necessary to do the management job. I can only hope that it conveys the message that this job can and must be done.

Wayne H. Tody
Chief, Fish Division
Michigan Department of Conservation

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Chinook (or king, spring, quinnat, tye), the largest of the pacific salmon, will soon join the ranks of Michigan fishes. Mature 4 year old chinook average about 20 pounds in weight, 40 pounders are not uncommon, and fish in excess of 100 pounds have been recorded. Two year old jacks typically weigh about 3 pounds.

Fall chinook (the strain chosen for Michigan introduction) prefer large streams and migrate and spawn in the fall. Unlike the coho salmon however, the young leave the rivers the following spring as soon as flows increase and temperatures rise. They usually return as 3, 4, and 5 year olds, less commonly at age 2 and 6. One year old jacks and 7 year old adults are not unheard of. Among salmon, chinook are second only to the sockeye as a food fish. They are excellent fresh, smoked or canned. Because of its awesome size and strength, the chinook is rated by most anglers as king of the Pacific Salmon. It is most commonly taken by trolling from mid-summer through November.

Photo: California Department of Fish and Game.

INTRODUCTION

Many changes have taken place in the Great Lakes during the past 25 years. Prior to 1940, lakes Huron, Michigan, and Superior supported a stable fish population composed chiefly of lake trout, whitefish, yellow perch, walleye, burbot, several species of small coregonids (chubs), and native minnows. Commercial fishermen annually caught 15 million pounds of lake trout alone.

The invasion of the sea lamprey through the Welland Canal changed this picture dramatically in just a few years. By 1950 the lake trout fishery on lakes Michigan and Huron was gone, and 12 years later the Lake Superior fishery was closed. The lake trout was not the only species to suffer from the lamprey--all were affected. Commercial fishermen that did not hang up their nets switched operations to smaller, less valuable species.

This near absence of fish eating predators set the stage for another invasion. The alewife, a small pelagic plankton feeder closely resembling the shad or herring in both appearance and habits, reached staggering abundance almost overnight in lakes Huron and Michigan. Their numbers are now mounting in Lake Superior.

To add to these natural changes, the Bureau of Commercial Fisheries under direction of the Great Lakes Fishery Commission discovered a selective lamprey poison during the late 1950's. As a result, the control of lampreys and the rehabilitation of the lake trout now seems assured. Whitefish also appear to be rallying in northern Lake Michigan. None of the Great Lakes fishes escaped the impact of the violent changes of the past two decades. Many species have disappeared forever.

The period of change is not over, either. Alewife abundance strikes Michigan's fisheries men as an opportunity--that of converting an efficient but commercially worthless forage fish into valuable sport and commercial fish. Since the bottom dwelling lake trout is only a partial answer, Michigan looked elsewhere for a predator. (Imagine the Pacific and its commercial and sport fishery without the salmon and the tunas--this is the opportunity the Great Lakes presents.)

After a thorough study, the Pacific salmon showed promise enough to justify a trial. In the spring of 1966, 850,000 coho smolts were released in three Michigan streams.

In 3 months coho began showing up in commercial gill nets--first a few, and then substantial numbers of fat silvery coho ranging from 12 inches to 7 pounds.

By September, angler reports were pouring in from the planting streams. The run of jacks created quite a stir among Michigan fishermen. About 2,000 have been caught by anglers.

Eggs taken from this run have hatched out 22,000 healthy fry.

This spring and the following spring more coho from Oregon, Washington, and Alaska will be planted to complete one life cycle in Michigan waters. By then we hope to have our own egg source well established. Also this spring, if all goes well, up to 1 million Washington chinook salmon will be stocked. If chinook take to Great Lakes living as well as the coho seems to have, Michigan anglers are in for a pleasant shock.

This is the first of what we hope to be an annual status report of Michigan's Great Lakes fisheries. It covers most, but not all, of our important fish species with special emphasis on the coho. Noticed by their absence will be smelt, cisco, suckers, rock bass, and a few others. We recognize the importance of these species, but at present our knowledge and capacities are such that we have no management program for them worthy of mention. To include a section on each would be easily recognizable as lip service.

Conversely, sections are devoted to species not yet a part of the Great Lakes fisheries picture--chinook salmon, Atlantic salmon, and summer steelhead. These offer opportunities for the future that we all can hope to see become a reality.

LAKE TROUT (Salvelinus namaycush)

Under the auspices of the Great Lakes Fishery Commission, programs to control sea lamprey and restore lake trout have been operative since 1958. All of the jurisdictional agencies on the Great Lakes have cooperated. Two factors have been of major importance in the success of these programs to date:

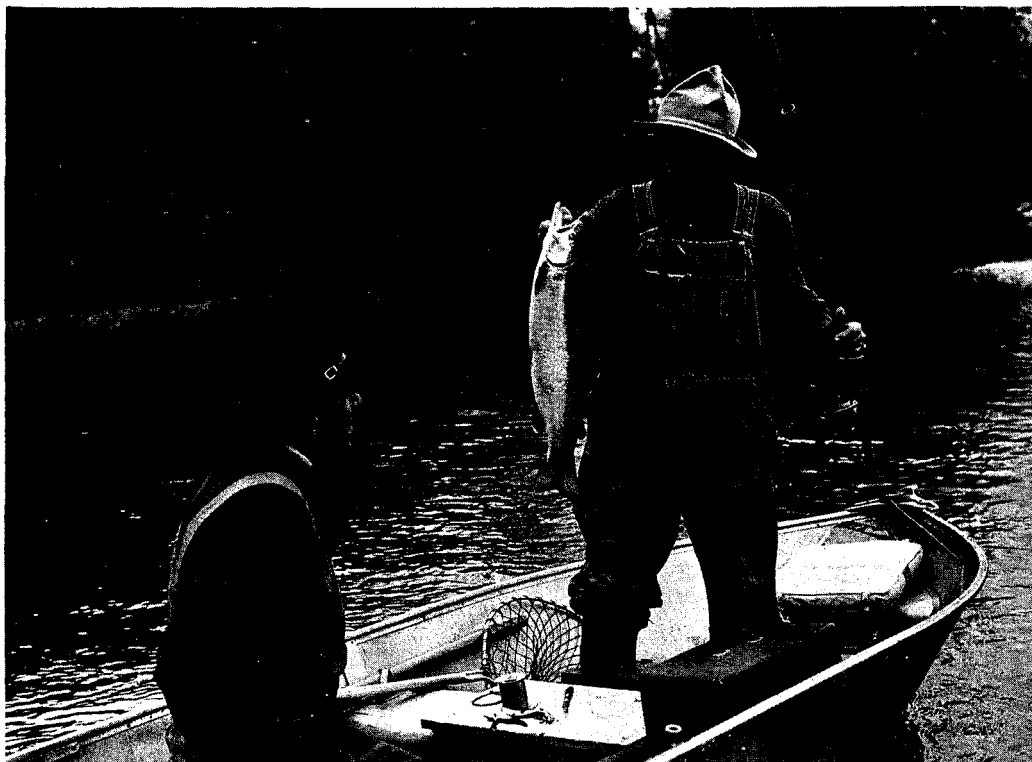
1. The discovery and testing of a chemical which would destroy sea lamprey larvae in streams.
2. The establishment in Michigan hatcheries of lake trout brood stock as a source of eggs for the lake trout restoration program.

In Lake Superior, the combined effects of sea lamprey control, intensive stocking, and reduced fishing (the commercial fishery was closed in 1962) have permitted lake trout populations to become reestablished. Sea lamprey abundance has been reduced by about 90 per cent, and it is expected that at least this level of control will be maintained. Nearly 16 million lake trout were planted in the period 1958-1966. Stocks of lake trout in Lake Superior have recovered to a remarkable degree. At present the bulk of the population consists of hatchery reared fish. Natural reproduction has not been fully restored, but can be expected to contribute significantly within the next two or three years. A portion of the lake trout planted in 1958 and 1959 are now sexually mature at lengths of 18 to 22 inches. The lake trout restoration program has resulted in a revival of the sport fishery in Lake Superior which started in 1962. It is now expanding rapidly in certain areas, notably out of Presque Isle and Black River harbors, and in Keweenaw Bay.

Programs to control sea lamprey and restore lake trout have been extended into Lake Michigan. By the end of 1967, all lamprey producing streams will have been treated at least once. The lake trout planting program in Lake Michigan was started in 1965 when about 1.2 million yearlings were planted. Some 1.7 million were stocked in 1966 and approximately 1.8 million are scheduled to be released this year (1967).

Results of sea lamprey control and lake trout restoration in Lake Michigan are being closely followed, and findings to date have been most encouraging. Survival is apparently good and growth is outstanding. A portion of the 1965 plant has already (fall, 1966) reached 17 inches in length. To date, a sport fishery has not developed, but its revival can be expected in the very near future as stocks continue to build. Some concern is coming into the picture because commercial gill nets inadvertently take some of the small lake trout.

LAKE TROUT - Angler caught, adipose fin clipped lakers from Keweenaw Bay, indicate success of planting program.



STEELHEAD - A fine specimen taken from Manistee River in the fall of 1966.

STEELHEAD RAINBOW TROUT (Salmo gairdneri)

Since 1965 steelhead populations in the Great Lakes have rallied remarkably from depredation by the sea lamprey. Good runs of the large rainbows are now being observed in most of the traditional steelhead streams tributary to lakes Michigan and Superior.

The Lake Michigan steelheads taken in the fall of 1966 were unusually large, suggesting that they are waxing fat on alewife. Impressive numbers of steelhead in the 10 to 19 pound class were taken from the Manistee drainage which, in years past, was famous for its trophy steelhead. For the first time in many years steelhead reappeared in impressive numbers in the harbor lakes and streams all around Lake Michigan.

This resurgence of steelhead populations has caused renewed angler interest. The most notable increase in fishing pressure was on the Manistee and Platte rivers, along with expansion of the troll fishery at the river mouths on Platte and Manistee lakes.

A modest effort to supplement natural reproduction of native steelhead was made in 1966. A total of 127,000 yearling rainbows of hatchery stock was released into the Muskegon and Platte rivers and Bear Creek in the Lake Michigan drainage. In addition, 17,500 were planted experimentally directly into Lake Michigan--7,500 yearlings into Little Traverse Bay and 10,000 tagged yearlings offshore at Arcadia and South Haven--to determine whether these fish will survive and migrate as adults into tributary streams and contribute to the angler's catch. Some 48,000 rainbow yearlings were also planted in the Big Huron River in the Lake Superior drainage.

Autumn steelhead runs into the Big Huron River, Platte River, and Bear Creek were monitored along with the coho runs. The run in the Big Huron began in late September and peaked the last week of October; 58 steelhead averaging 16.4 inches in length were tagged to learn more about the migration patterns and angler harvest of this species. The fall run of steelhead began in the Platte River in late August and peaked at the weir during mid-November. As of late January, 211 steelhead averaging 2.5 pounds but reaching 12 pounds in weight had been taken from the trap and released upstream. Although there was an excellent fall run of steelhead in the Manistee River, only 22 migrated upstream for enough to be caught in the Bear Creek trap. Sixty-one steelheads tagged in the Manistee River averaged 24.1 inches in total length and 5.1 pounds.

On hand for the future are 550,000 steelhead yearlings scheduled for release in Great Lakes tributaries when these fish attain the required planting length of from 6 to 8 inches. Two million eggs will be collected from steelhead during the 1967 spring spawning runs in the Big Huron, Platte, and Little Manistee rivers and Bear and Thompson creeks to continue the program. Plans call for a release of 750,000 steelhead smolts in 1968 with provisions for gradual increases to 2

million by 1976. Steelhead stocking has had impressive success in the West, e.g. Washington's Skagit River and Oregon's North Umpqua River, and it appears likely that we will be able to substantially improve runs in our own steelhead streams by following their techniques. However, new and improved hatchery facilities are required before Michigan will be able to duplicate the western success.

The removal or laddering of dams and barriers on key streams like the Boardman, Betsie, Manistee, and Ontonagon is especially crucial to the future of steelhead in Michigan.

COHO SALMON (Oncorhynchus kisutch)

In the spring of 1966, coho salmon were stocked in Michigan waters after the coho had emerged from a thorough screening of open water predator fish as the most promising species for introduction into the Great Lakes. Six months and thousands of 2-7 pound coho later, the faith of former Fish Chief Howard A. Tanner and his successor, Wayne H. Tody, was rewarded. Their dream for the coho is presented in their report: Coho Salmon for the Great Lakes (1966).

Planting

From the 1 million coho eggs generously supplied by the Oregon Fish Commission, 850,000 survived to the yearling stage and were planted in the spring of 1966. Survived is a poor word--coho thrived on Michigan hatchery life like no fish before it. Specifically, 394,760 yearling coho at 16 per pound were released into Bear Creek in late March; 264,000 yearlings at 20 per pound were planted in the Platte River in late March; and the Big Huron River received 192,400 yearling salmon at 22 per pound in mid-May. The Big Huron plant was delayed because of unfavorably low water temperatures.

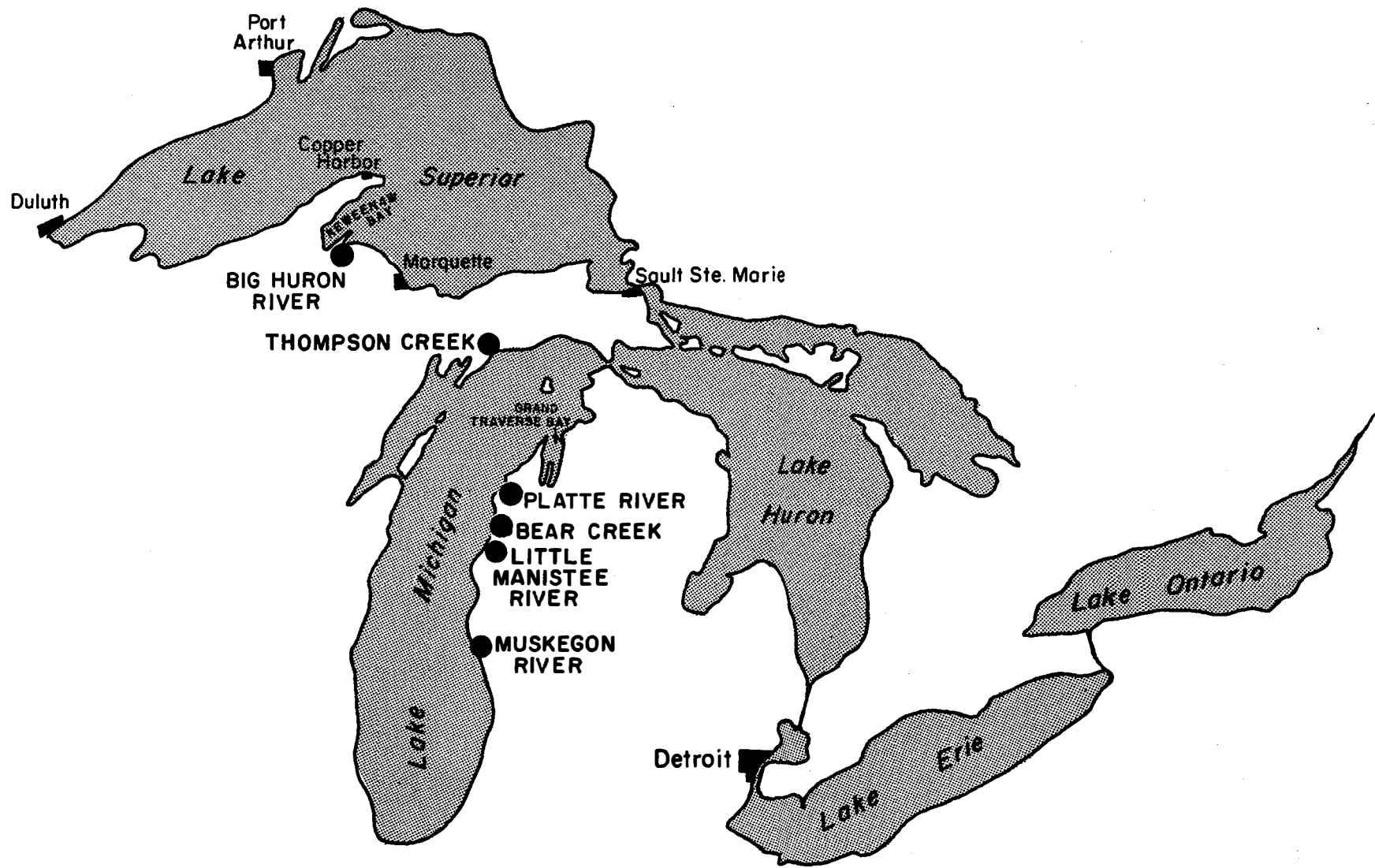
Downstream Migration of Yearling Coho

Field personnel followed the newly planted coho downstream to the Great Lakes. Particular attention was given to the rate of downstream movement and losses to predators.

Bear Creek

Within 2 days after being planted in this stream, coho were found approximately 6.5 miles downstream from the release locations. Several were captured at the mouth of Bear Creek, some 20 miles downstream, within a week after release. (Bear Creek is a tributary to the Manistee River, which in turn flows into Lake Michigan.)

The largest downstream movement of coho in bear Creek occurred prior to mid-May. By mid-June most of the smolts were either close to or in Lake Michigan.



Brown trout in Bear Creek preyed on the salmon, and probably accounted for the greatest loss. Checks of stomachs from northern pike and bowfins revealed no predation by these two species.

Platte River

Platte River coho did not migrate as readily as was hoped perhaps because water temperatures plummeted soon after the fish were stocked. A single coho was captured 5.5 miles downstream from the release site 2 days after planting and 11 days after release a few smolts were caught at the river mouth 17 miles away. The major migration into Lake Michigan occurred between the first of April and mid-May. Very few remained in the river after June 8. The coho had to pass through Platte Lake before entering Lake Michigan, but this apparently was no obstacle to the migrants.

Examination of numerous stomachs from bowfins and northern pike turned up no evidence of predation by these species. Stomachs from two 14-inch brown trout contained 4 coho which suggests, in view of the Platte River's good brown trout population, that coho losses to predatory browns may have been substantial. Numerous coho were caught by anglers, and hooking mortality on these fish was relatively high. No other predators were noted.

Big Huron River

Coho smolts in the Big Huron River moved rapidly downstream--in less than 24 hours the first smolts had traversed the 7 miles to the stream mouth and were dispersing into Lake Superior. The heaviest movements occurred after dark, when up to 300 salmon per minute were estimated to have passed through the Bureau of Commercial Fisheries' electrical lamprey weir 5 miles below the planting site. Most of the coho smolts had migrated to Lake Superior within 3 days, and only a few remained in the stream by June.

Anglers, kingfishers, herring gulls, loons, and one great blue heron were observed catching smolts. However, over-all losses appeared to be light.

Dispersal

Knowledge on the dispersal and habits of the coho in lakes Michigan and Superior is sketchy. An effort was made to locate the salmon in the open lakes by netting, but this was largely unsuccessful. However, commercial fishermen were requested to report all salmon caught, and this proved to be an important source of information.

In early June, 2 coho were found in the stomach of a 5 pound lake trout caught in Keweenaw Bay, 18 miles west of the Big Huron River.

At least 19 coho were caught in Lake Superior. The first, an 11-incher, was taken in Keweenaw Bay on August 26, 1966, in a floating herring net.

In early September, 15 coho averaging 13 inches in length were caught by a commercial fisherman in Minnesota waters near Isle Royale. Several coho, only one of which was kept, were caught by an angler in early October 80 miles east of the Big Huron River. The largest known Lake Superior coho was 14.4 inches long and weighed 1 pound.

In Lake Michigan 41 coho were reported by commercial fishermen from early August through September. These fish showed a wide dispersal over the northern half of the lake--catches were made in Michigan waters at Whitehall, Ludington, Manistee, Grand Traverse Bay, Manistique, and in Wisconsin waters at Green Bay and Two Rivers. These coho ranged from 9.5 inches and 0.2 pounds to 23.6 inches and 6.2 pounds. Most of the salmon catches were made at depths of 50 feet or less, although one was netted at 180 feet.

Smelt were found in the stomach of 1 coho; in other stomachs checked, the contents were digested beyond recognition.

1966 Run of Coho Jacks

In order to evaluate the spawning migration of early maturing coho jacks anticipated in the autumn of 1966, a barrier and trap were constructed on the Platte River and Bear Creek. On the Big Huron, the federal electrical lamprey control weir was employed. Electrofishing gear was also used on the Platte and Manistee rivers and Bear Creek to trace the spawning runs and to check nearby streams for stray migrants. Trap netting and tagging at the stream mouths, visual observations, and creel census rounded out the evaluation.

Bear Creek

During the last week of August incidental commercial catches of coho in Lake Michigan near Manistee increased, indicating that a fall run was imminent. By mid-September coho were being taken in good numbers by anglers in the lower Manistee River, and by late September coho began entering the Bear Creek trap 40 miles upriver from Lake Michigan. Peak migratory movements in Bear Creek, like those in the Platte, were stimulated by runoff. A total of 2,734 coho, including 32 females, had been caught in the trap by mid-January when operations were suspended because of ice conditions. The main run, however, was essentially over well before then. Tag returns at the Bear Creek weir, electrofishing, and visual observations indicated that more than half the run remained in the stream section below the barrier.

Coho jacks trapped at the Bear Creek weir averaged 18.7 inches long and 2.2 pounds in weight; the largest fish was 23.9 inches in length and weighed 5.3 pounds. The Bear Creek run was larger than the runs in the Platte and Big Huron rivers; the fish were bigger because of the greater numbers and larger size of coho planted there. This was predictable because the magnitude of jack runs in the West also bears a direct relationship to the size of smolts released. It is, however, difficult to predict from last fall's jack runs the

relative magnitude of the adult runs in each of these streams next fall. The total run in the 3 streams is expected to be at least double that of the jack runs, however, and quite likely even higher.

The ability of the transplanted coho to home back to the stream of release in their new freshwater environment was demonstrated at an exceptionally high level. A few did stray to nearby streams. One or 2 coho each were found in the Boardman, Crystal, Betsie, Elk, and Leland rivers, all of which are tributary to Lake Michigan in the vicinity of the Platte and Manistee rivers. Considerable movement did occur within the Bear Creek stream system. Many coho entered small tributaries below the weir, and some fish transferred over the weir migrated well above the areas of release.

No spawning activity was observed in Bear Creek, but the 32 female coho trapped at the weir were stripped of 45,000 eggs averaging 110 per ounce. Despite the fact that some eggs were green and others not ideally ripe, these eggs produced 22,000 apparently normal fry. Probably some natural spawning did occur by females below the weir.

The first dead salmon was found in Arner Creek in early October, and small numbers of carcasses were found in various areas later in the fall, but no massive die-off had occurred prior to freeze-up in December.

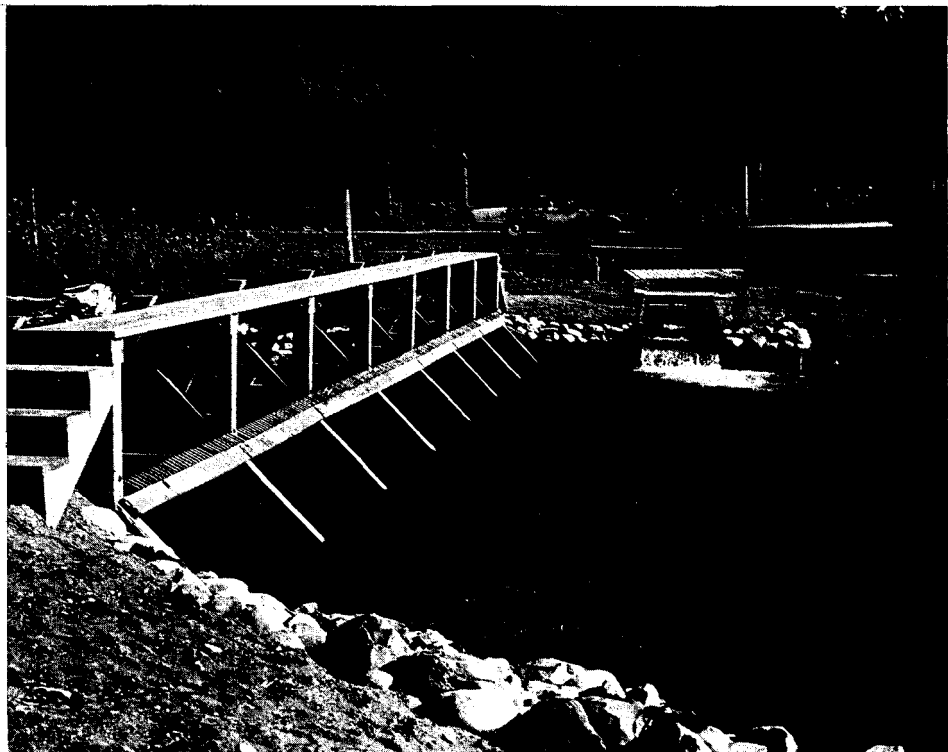
Anglers harvested an estimated 1,500 coho from the Manistee River and Bear Creek during the fall season with the peak fishing occurring between September 20 and October 10. Creel censuses revealed that up to 1,450 angler days were expended during a single weekend on the Manistee. Angler enthusiasm was electric. The record coho--23.5 inches in length and weighing over 7 pounds--was caught on the Manistee. Numerous 4 to 6 pounders were taken and several limits were recorded (the bag limit is 10 pounds and 1 fish).

Platte River

Coho began to enter the Platte River during the first week of September, and first reached the barrier trap on September 10. There were several peak periods of migration during the fall, each one stimulated by a freshet. By early February, 1967, 1,056 salmon had entered the Platte River trap. These fish, all mature males, averaging 16.2 inches long and 1.5 pounds in weight, were released above the barrier so that their behavior could be observed. By February, 174 coho carcasses had lodged against the upstream side of the barrier weir.

Tag returns, electrofishing, and visual observations indicated that not all of the coho migrated upstream to the weir; more than half remained in the river below. No coho spawning activity was observed below the barrier. Anglers caught approximately 400 coho in the lower river and in the lakes near its mouth.

RECORD COHO - William Soderstrom of Parkdale, Michigan with his 23½", 7 pound record Michigan coho salmon. The fish was only 5 or 6 inches long when releases six months earlier.



WEIR, LADDER, AND TRAP - Temporary facility for obtaining salmon and steelhead spawners on the Platte River.

Big Huron River

In late September coho began to enter the Big Huron River, and reached the electrical weir in early October. The run apparently was quite small. Twenty-one coho jacks were caught in trap nets and tagged near the river mouth, but only 2 of these were subsequently recaptured 2 miles upstream at the weir. Only 10 male coho were recorded at the weir by December. No strays were found in the Little Huron River, the stream nearest the Big Huron.

Coho caught in the river averaged 14.5 inches in total length and 1.1 pounds, and ranged from 10.3 to 16.2 inches and 0.5 to 1.5 pounds.

During the early part of the migration coho were in good condition, but as the season progressed they darkened in color and lost weight. Their gonads ripened normally, and the characteristic hooked snout developed. No spawning activity or final mortality was observed.

Shortly after the first of October anglers began catching a few coho in the lower river, and continued to do so until the close of the season (November 30).

Future Plants

The impressive first year success of coho has triggered public demand for salmon all over the state. However, the first 3 years of the salmon planting program must be devoted to establishing an egg source. This will assure a continuance of the program independent of western egg supplies. Thus, our early plants will be restricted to a few of our best streams where adults can be trapped, held to maturity, and stripped of their eggs.

In the spring of 1967, over 2 million yearling coho, a generous gift from the states of Oregon, Washington, and Alaska, will be released into the Big Huron, Platte, and Little Manistee rivers, and in Thompson and Bear creeks. Planting will be expanded to include the Little Manistee River and Thompson Creek to utilize egg taking facilities planned for these 2 streams. The Thompson Creek plant will consist solely of Alaskan coho from a strain which exhibits a marked ability for adapting to a freshwater environment. These fish will be marked to further assure that their identity is retained.

Again in 1968, about 2 million coho will be stocked in the streams mentioned above. No fish of Alaskan strain will be available, however. Hopefully, the 1967 spawning runs will provide the eggs needed for 1969 planting. Long range hatchery expansion plans will allow annual planting to increase to 13 million or more by 1976. As soon as we are assured of our own egg source and can rear sufficient fish, plants can be made in other suitable streams throughout the state.

Future Evaluation

The downstream migration of coho smolts will again be followed in 1967 with evaluation techniques modified and improved by last year's experience.

The Big Huron and Platte rivers and Bear Creek will be surveyed at ice break-up to determine the extent of the die-off from the previous autumn. A mid-summer survey will be conducted to determine if natural reproduction occurred in lower Bear Creek. With the acquisition of equipment suitable for work on the Great Lakes, surveys to determine the distribution and habits of salmon in open water will be initiated in 1967.

Creel censuses will begin on the Great Lakes in mid-July, and will be extended to the streams when spawning runs begin.

Smolt traps will be incorporated into future permanent weirs to evaluate the success of natural reproduction and obtain a measure of stream productivity.

Research and Development Division has already started a study to measure the effects of salmon on stream trout and steelhead.

CHINOOK SALMON (Oncorhynchus tshawytscha)

"It is likely that within a year plans for an attempted introduction of the chinook salmon will be announced", wrote Wayne H. Tody and Howard A. Tanner in Coho Salmon for the Great Lakes, February, 1966.

At this writing 1 million chinook fry are being reared at Oden State Hatchery for release in late April, 1967.

As the quotation indicates, after Tody and Tanner had thoroughly screened the chinook, there remained no doubt in their minds as to the desirability of introducing it into Michigan waters.

In fact, the ultimate decision to introduce the coho before the chinook was not based on the relative merits of the two as sport and commercial fish, but because the chances of successfully introducing the coho into Michigan waters appeared somewhat better and a supply of eggs was available.

The coho also lends itself more easily to hatchery propagation than the chinook and is considerably larger (15 to 30 per pound as compared to 60 to 120 per pound) when it is released as a smolt and hence, has a better chance of survival.

The chinook introduction appears very nearly as promising, however, and the species has such great potential for the Great Lakes that there should be no further delay.

The chinook is the "king" of the game fish in the Pacific Northwest. Trout like in appearance, running 20 pounds and over, powerfully built and packed with energy, it offers the Great Lakes angler a real opportunity to have a "big game" fish. It is extremely efficient in production, reaching its huge size in only 3 or 4 years. Commercially, as a food fish, it is rated at the top of the list.

Freshwater Adaptability

One needs look no farther than Lake Ontario to find promise of success in establishing chinook in freshwater. Numerous chinook plants (mostly fry) were made in streams tributary to Lake Ontario between 1875 and 1882 and again between 1919 and 1925.

In October of 1876, a mature male jack, apparently from the 1875 plant, was taken from Wilmot Creek (MacKay, 1963). The fish was 15 inches long.

Quoting from MacKay, who in turn quotes from a letter from a past Ottawa Director of Fish Culture, Mr. J. A. Rodd, "several were taken in 1877 in Lake Ontario up to 23 inches long and five pounds in weight. In 1881, one grilse was taken in the same lake. In 1922 several were taken in Lake Ontario, some weighing 20 pounds. Others were seen in large numbers in the Port Credit River, the same year, up to 23 pounds. In 1923-24-25, spring salmon were caught in the same river, some up to 30 pounds in weight and with eggs and milt well developed."

MacKay further mentions observing a small spawning run of chinook salmon in Twelve Mile Creek in October, 1927--2 spent females and a ripe male were caught. Four redds were found in shallow, swift water at the foot of a rapids, and a number of salmon eggs were found in these redds by removing a few inches of gravel.

Chinook were also introduced into Michigan waters between 1873 and 1880 during December and January. A total of 1.3 million fry were planted in many inland lakes and the following rivers: Dowagiac, Paw Paw, Flint, Rifle, Detroit, Rouge, Tittabawassee, Chippewa, Raisin, Clinton, Maple, St. Clair, Black (St. Clair County), Thornapple, Muron, St. Joseph, Portage Creek, Boardman, Rapid (Kalkaska County), and Au Sable.

It is little wonder that these Michigan plants failed considering hatchery propagation methods, the size of the chinook stocked, the time of year planted, and how thinly they were spread throughout the state. Western salmon experts have cautioned us that an almost sure route to failure in salmon introduction is to ignore any one of these considerations.

Wholly freshwater and self-sustaining chinook populations now exist in New Zealand. Quoting from a letter from Mr. Pat J. Burstall, Department of Internal Affairs, Wellington, New Zealand, "The chinook

salmon on the east coast of the South Island of New Zealand are both anadromous and landlock. The landlock have access to the sea but do elect to remain in lakes where they complete their life cycle. In both cases no artificial propagation of the stocks takes place."

Eggs for the New Zealand introduction were from Sacramento River (California) stock.

Another self-sustaining landlocked chinook population exists in Lake Cushman, Washington, an impoundment of the North Fork of the Skokomish River. The chinook became established there as a result of plants of fingerlings obtained during salvage operations in the 1940's. The population of adults has never been large, nor the fish big, according to the Chief of Washington Game Department, Cliff Millenbach, but 8 to 10 pounders have been taken since the early 1950's.

Thus, the chance of a successful Michigan introduction of chinook is clearly good. But why introduce it now when we already have the coho?

The Chinook's Potential

Looking beyond the chinook's ability to stand on its own merits as a game and food fish, the best answer to the question posed above lies in the way the chinook's life history meshes with a relatively untouched Michigan resource--its large, warmwater streams.

Warm summer stream temperatures have no influence on the fall chinook; in fact it sustains itself quite nicely in some California streams that completely dry up in the summer.

Since fall chinook ascend spawning streams from September through November, and their young descend to the open water by June, virtually any Michigan stream with ample oxygenation and suitable gravel areas could suit them. This opens up a completely new habitat unusable by steelhead and coho which must spend at least one entire summer in the stream environment. Rivers like the Muskegon, Grand, Kalamazoo, St. Joseph, Thunder Bay, lower Au Sable, and Rifle offer potential as spawning and rearing areas for chinook.

The chinook offers one big advantage over the coho in that it should provide year-round Great Lakes angling, weather and regulations permitting. For example, chinook are taken in good numbers by California sportsmen from February through November, but coho are taken in numbers only during June through September.

There seems little question but what the chinook will extend the scope of Great Lakes fisheries to new and exciting possibilities even in heavily populated southern Michigan. Probably part of its contribution will need to be supported by hatchery propagation. Early experience is needed to weigh the efficiencies offered by its short term hatchery residence (6 months compared to 18 for the coho) in planning future hatchery production.

Pollution and dams are problems on potential chinook streams, but they are not insurmountable ones. Hydroelectric power is even now giving way to nuclear reactors in Michigan, and the enforcement of strong pollution legislation is strengthening. Fortunately, too, adult chinook have amply demonstrated their ability to penetrate formidable reaches of polluted western rivers to reach clean upstream areas. Their determination when confronted with physical obstacles is legend.

Streams to be Stocked

Streams chosen for the first chinook releases and the approximate number to be released in 1967 are:

Big Huron River	- 50,000
Little Manistee River	- 300,000
Muskegon River	- 500,000

These streams were chosen with the thought of taking eggs uppermost in mind. The initial plants cannot be considered as management plants. Once our own egg source is assured, planting in other Michigan streams can begin.

Our present chinook, of Toutle River strain, are a gift from the state of Washington. The Toutle River strain was selected because it thrives in stream habitat and climatic conditions similar to Michigan's. Hopefully, we will continue to get eggs from the west for 3 more years in order to duplicate the chinook's 4-year cycle without a break.

Hatchery expansion is planned and is sorely needed for significant success in the future chinook program. Hopefully, we will be capable of rearing 15 million or more chinook smolts annually by 1976 in addition to our other trout and salmon.

SPLAKE

During the past decade the Province of Ontario has developed a strain of splake (brook trout-lake trout hybrid) with characteristics that will give it an advantage over the lake trout in coping with the vastly changed Great Lakes habitat. The splake were selected for two important characteristics: 1) early maturity to lessen the impact of lamprey parasitism on brood stock and 2) the deep-swimming habits of the lake trout. This stock has now been selected through the fifth generation and the desired characteristics are presumably well established.

At its 1966 annual meeting, the Great Lakes Fishery Commission recommended that lake trout restoration in Lake Huron be carried out with this improved variety. To this end, 2 year-classes of fingerlings for potential brood stock have been transferred from research facilities at Maple, Ontario, to production hatcheries in both Michigan and Ontario. Michigan's portion of these splake are being reared at Marquette Hatchery.

Through the use of the hybrid splake, it is hoped that rehabilitation will be cheaper and quicker, and natural reproduction will be effective more rapidly than if lake trout were used in the Lake Huron restoration program.

The first plantings of selected splake in Lake Huron are planned for 1970, but sufficient hatchery facilities to rear them presents a serious problem.

COASTER BROOK TROUT (Salvelinus fontinalis)

Although they are rare, "coaster" brook trout (brook trout that spend part of their lives in the Great Lakes) have always supported a small but exciting and unique fishery in certain areas of northern Michigan, notably near the mouths of streams along the Lake Superior shore. It is these fish that have long provided most of the brook trout over 2 pounds taken from Michigan waters. Coasters have an indefinable, perhaps sentimental, attraction all their own. Their value is out of all proportion to their numbers and size.

In an attempt to enhance and expand this fishery, plants of fingerling and yearling brook trout were stocked in Keweenaw and Grand Traverse bays in 1965 and 1966.

Field investigations and angler reports indicate that these plants, totaling 205,000 fish, have resulted in some excellent angling. Growth has been good. Fingerlings averaging 3.5 inches in September, 1965, grew to over 7 inches by mid-June of the following year in Keweenaw Bay. Yearlings (5 to 7 inches) reached 10 inches during this same period. In Grand Traverse Bay, 7 inch yearlings planted in January, 1965, averaged a fat 11.6 inches 9 months later. During the 1966 season, several 15 to 17 inchers were taken by anglers. This growth compares favorably with that of native coasters.

In the summer of 1965, a total of 100,000 yearling brooks will be stocked at 4 locations--Grand Traverse Bay, Keweenaw Bay, Eagle River (Copper Harbor), and Marquette. Some of the trout will be tagged and fin clipped to gain knowledge that will guide future management of this valuable species.

SUMMER STEELHEAD (Salmo gairdneri)

In the west steelhead are categorized by anglers as follows: summer steelhead, and all other steelhead. The summer steelhead is, indeed, in a class by itself. It merits its name by the fact that adults ascend certain spawning streams months earlier than other steelhead (often in June) and reside there almost an entire year before spawning the next spring.

It ranks above other steelhead as a sport fish because low, clear, relatively warm summer water conditions seem to magnify the wildness within this fish, demanding the utmost in finesse on the part of the angler. Summer steelhead are to the western angler what Atlantic salmon are to fishermen of the Northeast. Fly fishing is the popular and accepted method of fishing for both.

Western experts have counselled us that some of our streams, notably the Manistee and Little Manistee, Boardman, Sturgeon (Cheboygan County), and Two Hearted rivers, appear well suited to this species.

It is unfortunate that we cannot introduce the summer steelhead now, but this species is extremely demanding of hatchery facilities. As soon as hatchery expansion permits, however, an attempt will be made to establish this fine fish in at least one of our rivers.

ATLANTIC SALMON (Salmo salar)

The Atlantic salmon needs no introduction to the serious fisherman. The quality of sport that this fish offers is legendary.

Its life history, too, is familiar to most. The adults may ascend spawning streams of the Atlantic any month of the year, but most commonly in early summer and fall. Spawning occurs in the fall and the young hatch in early spring. After spending about 2 years in the stream (often 3 or 4), young Atlantic salmon descend to the sea as 5 to 7 inch smolts. They typically return to the spawning grounds 1 to 3 years later as grilse or as salmon (grilse is a term applied to young fish of 3 to 6 pounds). Unlike the Pacific salmon, the adults may live to spawn more than once.

The world's record on rod and reel was caught in Norway and weighed 79 pounds 2 ounces, but the size range for most rivers is 3 to 30 pounds.

Landlocked salmon is the common name reserved for the freshwater counterpart of the Atlantic salmon. Records show that they were once abundant in Lake Ontario.

This fish has a place in our long range fisheries plans. It almost certainly can be established in 1 or 2 carefully selected streams, and should be, in the interests of a well rounded program. The value afforded by one good Atlantic salmon stream in Michigan would be out of all proportion to the numbers and pounds of salmon produced.

Here again, the introduction must await the expansion of hatchery facilities. Funds permitting, we may well have an Atlantic salmon fishery within the next decade.

LAKE RUN BROWN TROUT (Salmo trutta)

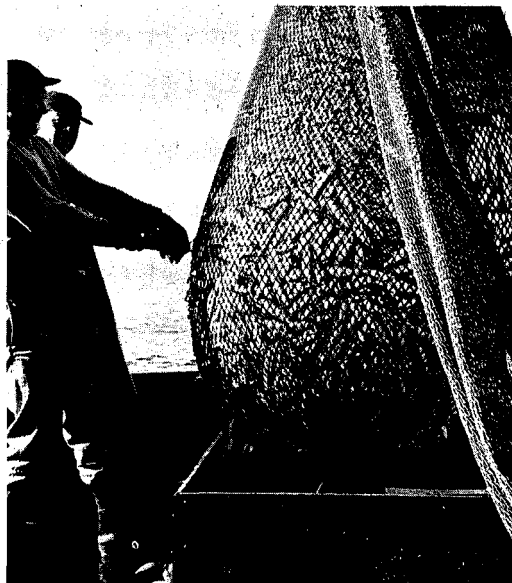
The lake run brown trout, or sea trout, is easily mistaken for a steelhead by the casual angler. Its small head, streamlined body, pale coloration, and lack of red spots belie the fact that it is a brown. To the serious angler its black spots, which are really not spots at all but modified X'es (see photo), and its slightly buff hue give it away as a brown, but it is almost a dead ringer for the Atlantic salmon. Some good, pleasant arguments have rung out in past years.

In Michigan lake run browns are not abundant, but they are more common than catch records indicate. Being browns, they are not easily taken. They are present to some degree in most of our good brown trout streams that flow freely into the Great Lakes. Fair runs occur in the Little Manistee, Manistee, Platte, and Sturgeon rivers in the Lower Peninsula and in the Ontonagon River in the Upper.

Like the Atlantic salmon, they often ascend spawning streams during late spring and summer to await spawning in the fall. Many are taken during the June-July mayfly or "caddis" hatch, but most are caught incidentally by fall steelhead fishermen. They are longer lived than the rainbow, easily reaching 8 years of age and older, and typically spawn more than once.

The special fall brown trout regulations were formulated with the elusive lake run brown in mind. Until more anglers find ways to catch them, lake run browns will not be emphasized in our production plans.

ALEWIFE - Results of a 15-minute drag off Manitowoc, Wisconsin - 3,800 pounds alewife, 300 pounds chubs. (Photo: U.S.F. & W.S., Bureau of Commercial Fisheries).



LAKE RUN BROWN TROUT - Trophy fish of this size run many Michigan streams from the Great Lakes.

ALEWIFE (Alosa pseudoharengus)

At about the time hope for the control of sea lamprey was growing, another marine species--the alewife--entered the Great Lakes and increased at a staggering rate. It has already reached incredible abundance in lakes Huron and Michigan, and numbers are mounting in Lake Superior.

This prolific member of the herring family has brought profound changes, mostly bad, in the fish population structure in the upper Great Lakes, particularly in Lake Michigan. By sheer weight of numbers it has severely affected most species in the lake including perch, herring, chubs, and even minnows. Its value as a commercial fish is low, even though some effort to utilize it is now being made. Commercial production from Lake Michigan reached nearly 30 million pounds in 1966. But despite expansion of the commercial fishery for alewives, nuisance from die-offs of the species has not abated. Beaches are littered and water intakes are plugged.

On the credit side of the ledger, the alewife is an excellent forage fish for high value game and commercial species such as salmon, steelhead, and lake trout. Alewife abundance, coupled with sea lamprey control, presents us with the opportunity to develop strong populations of these high value predator fish in the upper Great Lakes.

Although the alewife's greatest potential is as a forage fish, until this potential is realized the commercial fishery will continue to expand.

WHITEFISH (Coregonus clupeaformis)

This important commercial species, severely damaged by the sea lamprey in lakes Michigan and Huron, is showing signs of a comeback. For the past 3 years commercial production has been on an encouraging upward trend, primarily as a result of improved production in northern Lake Michigan. In 1964, the catch in Lake Michigan reached 500,000 pounds for the first time since 1954. In 1965, it rose to 800,000 pounds, and rose again to 1.2 million pounds in 1966.

In Lake Superior, whitefish production has remained close to normal; in Lake Huron, it remains far below normal. Sea lamprey control in lakes Superior and Michigan has been effective in maintaining this valuable fishery. We hope that extension of control in Lake Huron, coupled with careful assessment of whitefish stocks, will soon restore a stable and productive fishery there.

YELLOW PERCH (Perca flavescens)

For many years perch have been the number one attraction to anglers along the shores of the Great Lakes. The perch, like the walleye, is a prolific species that has always been subject to periodic changes in abundance. In recent years, however, perch fishing from piers and breakwaters along the Lake Michigan shore has been consistently poor while other areas, particularly Saginaw Bay, have continued to produce excellent fishing.

Commercial fishery statistics reveal, surprisingly enough, that over-all perch populations in the Great Lakes have not been severely reduced. Commercial production in Michigan's Great Lakes waters has been above normal for 14 consecutive years, 1953 to 1966. In Lake Michigan, commercial production has been above normal each year since 1952.

Commercial production figures, in this case, are believed to be indicative of abundance since commercial catch per unit of fishing effort has remained relatively stable.

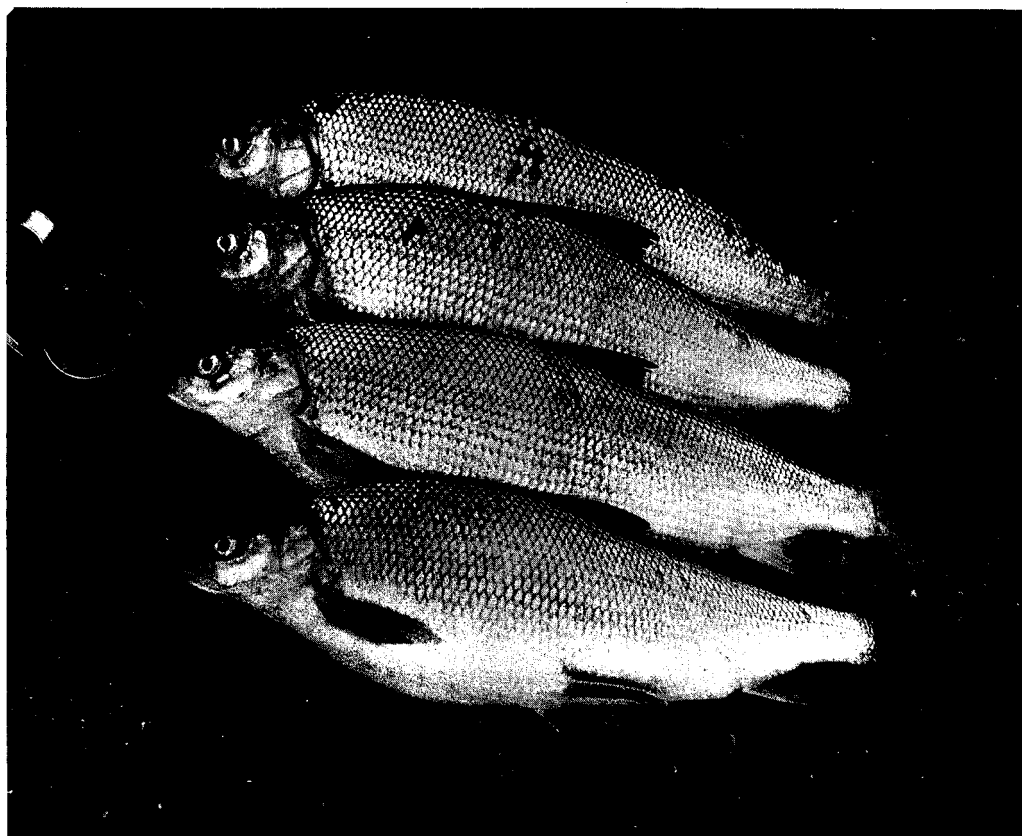
Poor angling in the face of good perch populations strongly suggests that this species has, at least temporarily, adjusted its habits to cope with the recent alewife explosion. Thus, perch are not now present in many areas where they were commonly taken in past years. Some anglers, on tips provided by commercial fishermen, have found good perch angling away from the traditional piers and breakwaters. We can only hope that these esteemed fish will return to their old haunts when conditions in the lakes stabilize.

WALLEYE (Stizostedion vitreum vitreum)

Walleye populations have long been characterized by wildly fluctuating abundance. The fishery for this prolific, long lived species typically depends upon one or two strong year classes. Commercial production Michigan's Great Lakes waters has been far below normal since the mid-1940's with the drop being most apparent in Lake Huron, the major producer.

The walleye seems to be one of the species hardest hit by pollution in Saginaw Bay which historically has provided most of Lake Huron's production.

SMALLMOUTH BASS - Local areas of the Great Lakes provide good fishing for this traditional game fish.



WHITEFISH - Basically a commercial species, now being sought by more and more sport fishermen.

SMALLMOUTH BASS (Micropterus dolomieu)

The smallmouth bass is an esteemed sport fish that provides high quality angling in certain areas of the Great Lakes, particularly in the northeastern zone of Lake Michigan and in Lake St. Clair. During 1966, Michigan anglers landed 84,000 smallmouth bass from Lake St. Clair alone. Concentrations of this species are scattered along the Great Lakes shoreline, usually in areas of submerged rock cover.

Exploitation of these populations is now relatively low, partly because the good fishing areas are unknown to the average angler. Early tales of smallmouth bass fishing in the Great Lakes tell that everyone caught their limit of bass, and that the fish ranged from 1 to 6 pounds in weight. The prospect of wading the Great Lakes shoreline for bass, like surf fishing the ocean, apparently captured the imagination of early sportsmen. There was, and still is, much publicity about wading and boating the Great Lakes for smallmouth. However, bass fishing today, at most points along the Great Lakes shoreline, is not of the quality described for earlier years.

Implementation of the new Great Lakes program will include studies on smallmouth bass, and results should guide us to better management of these fine game fish.

NORTHERN PIKE (Esox lucius)

Northern pike occur throughout the Great Lakes but only in shallow bay areas like Saginaw Bay are they abundant. Sport fishing for big northerns is excellent in some areas of the Great Lakes.

The species was removed from the commercial fish list in 1965 to stimulate sport fishing. Destruction of the habitat through pollution and dredging and filling operations threaten populations of pike as well as muskellunge. Programs designed to define and protect valuable habitat and to determine the types of regulations needed to manage northern pike will continue into the future. In areas where habitat has already been lost, the construction of pike spawning marshes may be effective in restoring pike populations.

Studies on distribution and cause of red sore disease in northern pike are continuing at the fish pathology laboratory in Grayling. An informational bulletin on red sore has been prepared to answer the many letters inquiring about this disfiguring disease of the pike. To prevent the spread of this disease, pike are not being transferred from waters known to have red sore and all transfers are being held to a minimum.

MUSKELLUNGE (Esox masquinongy)

Muskellunge occur throughout the upper Great Lakes but only in Lake St. Clair are they abundant. A creel census of Lake St. Clair, made during 1966, showed that the lake supports an extremely intensive sport fishery. A total of 888,000 angler days were expended on this body of water in 1966. About 34,000 angler days were spent in pursuit of the muskellunge on Michigan's area of the lake alone, resulting in 12,000 muskies being landed. The largest weighed 32 pounds, but most were in the 8 to 10 pound class.

Destruction of habitat through pollution and dredging and filling operations, and over-fishing are real threats to the now thriving muskellunge population in Lake St. Clair. Programs designed to define and protect valuable habitat and to determine the regulations needed to protect muskellunge from over-fishing will be continued in 1967.

FACILITIES

Hatcheries

Approximately 4 million coho and chinook salmon, steelhead, brook and rainbow trout from fingerling to yearling size are now being produced in Department hatcheries for the Great Lakes and anadromous fishery. Also some 3.5 million lake trout (splake will soon be included) are being produced for the Great Lakes in U. S. Fish and Wildlife Service hatcheries. Brood fish to furnish eggs for the federal hatcheries are maintained by the Department.

Tody and Tanner (1966) outlined Michigan's needs for hatchery production of anadromous fish based on their best estimates of natural stream productivity and of Great Lakes potential. Long range plans detailing our expansion and fiscal needs in this area will soon be forthcoming in another report.

These plans provide for egg taking stations, assessment weirs, and hatcheries capable of producing 30 million steelhead and salmon annually by 1976.

All existing hatchery stations are now at maximum capacity. To meet the production goal, 3 to 5 new hatcheries, costing an estimated 10 million dollars, are required. If the desired fishery is to be realized in 10 years (1976), the proposed hatcheries must be funded by fiscal 1968-69. Time requirements involve consecutively 1 year for design, 2 years for construction, 1 year of shakedown prior to operation, and from 3 to 5 years to complete one life cycle of the fish produced before they are available to the fishery.

The first new hatchery facility, planned for Platte River, will have a capacity for over 7 million salmon and trout, and if funds are made available, it will be in production by 1970. Meanwhile, available facilities will be geared up, to the extent feasible, for a maximum production of about 5 million anadromous fish.

Anticipating hatchery construction, weirs and anadromous fish egg taking stations have been programmed and will be constructed in 1967. Structures have been funded for the Little Manistee, Platte, and Big Huron rivers. Existing hatchery facilities are being remodeled at Bear Creek and Thompson Creek which will add to the egg taking capacity. Collectively, these stations are expected to provide an adequate egg stock for a 30 million fish production goal.

A facet not to be overlooked in the plans for weirs is that they will also serve as evaluation tools. Traps for counting migrating smolts as well as adults are incorporated into these facilities. They will contribute substantially to our knowledge of natural smolt production, and survival of smolts to adults, knowledge that will help us more efficiently manage these species in the future.

Dams, Barriers, and Fish Passage

To a program so strongly oriented toward anadromous fish, the importance of dams and natural barriers cannot be overstated. Some of our finest spawning areas for migratory fish now lie beyond their reach. Areas for stream fishing for salmon and steelhead are already critically limited.

Field personnel have completed a preliminary inventory of streams with anadromous fish potential. All barriers have been pinpointed and described. Miles of spawning, rearing and fishing stream, both above and below the barriers, are now being recorded so priorities for barrier removal or fish passage can be set. Although Michigan has many suitable streams, the total area is very limited, when contrasted to the vast areas of the Great Lakes. There is no question but what natural reproduction must be heavily supplemented by a program of hatchery based artificial propagation.

Natural reproduction of anadromous fish will be extended to the maximum possible extent, but care must be exercised to protect many excellent brook and brown trout streams which now support a most valuable fishery for wild fish.

We are already moving on a barrier removal and fish passage program. Newaygo Dam on the Muskegon River and Homestead Dam on the Betsie River have come under Department control in the past 6 months. This will free 32 miles of high quality big water for anadromous fish and fishing.

New proposals for dam construction are being viewed critically as they relate to anadromous fish. We plan to actively seek means of overcoming key obstacles to fish migration on our streams of highest potential. To appreciate the need and the opportunity afforded by this approach, one need only look at a map of Michigan. Rivers like the Au Sable, Muskegon, Grand, Kalamazoo, St. Joseph, Manistee, Boardman, Thunder Bay, Presque Isle, Black, and Ontonagon could, if opened up, increase our natural anadromous fish production and fishable stream area many fold.

Fiscal requirements for fish passage have not yet been accurately assessed. Construction costs are high, but part of the job can be handled by local communities and by private parties who own dams. At this time we estimate Department fiscal needs to range from 5 to 10 million dollars in the next 10 years. Priority projects will be established on an annual basis as the program develops.

Public Access and Fishing Facilities

Within 10 years (1976) we expect a sizeable sport fishery to develop on the open waters of the Great Lakes. Eventually, thousands of boats of all sizes will be involved. Charter boats are returning to Lake Superior for lake trout, and will return to Lake Michigan as rapidly as an attractive fishery is developed. Marinas and harbors of refuge for Great Lakes boats are being planned by the Michigan Waterways Commission. The combined fleet of private and charter craft will predictably add many millions of dollars annually to the state's economy. Motels, restaurants, fish packing services, bait shops, and a host of other essential tourist and fishermen facilities will be expanded by private enterprise. Studies are now being organized to accurately measure these economic aspects.

The stream fishery for anadromous species is already developing rapidly. Last fall for example, over 1,400 fishermen were concentrated on the Manistee River on a single weekend, fishing for steelhead and the first small run of Michigan salmon. Crowded fishing conditions, trespass on private lands, traffic congestion, and a lack of parking areas were evidence of things to come. Public access and facilities on fishable anadromous streams must be provided as the program develops. Land costs can be expected to increase rapidly. The Department plans to initiate surveys to determine land and development requirements in 1967.

We shall make every effort to encourage local communities to participate in providing facilities. At this time we estimate that fiscal needs for land acquisition and development in the next 10 years will be approximately 1 million dollars annually on behalf of the Department.

Great Lakes Operations

Fish populations in the Great Lakes will never be static, and the stocking of salmonid fishes in large numbers will only accelerate changes. The habits of Pacific salmon in their new Great Lakes environment are as yet unknown. Knowledge of prey-predator relationships, fish movements, concentrations of abundance, relative abundance between species, rates of growth and mortality, and early success of year classes are all important for successful management of all Great Lakes fishes. This information is useful in assisting the sport fishery, and it is essential for determining a proper utilization of commercial species--e.g., establishment of quotas by species, time, and area.

Harvest of Great Lakes fish is at present completely dominated by the commercial fishery. But, even now, considerable controversy surrounds commercial gill net operations as they affect the sport fishery. It can be expected that conflict between sport fish and commercial fish interests will intensify as the Great Lakes program develops. Factual biological data are required to rationally solve these problems. Plans call for a strengthening of available data on a continuing basis.

A 60-foot boat equipped with fish finding equipment and all types of netting gear has been contracted for completion late in 1967. It is planned to establish an initial Great Lakes station at Charlevoix if the discontinued U. S. Fish and Wildlife Service hatchery buildings and surplus U. S. Coast Guard lands can be obtained by transfer to the Department.

Initially this first survey vessel, supplemented by temporary use of law enforcement patrol boats and possible contracted activities by commercial fishermen, will be programmed to serve all of the upper Great Lakes. In the near future additional Great Lakes stations, complete with adequate boats and gear, will be planned for Lake Superior and Lake Huron operation respectively. It is estimated that these additional surveillance stations will cost \$500,000 in capital outlay funds for land, buildings, and boats.

SUMMARY

Status Report on Great Lakes Fisheries

1. Federal lamprey control now allows salmonid management in lakes Superior and Michigan, and will by 1971 in Lake Huron.

2. All available evidence indicates a high degree of success in attempts to build populations of steelhead, coaster brook trout, and lake trout. Growth and survival of planted fish have been most satisfactory, and both wild and planted fish are building population abundance. However, except for lake trout, management efforts have been very limited.

3. Hatchery propagation and first year success of coho in the Great Lakes have exceeded all expectations. Good viable second generation eggs have been taken. One more year (1967) is required to assess adult runs, and 2 years (1968) their ability to reproduce in the natural environment.

4. Chinook salmon eggs have been received. First plants of fish will be made in 1967. Chances for success are predictably good.

5. The 5 salmonid species now available--steelhead, brook trout, lake trout, coho and chinook salmon--coupled with the potential of splake, summer steelhead, and Atlantic salmon assure an adequate working stock of salmonid species to build a strong population of Great Lakes predators.

6. Alewife abundance in lakes Michigan and Huron is very high and creates a serious problem in die-offs along beaches, clogged water intakes, and as a depressant to more desirable species of fish.

7. The alewife has vast potential as forage for high value fish especially salmonids. Any control program should emphasize conversion by predators for maximum economic gain. Utilization for industrial purposes (fish meal, pet food, etc.) promises only low economic yield. In the long range view, maximum effort must be expended to utilize the forage populations efficiently to produce high value sport and food fishes.

8. Whitefish, a species primarily of value to the commercial fishery, shows rapid recovery following lamprey control.

9. Northern pike have been removed from the commercial list, joining the muskellunge, largemouth and smallmouth bass, and sunfishes as sport fishes. Collectively these species are of great importance in the shallow, relatively warm shore and bay areas of the Great Lakes. Information upon which to base effective management procedures is a serious need at the present time.

10. Yellow perch and walleye are important to both the sport and commercial fishery. Walleye stocks are at a very low level. Yellow perch angling is spotty, but commercial catches are above normal. Information on these species is also a serious need.

11. Approximately 4 million coho and chinook salmon, steelhead, brook and rainbow trout from fingerling to yearling size are now being produced in Department hatcheries for the Great Lakes and anadromous fishery.

12. Some 3.5 million lake trout (splake will soon be included) are being produced for the Great Lakes in U. S. Fish and Wildlife Service hatcheries. Brood fish to furnish eggs for the federal hatcheries are maintained by the Department.

13. The paucity of sport fishing in the Great Lakes coupled with the impressive first year success of coho salmon has triggered overwhelming public demand for a similar fishery all around the state. To carry out the anadromous fish program, to provide an attractive fishery at a conservative level for coho, chinook salmon, and steelhead, our 10 year hatchery production goal is 30 million fish. To meet this goal, 3 to 5 new hatcheries, costing an estimated 10 million dollars, are required. If the desired fishery is to be realized in 10 years (1976), the proposed hatcheries must be funded by fiscal 1968-69.

14. Anticipating hatchery construction, weirs and anadromous fish egg taking stations have been programmed and will be constructed in 1967. Structures have been funded for the Little Manistee, Platte, and Big Huron rivers. Existing hatchery facilities are being remodeled at Bear Creek and Thompson Creek which will add to the egg take capacity. Collectively these stations are expected to provide sufficient eggs to meet our production goal. These facilities will also serve to evaluate the success of hatchery plants of fish, and to measure the contribution of natural reproduction.

15. To a program so strongly oriented toward anadromous fish, the importance of dams and natural barriers cannot be overstated. Some of our finest spawning areas for migratory fish now lie beyond their reach. Areas for stream fishing for salmon and steelhead are already critically limited.

16. Field personnel have completed a preliminary inventory of streams with anadromous fish potential. All barriers have been pinpointed and described. Miles of spawning, rearing and fishing stream, both above and below the barriers, are now being recorded so priorities for barrier removal or fish passage can be set.

17. Natural reproduction of anadromous fish must be extended to the maximum possible extent, but care must be exercised to protect many excellent brook and brown trout streams which now support a most valuable fishery for wild fish. There is no question but what natural reproduction must be heavily supplemented by hatchery propagation.

18. We are already moving on a barrier removal and fish passage program. Newaygo Dam on the Muskegon River and Homestead Dam on the Betsie River have come under Department control in the past 6 months. This will free 32 miles of high quality big water for anadromous fish and fishing.

19. New proposals for dam construction are being viewed critically as they relate to anadromous fish. We plan to actively seek means of overcoming key obstacles to fish migration on our streams of highest potential. Priority projects will be established on an annual basis as the program develops.

20. Within 10 years we expect a sizeable sport fishery to develop on the open waters of the Great Lakes. Charter boats are already returning to Lake Superior for lake trout, and will return to Lake Michigan as rapidly as an attractive fishery is developed. The combined fleet of private and charter craft will predictably add many millions of dollars annually to the state's economy. Studies are now being organized to accurately measure these economic aspects. Marinas and harbors of refuge for Great Lakes boats are being planned by the Michigan Waterways Commission.

21. The stream fishery for anadromous species is developing rapidly. Crowded fishing conditions, trespass on private lands, traffic congestion, and a lack of parking areas are already in evidence. Public access and facilities on fishable anadromous streams must be provided. At this time we estimate that fiscal needs for land acquisition and development in the next 10 years will be approximately one million dollars annually.

22. On the Great Lakes knowledge of prey-predator food chains, fish movements, concentrations of abundance, relative abundance between species, growth and mortality rates, and early success of year classes are all important for successful management.

23. It can be expected that conflicts between sport fish and commercial fish interests will intensify as the program develops. Factual biological data is required to rationally solve these problems.

24. To obtain these data a 60-foot survey vessel equipped with fish finding equipment and all types of netting gear has been contracted for completion late in 1967. Plans also call for the establishment of an initial Great Lakes station at Charlevoix if the discontinued U. S. Fish and Wildlife Service hatchery buildings and surplus U. S. Coast Guard lands can be obtained by transfer to the Department. In the near future additional Great Lakes stations will be planned for Lake Superior and Lake Huron.

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