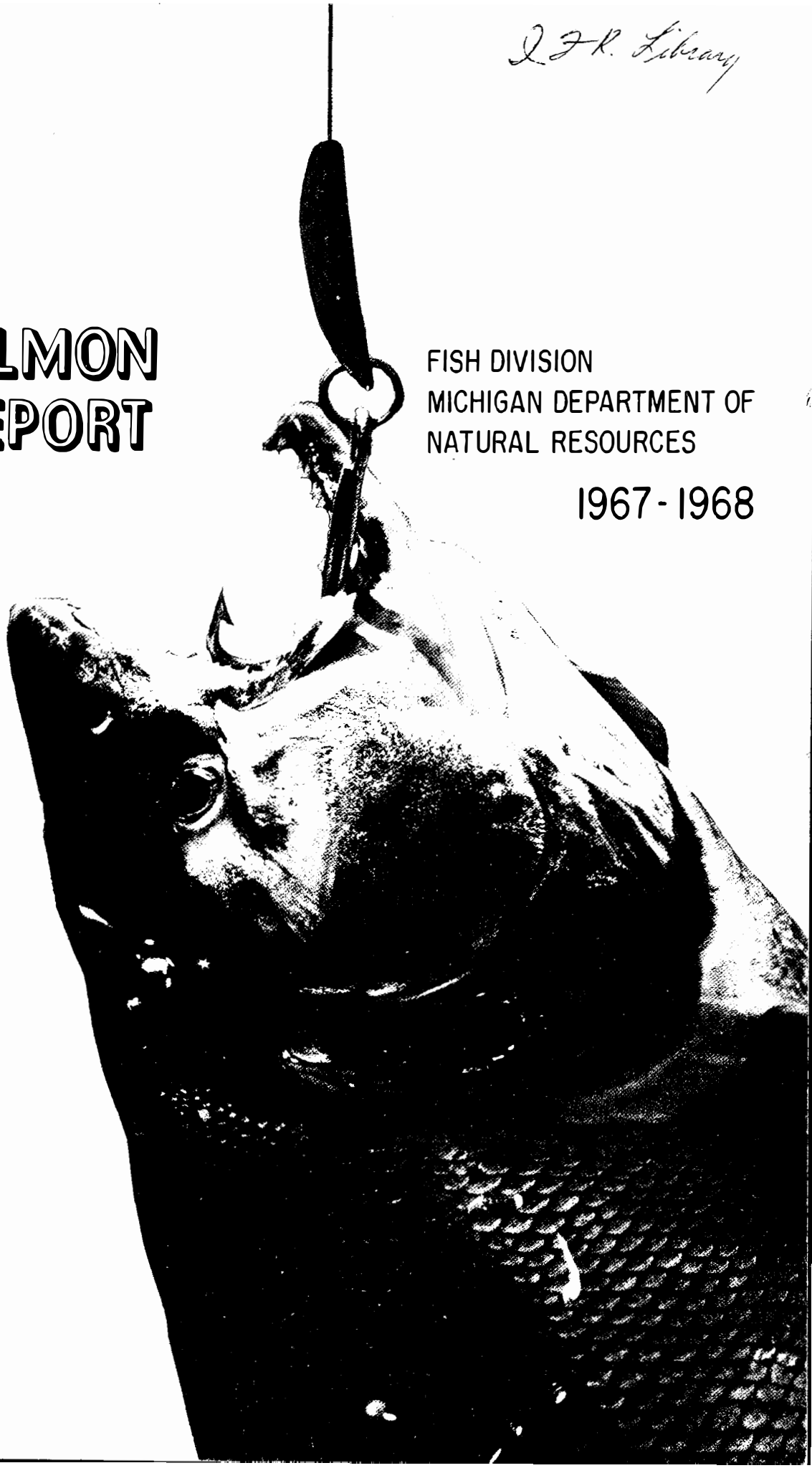
COHO SALMON STATUS REPORT

FISH DIVISION
MICHIGAN DEPARTMENT OF
NATURAL RESOURCES

1967-1968



Fish Management Report No. 3

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COHO SALMON

STATUS REPORT

1967-1968

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Michigan Department of Natural Resources

Fish Division

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MICHIGAN COHO SALMON

WITH FISH CHIEF WAYNE H. TODY

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INTRODUCTION AND RESUME', 1964-1966

Prior to 1940, lakes Huron, Michigan, and Superior supported a 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 twelve years later the Lake Superior fishery was closed. The lake trout was not the only predator species to suffer from the lamprey--all were affected. Commercial fishermen who 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.

To add to these changes, the United States Bureau of Commercial Fisheries, under direction of the Great Lakes Fishery Commission, developed a selective lamprey poison during the late 1950's. Since then, lamprey control operations and a lake trout restocking program have been undertaken first on Lake Superior, then Lake Michigan. As a result, prospects for control of lampreys and the rehabilitation of lake trout appear bright. 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 three decades. Many species have disappeared forever.

Alewife abundance struck Michigan's fisheries men as an opportunity--that of using this efficient but commercially worthless forage fish as food for valuable sport and commercial fish. Since the bottom dwelling lake trout and steelhead trout were only a partial answer, Michigan looked elsewhere for a predator.

After a thorough study, the Pacific salmon showed promise enough to justify a trial.

From one million coho eggs supplied by the Oregon Fish Commission in the fall of 1964, 850,000 survived to the yearling stage (4 to 5 inches) and were planted in the spring of 1966. Specifically, 394,760 were released into Bear Creek, a tributary to the Manistee River, and 264,000 were planted in the Platte River in late March; and the Big Huron River received 192,400 yearling salmon in mid-May.

During the last week of August, 1966, incidental commercial catches of coho in Lake Michigan near Manistee increased, indicating that a fall

run of "jacks" 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. 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.

Coho jacks trapped at the Bear Creek weir averaged 18.7 inches in length and 2.2 pounds in weight; the largest fish was 23.9 inches in length and weighed 5.3 pounds.

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 hatched to produce 22,000 apparently normal fry.

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--jack, 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 creel limit was then 10 pounds and one fish).

Coho began to enter the Platte River during the first week of September, and first reached the barrier trap on September 10. By early February, 1967, 1,056 salmon had entered the Platte River trap. These fish, all mature males, averaging 16.2 inches in length 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.

Anglers caught approximately 400 coho jacks in the lower Platte River and in lakes near its mouth.

In late September, coho began to enter the Huron River and reached the electrical barrier in early October. The run apparently was quite small.

Coho caught in the Huron 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.

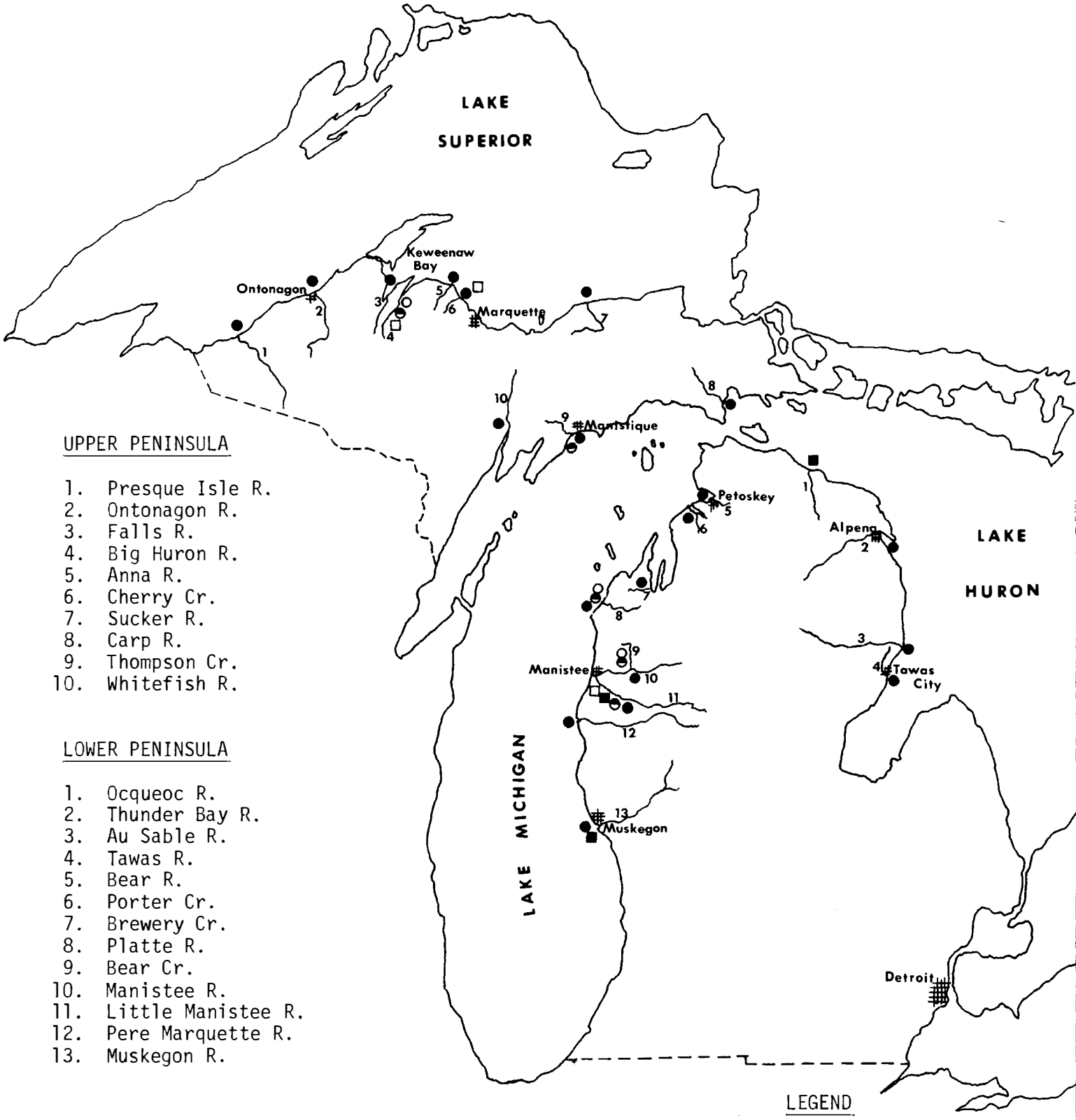
Shortly after the first of October, anglers began catching a few coho in the lower river, and continued to do so until the close of the season (November 30).

This impressive success the first year triggered public demand for salmon all over the state. However, the salmon planting program had to be geared to establishing an egg source independent of western egg supplies. Thus, 1967 plants were restricted to a few of Michigan's best streams where adults could be trapped, held to maturity and stripped of their eggs.

The salmon story to this point has been reported by Tody and Tanner (1966) and Borgeson and Tody (1967).

Thanks to salmon, 1967 and 1968 were hectic years for Michigan's fishermen and more so for its fisheries workers. This is a brief account of those two years.

MICHIGAN SALMON PLANTING AREAS, 1966-68



UPPER PENINSULA

1. Presque Isle R.
2. Ontonagon R.
3. Falls R.
4. Big Huron R.
5. Anna R.
6. Cherry Cr.
7. Sucker R.
8. Carp R.
9. Thompson Cr.
10. Whitefish R.

LOWER PENINSULA

1. Ocqueoc R.
2. Thunder Bay R.
3. Au Sable R.
4. Tawas R.
5. Bear R.
6. Porter Cr.
7. Brewery Cr.
8. Platte R.
9. Bear Cr.
10. Manistee R.
11. Little Manistee R.
12. Pere Marquette R.
13. Muskegon R.

LEGEND

- o 1966 Coho Plants
- ◒ 1967 " "
- ● 1968 " "
- □ 1967 Chinook Plants
- ■ 1968 " "

LAKE MICHIGAN RESULTS - 1967

Commercial Catches and Miscellaneous Recoveries

Skeptics who were once sure the coho would not survive in the Great Lakes became convinced after being confronted with a very real jack run that either the salmon would die or disappear during their first winter in the Great Lakes.

When ice broke up in Lake Michigan in the spring of 1967, the skeptics were answered. A handful of Indiana commercial fishermen landed 20,000 four-pound coho between March and May. Understandably, this raised some eyebrows around the Great Lakes, but as soon as it could act, the State of Indiana closed down the commercial operation. Unfortunately, anglers did not take advantage of these spring salmon concentrations in southern Lake Michigan.

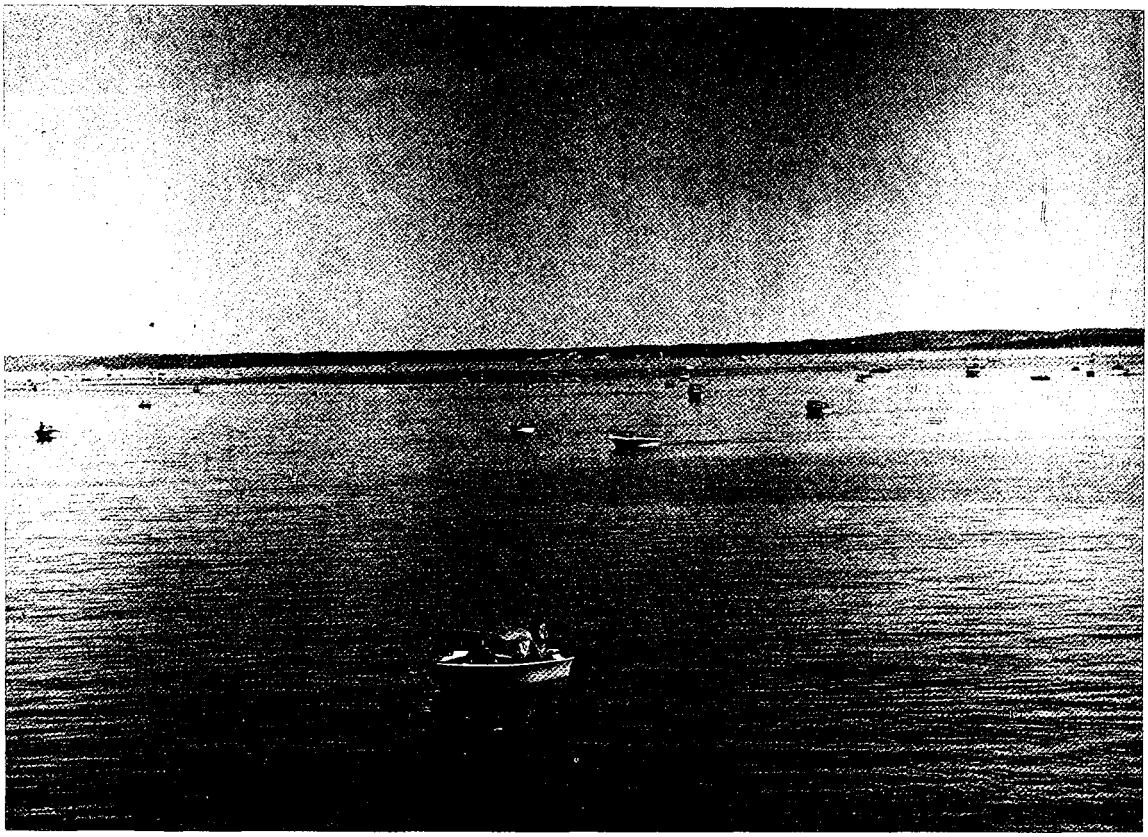
During the summer of 1967, Lake Michigan beaches were plagued by an unprecedented alewife die-off and amid these masses of silvery baitfish, an occasional salmon (about 40 total) was found dead or in its death throes. Autopsy usually showed kidney disease to be the cause of death and this news prompted fisheries men to wonder how many salmon might be lying dead on the bottom of Lake Michigan.

From the size and the location of the bodies, some inferences on growth and migration could be made. In mid-July seven salmon were found on the beaches between Saugatuck and Muskegon. Their average weight was seven pounds. During the first two weeks in August another seven fish were found, this time all north of Muskegon, between Pentwater and Manistee. These averaged ten pounds. On August 25, a 16 pounder was found off Manistee. Up to this time there was little or no sport fishing activity on the lake.

1967 Lake Michigan Sport Fishery

During the last week in August, Department of Conservation (now Department of Natural Resources) survey nets disclosed heavy concentrations of big salmon near Manistee.

News of the Department's netting success reached fishermen's ears in time for them to plan for the Labor Day weekend. At the same time, tall tales of pioneering salmon fishermen reached the grapevine. This seemed to be what Michigan's fishermen were waiting for. Thousands descended upon the Manistee-Frankfort area on Labor Day weekend, September 1-3, 1967. The weather was warm, clear, and calm. Lake Michigan was smooth as glass. To complete the script, the coho seemed eager to greet Michigan's fishermen. By the time the three day weekend was over, 6,000 salmon averaging over 12 pounds each and ranging to 22 pounds had been taken. Fifteen to 18 pounders were common. Michigan fishermen could not believe what was happening. During the month of September, 26,000 salmon were caught from Lake Michigan in 72,000 angler-days. Motels filled for 50 miles around,



Trolling for salmon on Lake Michigan.

Crowds taxed capacity of available facilities.

parking lots were hastily constructed, fishermen sometimes waited in a mile-long line to launch a boat, restaurants ran out of food, tackle dealers ran out of tackle, and gas stations ran out of gas. Retail sales jumped 11.9 million dollars during the three month fall season in the 11 county area infected with salmon fever. Michigan's "coho country" was born.

1967 Spawning Run in Lake Michigan's Streams

During the third week in September, large numbers of coho began entering the Manistee River and its tributary, Bear Creek. Fishermen followed in such numbers that Bear Creek had to be closed on October 7 to prevent abuse of the habitat and assure the survival of enough salmon for an egg source. As it turned out, there needed to be no concern about the latter.

The Platte River run commenced later than Bear Creek's (this is believed due in part to the fact that the lower Platte flows through Platte Lake and hence cools more slowly in the fall, and partly because of the fisherman activity and harassment of salmon at the mouth of this clear, shallow stream). Finally, on October 9 the Platte River and Platte Bay were closed to fishing. On that same day a heavy run of fish entered the stream and 1,242 were counted at the Department weir, 20 miles upriver.

Angling activity was hectic on the Manistee River from mid-September through November and on Loon and Platte lakes during October. Creel census figures indicate that approximately 7,000 adult salmon and 2,500 jacks (1967 plant) were taken in 84,000 angler-days on these two drainages. The total sport catch for 1967, therefore, was 40,000 fish of which 33,000 were adults averaging 12.1 pounds each. Total fishing effort was estimated at 159,000 angler days.

Even though the Platte River run did not begin until October 9, it developed much more rapidly once underway and peaked nearly a week earlier than the Bear Creek run.

The vanguard of adults arrived at the Platte River weir on October 9 (1,242) and by the end of the week over 4,000 had been sorted.

At Bear Creek weir, the initial surge of coho arrived on October 16, (822) and nearly 2,000 had been sorted by the following weekend.

From this beginning, periods of run-off precipitated new runs of salmon through January.

Following is a breakdown of information gathered during the 1967 fall run of adult salmon:

(a) Total fish in the sample:

PLATTE RIVER - 968 fish weighed and measured
8,552 fish sexed and checked for lamprey scars and fin clips

BEAR CREEK - 363 fish weighed and measured
2,283 fish sexed and checked for lamprey scars and fin clips

(b) Sex ratio for the above sample:

PLATTE RIVER - 54.4% female

BEAR CREEK - 55.9% female

(c) Average length and weight by sex:

	MALE	FEMALE	COMBINED
PLATTE RIVER -			
Length	29.0"	28.9"	28.9"
Weight	10 lbs. 0 oz.	10 lbs. 3 oz.	10 lbs. 1 oz.
BEAR CREEK -			
Length	29.1"	29.1"	29.1"
Weight	9 lbs. 14 oz.	10 lbs. 3 oz.	10 lbs. 1 oz.

Fish over 23 inches in length were considered 3-year-old adults (of the females measured, only two were less than 23 inches. In 1966, of the 1,085 jacks measured, only one was over 23 inches).

(d) Incidence of lamprey scarred fish:

PLATTE RIVER - 4.1%

BEAR CREEK - 3.2%

(e) Fin-clipped salmon made up 18.9 per cent of the 1966 release at the Platte River and 16.7 per cent of the 1967 adults returning to the weir. No fin-clipped salmon were found at the Bear Creek or Little Manistee River weirs.

(f) Summary of data on adult salmon recovered at Department weirs:

TRAP LOCATION	TOTAL NUMBER	TOTAL POUNDS	AVERAGE WEIGHT LB.	AVERAGE WEIGHT OZ.	PER CENT RETURN	NUMBER PLANTED 1966
Platte River	51,574	509,120	10	1	19.5	264,596
Bear Creek	101,115	1,021,150	10	1	25.9	394,760
Little Manistee R.	35	353	10	0	--	strays
	152,724	1,530,623			23.3	659,356

The 35 stray adults trapped at the Little Manistee River weir consisted of 14 males and 21 females, all of which were released upstream.

Use of 1967 Salmon Run

In early October, the Department announced a five-point plan to make the best possible use of surplus salmon reaching the weirs.

1) About 5,000 mature coho adults would be needed to collect some 7.5 million eggs.

2) To encourage natural reproduction, 2,000 adults were to be released above the Bear Creek weir in addition to an undetermined number that would remain below the weirs in the Bear Creek and Platte River systems.

3) A dozen northern Michigan streams would receive approximately 15,000 spawners in an attempt to gain knowledge of the success of coho natural reproduction in Michigan streams.

4) Some of the surplus salmon of good eating quality would go to state institutions.

5) The remainder could be sold.

1967 Egg Take

In accordance with this plan, some 8 million eggs were taken between October 10 and October 26 and moved to hatcheries around the State. Optimum ripeness was not reached until late October.

Upon request, 1.1 million eggs were made available to Wisconsin (300,000), Ohio (200,000), Pennsylvania (300,000), New York (100,000), and the Province of Ontario (200,000).

Two thousand salmon were allowed to pass through the Bear Creek weir for natural reproduction and 17,000 were transferred to ten representative streams in an attempt to determine the success of coho natural reproduction in representative Michigan streams and to learn what effect salmon spawning activity and naturally produced young salmon might have on "native" trout in Michigan streams. As a precaution, most stream sections chosen to receive salmon transfers were above impassable barriers that would prevent offspring from returning once they moved down to the Great Lakes.

Following is a planting record for the transfer operations:

STREAM	COUNTY	NUMBER
Pine River	Wexford	5,008
Manistee River	Crawford	2,309
Boardman River	Grand Traverse	3,111
Mitchell Creek	Grand Traverse	96
Yuba Creek	Grand Traverse	100
Boyne River	Charlevoix	1,896
Bear River	Charlevoix	960
Ocqueoc River	Presque Isle	1,069
AuGres River	Iosco	1,844
Carp River	Mackinac	624
	Sub-total	17,017
(State of Indiana)		198
	TOTAL	17,215

Sale, 1967

Sale of salmon for human consumption commenced on October 13 and continued through November 24. During this period 785,000 pounds of salmon were sold in lots ranging from 500 pounds on small pickups to 34,000 pounds on semi-trailers. In addition, 11,230 pounds of salmon were given to the Traverse City State Hospital, Pugsley and Sauble Prison Camps, and the Nokomis Boys Camp.

On November 24 the decision was made to halt the sale of salmon for human consumption. Sealed bids were then accepted to market the remaining surplus for animal food. Scher-Freeze, Inc. of Fennville, Michigan, secured the original bid but after receiving 219,510 pounds relinquished their contract to the Lewis Fur Farms of Rodney, Michigan. An additional 314,740 pounds were loaded for Lewis for a total of 534,250 pounds. To insure that none of these fish would be diverted to the human market, the trucks were sealed after loading and the seals were inspected upon arrival at the processing plants.

In summary, 1967 distribution of adult salmon from weirs was as follows:

Platte River

	Number	Pounds
Transfer	10,363	103,630
Sold (dressed)	3,313	26,509
Sold (in round)	36,275	362,751
Miscellaneous (accountable)	1,123	11,230
Miscellaneous (unaccountable)	500	5,000
	51,574	509,120

Bear Creek

	Number	Pounds
Transfer	5,852	68,520
Sold (in round)	92,963	929,630
Miscellaneous (accountable)	300	3,000
Release above weir	2,000	20,000
	101,115	1,021,150

Little Manistee River

Release above weir	35	353
COMBINED TOTAL	152,724	1,530,623

Straying of Salmon to Unplanted Streams, 1967

Field surveys showed that some straying salmon entered most Lake Michigan streams between the Straits of Mackinac on the north and the Muskegon River on the south, including tributaries to Lake Charlevoix. Most of these streams received runs numbering less than 100 fish, but rivers nearest the planting sites (e.g., Crystal, Leland, and Betsie rivers) had runs of several hundred salmon. Thus, though many streams received at least a few salmon the total number that strayed was not great, perhaps totalling 10,000 fish. Three salmon were reported from Lake Huron proper (one from Saginaw Bay, two from Georgian Bay), two from Lake St. Clair, and two from Lake Erie.

It is also known that substantial numbers of salmon died in the Manistee River, Bear Creek, and the Platte River--never reaching the weirs. The true figure is unknown but our judgement places it over 5,000 but less than 30,000 with 10,000 being a reasonable figure.

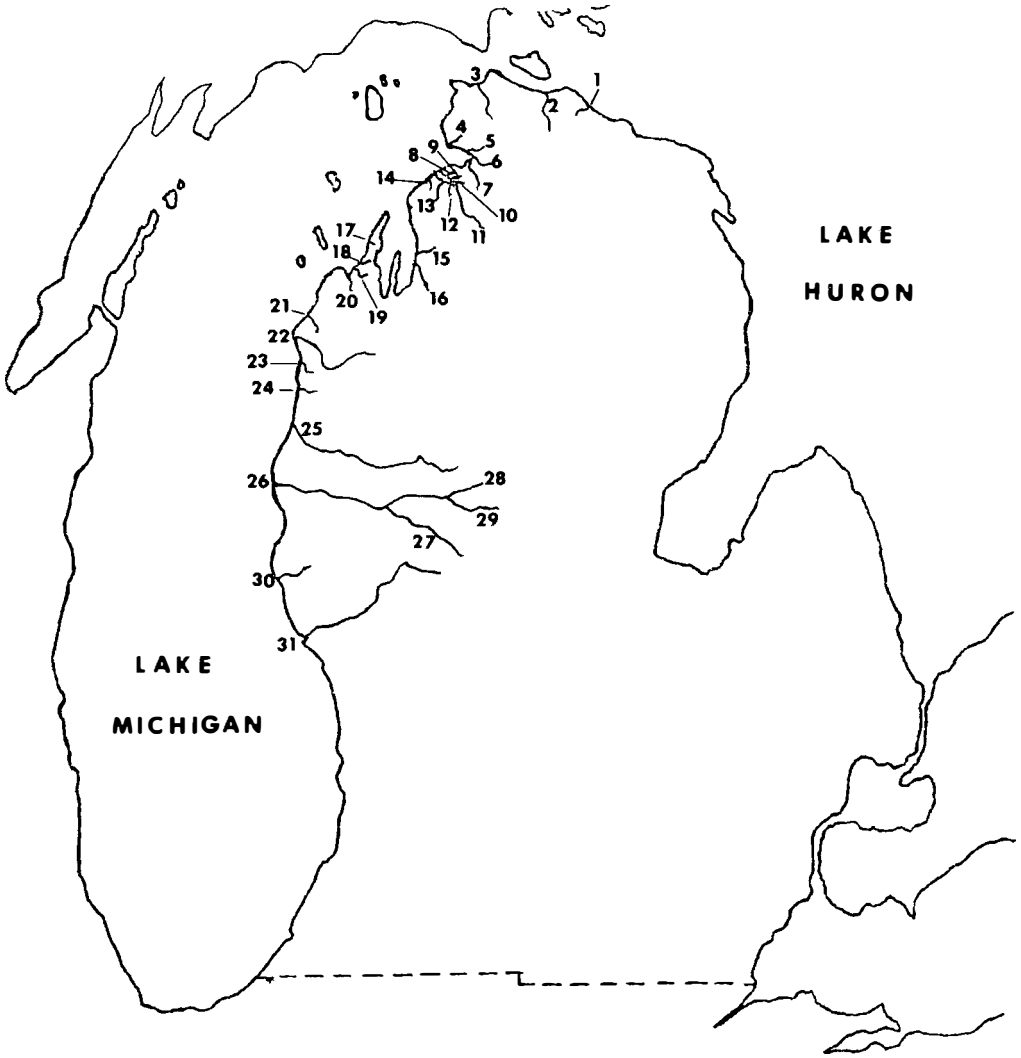
Total Returns from 1966 Coho Plants, Lake Michigan

	Number	Pounds
Jack weir returns, 1966	3,760	7,947
Adult weir returns, 1967	152,724	1,530,623
Jack sport catch, 1966	1,500	3,000
Adult sport catch, 1967	33,300	401,621
Gill netting, 1967 (Indiana)	21,000	84,000
	212,284	2,027,191

Number planted --- 659,356

Per cent return accountable --- 32%

Lake Huron and Lake Michigan Straying of Adult Coho Salmon - 1967



1. Black Mallard Creek
2. Cheboygan River
3. Carp Lake River
4. Five Mile Creek
5. Roaring Brook Creek
6. Tannery Creek
7. Bear River
8. Woods Creek
9. Horton Creek
10. Dyer Creek
11. Boyne River
12. Page Creek
13. Porter Creek
14. Unnamed Creek
15. Elk River
16. Yuba Creek
17. Leland River
18. Good Harbor Creek
19. Shalda Creek
20. Crystal Creek
21. Otter Creek
22. Betsie River
23. Herring Creek
24. Arcadia Creek
25. Little Manistee R.
26. Pere Marquette R.
27. Big South Pere Marquette River
28. Baldwin Creek
29. Sanborn Creek
30. Stony Creek
31. Muskegon River

Rough estimate of salmon straying or dying below weirs:

1966 --- 5,000 jacks
1967 --- 20,000 adults

Estimate of total catch and escapement --- 238,279 (36%)

LAKE MICHIGAN RESULTS - 1968

Spring and Early Summer Coho Fishing in Southern Lake Michigan

After a long winter, sportsmen from Michigan, Indiana, Illinois, and Wisconsin were eager to try for salmon that were expected to be concentrated in southern Lake Michigan in the spring (as commercial catches indicated they were in the previous spring). Fishing began as soon as the ice broke up in Indiana, Illinois, and Wisconsin waters and on April 1 in Michigan waters (opening day). At first, fishing was from piers or from boats close to shore, but as weather conditions improved and as fish began to disperse (late May), salmon anglers ventured to deeper water further from shore (ten miles or more).

Fishermen also found concentrations of salmon in the lower reaches of southern Lake Michigan tributary streams, particularly in the early season (March-April).

Estimates of the spring sport salmon catch from Indiana, Illinois, and Wisconsin waters were 4,200, 3,000, and 2,500 salmon, respectively. From Michigan waters a creel census indicated a south to north decline in catch for the April-May fishing period:

PORT	COHO CATCH	
	BOATS	PIERS AND RIVERS
New Buffalo (near Indiana border)	3,924	26
St. Joseph-Benton Harbor	2,535	1,876
South Haven	577	783
Saugatuck	89	0
	7,125	2,685

Combined -- 9,810

The salmon were of rather uniform size during this period, averaging 18.9 inches total length and 2.5 pounds total weight in April, and 19.9 inches and 3.0 pounds in May. A few fish as large as 6 pounds were taken by the end of May.

The State of Indiana utilized commercial fishermen to assess salmon abundance and obtain biological data.

In 71 gill net lifts between March 8 and June 3, 13,042 coho, 385 rainbow, 84 brown trout, and 60 chinook salmon were taken. The highest concentrations of salmon in Indiana waters occurred in March and April when one coho was taken for every 25 feet of net. During May, one coho was taken for every 179 feet of net. A few 8 to 13 pound silvery coho were taken in the nets and proved to be late maturing (4 year cycle) salmon from the 1966 plants.

In the area between South Haven and Grand Haven no significant salmon fishery developed during 1968. It appears that during the period salmon were moving through this area of the lake (June and early July), they were a long way from shore in deep water. June salmon fishing was spotty at best throughout Lake Michigan.

Summer Fishing in Northern Lake Michigan

Salmon fishing began to improve in early June in the area between Grand Haven and White Lake, with fishing action peaking in the White Lake area by late July and early August. Coho were being taken from five to over ten miles offshore at this time and at depths of 60 to 100 feet. Their average weight was 6 to 8 pounds and they were feeding heavily on alewives. Preferred temperatures from sonar and netting data proved to be in the 50^{o} to 55^{o} F. range.

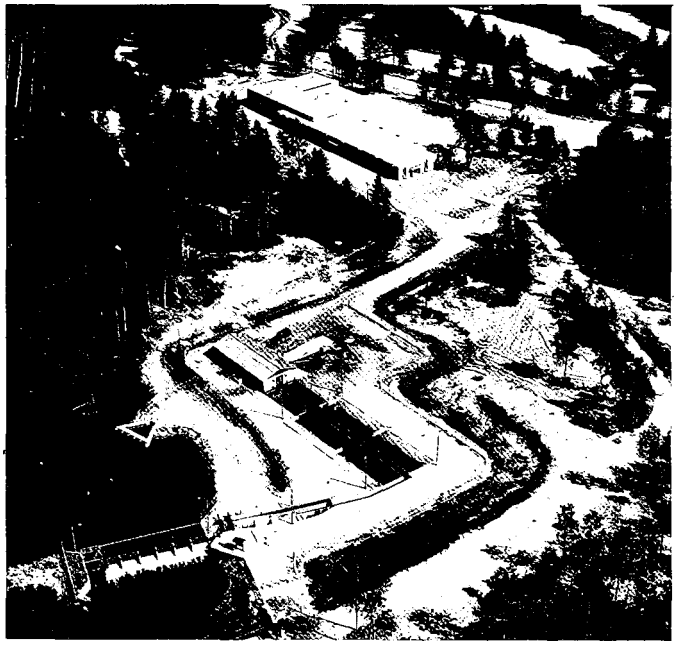
The July-August coho catch from Holland to White Lake was as follows:

Port	Coho Catch
Holland	101
Grand Haven	339
Muskegon	633
White Lake	1,144

During the first two weeks in August, excellent salmon fishing developed--first off Pentwater, then off Ludington. Anglers trolled two to five miles from shore at depths of 30 to 100 feet. Salmon were still feeding on alewives at this time. But the good fishing lasted only two weeks. Though some fishing continued through the last half of August out of these ports, action was poor.

Fishing effort peaked during the last half of August in the Manistee-Frankfort-Platte Bay area, but only the Platte Bay sustained good fishing for an extended period (fishing there continued into October, whereas the second week in September marked the end of activity off Manistee).

Salmon anglers on the Muskegon River.



Upper Platte River weir (lower left), fishway, holding ponds and egg taking station with new hatchery building (top center).

The August-October catch between Pentwater and Platte Bay was as follows:

Port	Coho Catch	Man-Days of Fishing Effort
Pentwater	6,247	24,077
Ludington	10,677	30,840
Manistee	19,828	11,160
Arcadia	1,220	24,247
Frankfort	4,336	45,007
Platte Bay	27,060	80,154
Empire	458	5,009
	69,826	220,494

The summer-fall 1968 salmon fishery in Lake Michigan, characterized by deep trolling (typically 40 to 80 feet in the 50^{o}-55^{o} F. temperature strata) contrasted with the 1967 fishery when nearly all salmon were taken within 30 feet of the surface (an exception to this was the late September-October fishing in Platte Bay which was a deep troll fishery in both years).

This difference is due in part to warmer water temperatures during late August and September of 1968 (Lake Michigan temperatures ranged from 64^{o} to 69^{o} F. to depths of 80 to 100 feet during this period). The good near-surface angling in 1967 followed a three-day blow in late August which cooled surface waters to the low fifties. It is reasonable, too, to assume that slight differences in the strain of coho planted in 1966 and 1967 could account for the variations in behavior.

Stream Sport Fishing

Stream salmon fishing in 1968 was somewhat of a let-down compared to 1967. The prime reason for this was the relatively poor showing of the Manistee, the mainstay of the 1967 stream sportfishery. Salmon moved through the Manistee and entered Bear Creek during a brief period early in September 1968. Hence, the fish were never concentrated in the Manistee where fishermen could get at them as they were in 1967. A creel census indicated that 1,666 coho, 1,158 rainbow, 328 chinook, and 33 brown trout were taken from the Manistee River between September 14 and October 26 by 54,000 angler days fishing effort. Fairly good fishing was enjoyed on the Betsie River below Homestead Dam all fall (for coho that strayed into this unplanted stream), and some coho fishing did occur on the Pere Marquette, Muskegon, and White rivers. However, most of the fishing on these streams was supported by chinook jacks.

Economic Impact

Retail sales recorded by the Michigan Department of Commerce for the 11 county area in the heart of "coho country" showed an increase of 26.8 million dollars in the fall of 1968 as compared with the 1964-66 norm. This more than doubled the increase of 11.9 million recorded for the fall of 1967.

Bear Creek Returns

A temporary pipe barrier weir was in place at the mouth of Bear Creek on September 20 to control fish moving upstream. The intent was to harvest the surplus salmon in good condition, but yet maintain enough fish between the mouth and the upper ponds to provide a respectable sport fishery. A portable fish trap from Idaho was included as a means for loading the salmon onto trucks at this point.

Prior to the 20th, however, the bulk of the run entered Bear Creek (estimated at 30,000 to 40,000 salmon). Subsequent gross misuse of habitat and disregard for sport fishing regulations made it necessary to effect the closure of Bear Creek to all fishing on September 25.

Since the bulk of the run had already passed upstream before the barrier weir was in place, the Idaho trap and elevator were moved to the upper ponds to load remaining salmon at that site.

Little Manistee River Returns

The Little Manistee River weir was activated on August 30, with the first significant number of fish (10,000) appearing September 3. The fish ladder and raceway were opened on that date and the holding areas were immediately filled to capacity. An actual count was made of 66 fish per minute entering the raceway.

Throughout the month of September, which brought the peak of the coho run, salmon were processed both manually and mechanically as modifications were completed in the system.

The processing operation eventually allowed six men to load 36 boxes (one truckload) of 100 salmon per box in two hours. This time varied with the numbers of steelhead handled, mechanical failures, and experience of personnel.

Peak activity of the initial chinook jack run at the Little Manistee weir occurred in mid-October.

All trout were passed upstream.

Until September 25, male coho and chinook salmon were also passed upstream to provide a stream fishery.

The weir grates were removed on January 2, 1969, to prevent damage to the facility from ice buildup. At this time, salmon movements were negligible and migrating fish consisted almost entirely of steelhead.

ALEWIFE - Salmon were introduced to convert them from a liability to an asset.

Harvesting surplus coho at the Little Manistee Station.

The Little Manistee was closed to all fishing below the Department weir during the salmon run.

Lower Platte River Weir

A new weir and harvest facility was constructed on the Platte River approximately two miles upstream from the mouth. This new structure was completed and put into operation the week of September 23.

An estimated 10,000 fish had moved upstream prior to this time. These fish provided a fishery in Platte and Loon lakes and were eventually removed at the upper weir.

The new harvest facility consisted of a barrier weir, a fish ladder, and a holding pond. A mechanical crowd gate lifted fish up to a loading tower and then onto a sorting table where trout were separated.

A lift gate was incorporated in the weir to allow passage of boats. Although it was anticipated that the opening caused by passing boats would allow upstream escapement, this problem did not occur. The salmon spooked very easily and the upstream losses were negligible.

This harvest operation terminated the week of October 28.

Upper Platte River Weir and Spawning Station

The 1968 coho salmon egg take commenced on October 17 and continued intermittently through December 3 when 505,000 eggs were collected at the Little Manistee River. A total of 9,695,000 coho eggs were taken for Michigan use and an additional 2,767,000 were taken for five neighboring states and Ontario.

The ripening of fish in 1968 was much slower than in 1967. The subsequent per cent of fertilization was also significantly lower. The latter may be the result of high stream temperatures during the spawning run. (Details are available in 1968 Summary of Coho Egg Taking Operations by Dave Galvin, Hatchery Biologist, Roscommon).

The Platte River, closed to fishing during the salmon run, was reopened to fishing on November 15 with pressure being very light and success fair to good.

Straying from Lake Michigan Plants, 1968

In 1968, as in 1967, coho strayed into most streams tributary to Lake Michigan between the Straits of Mackinac and the White River. The pattern of straying was similar. The Crystal River again received a fairly heavy run of stray coho (estimated at 1,000 to 2,000 fish) and was closed to fishing to prevent the type of problems encountered on Bear Creek. In 1968, coho straying was recorded in the following northern Lake Michigan streams which had no recorded straying in 1967: Riebolts

and Strawberry creeks, Door Peninsula, Wisconsin; Cedar River, Menominee County; Degraves Creek; Devils Creek; Thompson Creek; Bursaw Creek; and Nunns Creek. No quantitative measures of total straying from the 1967 coho plants were made, but based on observations and judgements, it is estimated at about 15,000 adults and 5,000 jacks.

Summary of Returns to Department Weirs from 1967 Coho Plants

The following data were obtained from the 1967 run of coho "jacks" at Department weirs:

	COHO JACK RETURN	TOTAL WEIGHT	AVERAGE LENGTH	AVERAGE WEIGHT	% SHOWING LAMPREY SCARS	PER CENT RETURN
Little Manistee	270	406	16.0"	1 lb. 8 oz.	.96	.06
Platte River	11,239	14,049	14.9"	1 lb. 4 oz.	.22	2.24
Bear Creek	1,534	1,822	15.0"	1 lb. 5 oz.	.68	.21

The adult run in 1968 produced the following returns at Department weirs:

	COHO ADULT RETURN	TOTAL WEIGHT	AVERAGE LENGTH	AVERAGE WEIGHT	% SHOWING LAMPREY SCARS	PER CENT RETURN
Little Manistee	60,248	523,404	28.1"	8 lbs. 11 oz.	4.26	13.9
Platte River	110,657	995,913	29.9"	9 lbs. 0 oz.	3.50	22.0
Bear Creek	55,339	504,968	29.6"	9 lbs. 2 oz.	3.46	7.4

Total Returns from 1967 Coho Plants, Lake Michigan

	Number	Pounds
Number Planted	1,686,000	
Jack Sport Catch, 1967	7,000	12,000
Jack Weir Returns, 1967	13,000	17,000
Adult Sport Catch, 1968	94,000	875,000
Adult Weir Returns, 1968	226,200	2,036,000
Assessment Netting, 1968	13,500	50,000
Total Return*	354,000 (21%)	2,980,000

*Straying of salmon to unplanted streams was well documented but no quantitative measures of its magnitude were made. Our best estimate places it at about 20,000 fish, which would raise the total return from these plants to 22 per cent (374,000 salmon and over 3,000,000 pounds).

Heavy run of coho in Platte River.

A popular surf fishery developed for Alaskan strain coho at the mouth of Thompson Creek.

REPORT OF (ALASKAN) COHO RUN, THOMPSON CREEK, SCHOOLCRAFT COUNTY - 1968*

Thompson Creek, with its existing hatchery facilities and abundant supply of spring water, was picked as the site for the planting of 46,400 coho (silver) salmon smolts on May 3, 1967. This stock was the result of 70,000 eyed eggs shipped from the Swan River near Anchorage, Alaska where they had spawned September 27, 1965. The coho in this run contribute to the partial landlocked population which occurs in the inland lakes of that area. It is hoped that the progeny of these fish, upon their return to Thompson Creek will be used for selective breeding purposes in the State of Michigan.

The smolts planted at Thompson averaged 16 per pound and ranged in length from 4.5 to 6.5 inches. The majority of salmon had migrated into Lake Michigan by May 8 and on May 16, 1967, only 8-9,000 smolts remained in the stream. For identification purposes, all fish had an adipose fin-clip.

From August through October, 1967, an estimated 5,000 adipose fin-clipped coho averaging 10-16 inches came back into Thompson Creek. Initial fishing in August was good in the creek, but as the run developed, better catches were made near the mouth in Lake Michigan. Daily runs seemed to enter the creek at night or early morning.

With a good return of "jacks" in 1967 a good return of adult coho was anticipated in 1968. Some "test fishing" was done by local trollers, one being George Chvala, foreman at Thompson Hatchery. However, no offshore schools of coho were located.

On July 22, 1968, a 6 pound coho was found dead on the beach near the mouth of Thompson Creek. The alert went out that coho may be in the vicinity. Fishermen started to fish in the shoal areas both by trolling and by spin casting from shore.

On July 25, two coho (18 inches and 24 inches) were caught in Lake Michigan at the mouth of Thompson Creek. They were identified by fisheries personnel working on the new weir. Fishermen reported numerous coho were observed swimming around in close proximity to them.

On August 1, I made observations in evening. High seas were rolling in. There were two boats out. Fishermen on shore reported about a dozen fish, two of which were rainbow, were caught this morning.

At 10:45 a.m. C.O. Ed Dorie checked and found 12 fish (5 to 6 pounds) caught, two of which were identified as rainbow. (Some concern over proper identification of fish). Most success was found by fishermen wading from shore using silver flat fish, little Cleo and the Daredevil. About 80 fishermen fished here this morning.

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*A field report by Leland R. Anderson, District Fish Biologist, Newberry to Henry J. Vondett, Regional Fish Biologist, November 27, 1968.

On August 6, Fish Culturist H. Brady, at 8 a.m., observed 55 vehicles on the parking lot, 85 waders, and 9 boats (weather foggy). He checked 20 coho varying from 2 to 9½ pounds (17 to 27½ inches). At 10 a.m. there were only 38 vehicles on the lot. Coho started moving up Thompson Creek in the evening. Seven were caught in weir trap during the night.

On August 7 a large school of coho noted by member of Sellman fish tug off Big Summer Island southwest of Fairport.

At 6:45 a.m. I observed 103 waders and 33 boats (average two fishermen per boat); at 8 a.m. there were 97 waders and 36 boats. Approximately 15 to 20 coho were creeled this A.M. mostly by waders using spinning tackle. Hooking activity was greatest between 6:30 and 7:30 a.m. Fish ranged from 5 to 9 pounds. Many fish were snagged, however, fishermen using small spinners were taking fish in the mouth. The coho were noted "slashing" at the larger spoons but not taking them in the mouth. The parking lot was full to capacity with 8 or 10 vehicles parked on the beach. Fishermen were having difficulty in landing boats. Some launched at Osterhaut's motel at $3 per boat (this dropped to $1 as season progressed). The mouth of Thompson Creek was deepened by bulldozer yesterday and 10 coho and 1 rainbow came up into the weir last night. Five cohos checked ranged from 5½ to 8 pounds (24-27 inches long). C.O. Dorie estimated that 100 coho were caught today.

August 27, I made the following observations today. The existing parking facilities were jammed to capacity and vehicles were strung out along Highway US-2. Boats and fishermen were scattered for half mile along the shoal off Thompson Creek. I estimated 150 coho (4 to 10 pounds) were caught during the day. There were 100-150 fishermen during that period also. Fish were observed caught on spawn. Many were taken by snagging, a few of which were deliberately snagged. One fisherman was arrested for having in his possession three fish over his daily limit.

Some creel census records were made between August 15 and September 20. During the period 435 coho were weighed and measured. The average length was 25.5 inches and average weight 6.9 pounds. The smallest fish in this group being 21.5 inches and weighing 3 pounds; the largest 28 inches and weighing 10 pounds. Of 28 male fish measured, they averaged 25.7 inches long and weighed 7 pounds, whereas 32 females averaged 25.3 inches long and weighed 6.6 pounds.

Forty-three per cent of the fishermen censused were from upper Michigan, 34 per cent from lower Michigan, and 23 per cent from other states and provinces.

The Manistique Chamber of Commerce estimated that the influx of fishermen added $180-200,000 to the local economy.

Coho (2,018) were transferred through the weir to the stream above.

The total number of coho eggs processed at Thompson this fall were 1,084,890 (1,011,450 Alaskan strain and 73,440 Oregon strain).

Thirteen ripe female coho weighed and measured averaged 5.39 pounds and were 23.9 inches long. The average number of eggs per female was 3,163.

During the 1967 season it was estimated that 5,000 (average 1/2 pound) coho; and during the 1968 season (July through October) that 6,000 (average 6.9 pounds) coho were caught by anglers. The production to anglers was 44,900 pounds.

In addition to this figure are 2,018 coho that were lifted through the weir for hatchery processing. This would bring the grand total of pounds of coho to 56,000 pounds.

Some "jacks" of the 1968 plant of 25,000 Oregon strain coho are evident in Thompson Creek this fall, but to date this does not come close to the estimated 5,000 that came up in 1967. In comparison, the projected 1969 production is not too promising.

LAKE SUPERIOR RESULTS - 1967

In the spring of 1967, Lake Superior's rainbow and lake trout sport fishermen were quick to find the one to two pound coho that seemed to be everywhere along the lake's southern coast, including the waters of Wisconsin and Minnesota. In April, excellent catches were made and fair to good fishing continued through June. During July and August fishing dropped off somewhat but in September the area off the planting site (Huron River) again provided good fishing. Modest sized silver or silver-blue spoons were the most successful types of lure used.

Stream fishing the Huron River began September 13 and by October 16 fishing effort became so intense that the river was closed to fishing to enable a sufficient number of adult salmon to reach the upstream egg-taking station. On November 10, the stream was reopened to fishing.

A creel census was conducted from July 7 through November 25 in Michigan waters of Lake Superior from Keweenaw Bay to Grand Marais, including the Huron River. Twelve thousand salmon averaging 3.3 pounds were estimated to have been taken by 45,000 man-days of fishing effort.

In addition to coho, these anglers caught approximately 8,500 lake trout, 400 rainbow and a few brown trout. Including the April through June fishery, we estimate the total sport catch for this area to be approximately 20,000 coho. Catch estimates for the area west of Keweenaw Peninsula and into Wisconsin and Minnesota waters are not available but anglers there probably accounted for a few thousand coho.

The diet of coho in Lake Superior included amphiponds, mysis, terrestrial insects, smelt (Osmerus), sticklebacks (Gasterosteidae), and sculpins (Cottus sp.).

Weir Count

The U. S. Fish and Wildlife Service's electrical sea lamprey barrier weir, located three miles above the mouth of the Huron River, was used to monitor the 1967 coho run and served as an egg collecting site. Between September 11 and November 15, a total of 2,556 adult (3-year-olds) coho were captured (40 "jacks" were captured at this site the previous fall). They averaged 20.2 inches total length and 2.75 pounds. The largest weighed 7 pounds. Jacks ranged from 12 to 17 inches and averaged 14.8 inches and 1.25 pounds. Upstream migrations were stimulated by run-off and high water.

A total of 100,000 eggs were taken from 40 females. The eggs measured 7,500 per quart.

Kidney disease was found in 12 per cent of the coho and nearly 100 per cent were infected with acanthocphalins (horny-headed worms). A parasitic roundworm was also commonly found in the intestines of cohos. Sea lamprey wounds were found on less than 1 per cent of the fish.

Salmon Transfer and Straying

To assess natural reproduction, a transfer of adult salmon was conducted in 1967.

A total of 922 adult salmon were transferred from the Huron River to three upper peninsula streams as follows:

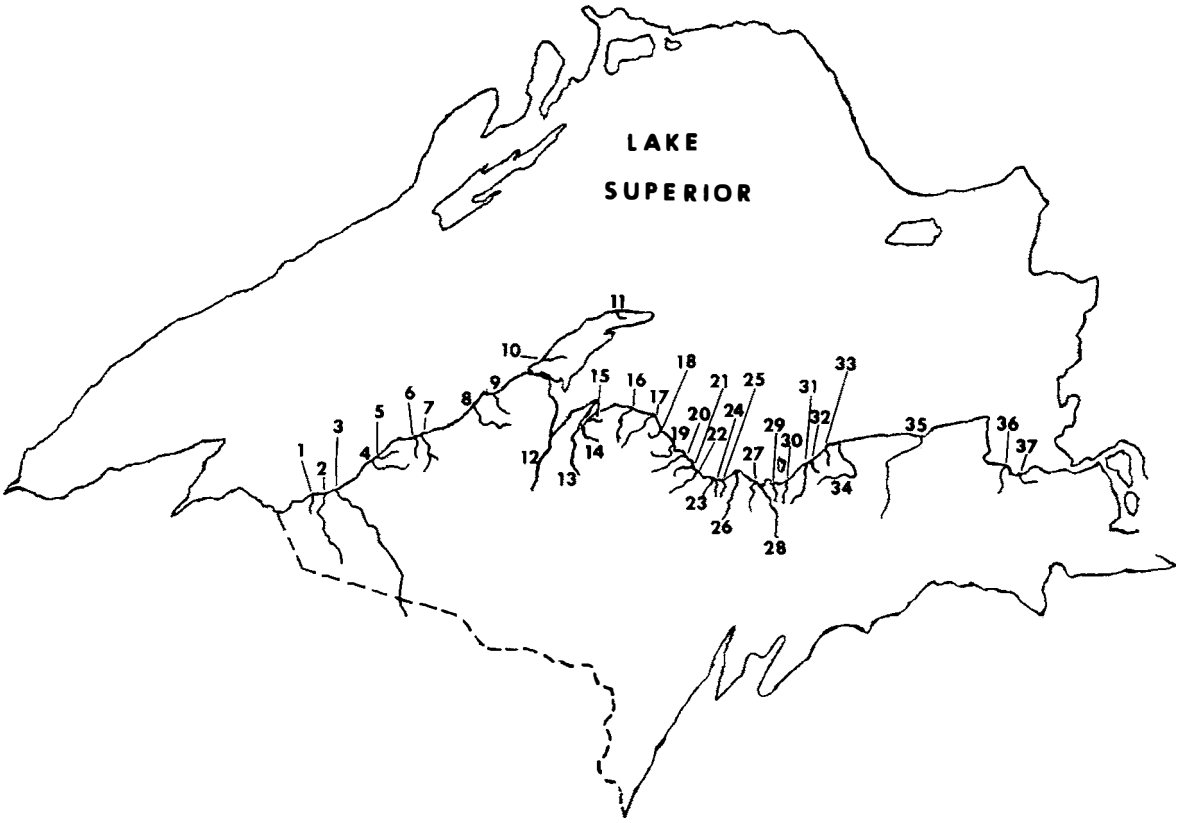
Silver River above Silver Falls, Baraga County	288
Daults Creek above the power dam on Falls River	311
Yellow Dog River above Lake Independence	323

Natural straying of salmon to streams not planted was widespread although numbers of salmon involved was not large, totalling perhaps 5-10 per cent of the total spawning run.

LAKE SUPERIOR RESULTS - 1968

Compared with 1967, coho fishing in Michigan waters of Lake Superior was a disappointment. Late winter ice fishermen, angling for lake trout, caught (and released because of the closed season) considerable numbers of coho from Keweenaw Bay which buoyed hopes for a good season. However, coho fishing was spotty all year in Michigan waters. Coho fishing was much improved over 1967 in Wisconsin's Apostle Island Area and in Minnesota waters, however, suggesting a change in movement of the fish in 1968. Fall fishing off the mouth of the Huron River was of brief duration, too. Heavy September rains stimulated rapid movement of salmon into the upper Huron River. From the 465,000 coho stocked in the Huron River in 1967, an estimated 10,500 (2.2 per cent) either returned to spawn or were caught during 1968. The estimated angler catch was 7,000 salmon of which 4,500 were caught in Wisconsin and Minnesota waters and 2,500 fish from Michigan waters which averaged 21.1 inches and 3.6 pounds.

Lake Superior Straying of Adult Coho Salmon - 1967



1. Maple Creek
2. Black River
3. Presque Isle River
4. Little Carp River
5. Carp River
6. Union River
7. Iron River
8. Firesteel River
9. Elm River
10. McGunn's Creek
11. Fanny Hooe Creek
12. Falls River
13. Silver River
14. Slate River
15. Ravine River
16. Little Huron River
17. Salmon Trout River
18. Iron River
19. Big Garlic River
20. Little Garlic River
21. Harlow Creek
22. Dead River
23. Carp River
24. Chocolay River
25. Sand River
26. Laughing Whitefish R.
27. Rock River
28. AuTrain River
29. Furnace Creek
30. Anna River
31. Miners River
32. Mosquito River
33. Seven Mile Creek
34. Sucker River
35. Two Hearted River
36. Halfaday Creek
37. Pendills Creek

In 1968, coho straying was recorded in Sleeping River and Grants Creek which had no recorded straying in 1967.

Incidence of lamprey scarring was again less than 1 per cent, but kidney disease was found in only 3 per cent of adult salmon in 1968 compared to 12 per cent in 1967.

Egg Viability, Pesticide Losses

Eggs from Lake Michigan coho salmon proved to be paler in color and have thinner, more fragile shells than those from Pacific Ocean coho. To prevent egg loss through shock, more care in handling was necessary than is typically used with salmon eggs. With the proper precautions taken to prevent egg breakage, however, survival to "button up" was good and no unusual problems arose.

But, early in 1968, just as the young coho were using their last reserves from the yolk sac, troublesome mortalities (amounting to 11 per cent of the original number of eggs) occurred. Mortalities were highest in hatcheries having relatively warm winter water temperatures (near 50° F.). Following his research, Dr. Howard Johnson of Michigan State University concluded that the "most probable cause" of these mortalities was DDT residues in the eggs. DDT is also suspected to be the cause of the unusually thin, fragile egg shells of Michigan coho. Eggs from Lake Superior coho, though smaller because of the much smaller size of the adult salmon, had good color and developed normally. DDT levels in these eggs were much lower than that in eggs from Lake Michigan salmon.

Natural Reproduction: Competition with Trout

Every evidence indicates that the newly introduced coho salmon went through the cycle of natural reproduction normally in Michigan's freshwater environment. In the lower peninsula, spawning activity occurred in October, November, December, and January. In the Huron River in the upper peninsula, spawning was delayed by cold water conditions. In fact, considerable spawning occurred as upper peninsula streams warmed in the spring.

Eggs developed and hatched and coho fingerlings survived and grew well in typical Michigan trout streams. Several streams were studied to quantify coho spawning success and to compare it with trout production. Briefly summarized the data show that, in most cases, the best trout reproduction and coho reproduction occurred in the same stream sections. Conversely, poor trout reproduction was usually accompanied by poor coho reproduction or no coho reproduction whatever. Coho natural reproduction tended to be in the same order of magnitude as trout reproduction.

It appears that many of the physical factors that favor trout reproduction and survival in Michigan streams also favor coho reproduction and survival. Some Michigan trout fishermen have expressed fears that coho reproduction in trout streams would be at the expense of trout. However, no simple dominance of coho over trout has shown up on any of the streams studied so far.

Study of coho-trout relationships in several Michigan streams is continuing in order that more definitive information on the effects of coho on Michigan's trout may be obtained.

SUMMARY

1. Coho salmon were introduced into Michigan waters of the Great Lakes in 1966 to supplement lake trout and steelhead trout as predators on super-abundant alewife.

2. Impressive returns of 2-4 pound "jack" coho in the fall of 1966 stirred intense public interest and triggered demands for salmon from all areas of the state.

3. On Labor Day weekend, 1967, salmon fishing began in truly "barn burning" fashion. During the sunny 3-day weekend 6,000 coho averaging over 12 pounds each were taken.

4. During September, 1967, 26,000 salmon were caught by 72,000 man-days of fishing effort and fall retail sales jumped 11.9 million dollars in the affected area.

5. The total accountable return of the first Lake Michigan coho plants was 238,000 out of 659,000 planted or 36 per cent. Of this total, 213,000 coho weighing 2,027,000 pounds were harvested by angling, netting, and at weirs.

6. The 1968 salmon fishery was characterized by good spring fishing in southern Lake Michigan, a mid-summer lull when salmon were hard to locate and a fall flurry which accounted for the bulk of the year's total sport catch of 94,000 salmon. Retail sales rose 26.8 million dollars above the fall norm in the affected area.

7. Accountable returns from the second year's coho plants in Lake Michigan totalled 385,000 or 22 per cent of the planted stock weighing over 3 million pounds (including Thompson Creek returns).

8. Returns from a plant of 46,400 Alaskan strain coho in Thompson Creek totalled 13,000 of which 11,000 (45,000 pounds) were taken by anglers as jacks and adults.

9. The Thompson Creek fishery stimulated the local economy (Manistique) by $180,000 to $200,000.

10. The diet of Lake Michigan coho is principally alewives and they seek out temperatures in the 50-55° F. range.

11. Lake Superior coho provided excellent fishing in the spring of 1967 all along the southern shore of the lake. A mid-summer lull was followed by a good fall sport fishery off the mouth of the Huron River.

12. The 1968 sport fishery in Lake Superior was spotty all year long.

13. Lake Superior coho reach an average size of 3-4 pounds on a diet of invertebrates, smelt, sticklebacks, and sculpins.

14. High pesticide levels in coho eggs caused some mortality but not enough to cripple the program.

15. Salmon strayed to most northern Lake Michigan and southern Lake Superior streams and successful natural reproduction was recorded on many of these. Growth of coho in Michigan trout streams was good and production was in the same order of magnitude as trout numbers in the same streams.

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