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Fisheries Research Report No. 1983

July 15, 1991



fisheries division

**MICHIGAN DEPARTMENT OF NATURAL RESOURCES
FISHERIES DIVISION**

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**HARVEST, MOVEMENT, RETURN TO THE CREEL,
AND GROWTH OF CHINOOK AND COHO SALMON
IN LAKE HURON, 1985-88¹**

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¹A contribution from Dingell-Johnson Project F-53-R, Michigan.



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Abstract.—Sportfishing effort at 14 Lake Huron sample areas ranged from 2.7 million angler hours in 1988 to 3.4 million hours in 1986. The sport harvest of chinook salmon ranged from 84,000 fish in 1986 to 105,000 in 1988. During 1986-88 the lake-wide chinook harvest and catch rate increased by 25% and 56%, respectively, while total angler effort declined by 20%. The mean age of chinook salmon harvested in the sport fishery ranged from 2.8-2.9 lake years. The return of marked chinook salmon to the sport fishery in the Michigan waters of Lake Huron was 31 fish per 1,000 stocked. The return of chinook to the sport fishery declined the further south in Lake Huron a stocking site was located. Chinook salmon stocked at Rogers City contributed the most to the Lake Huron sport fishery (46.0 fish per 1,000 stocked), while fish stocked at Lexington contributed the least (13.7 fish per 1,000 stocked). In general, chinook contributed the most to the sport fishery in the area where they were stocked. All four lots of marked chinook were found to reside in southern Lake Huron during the spring (April-June). Later during the sportfishing season (July-September), chinook moved north, and were found along most of the western shoreline of Lake Huron. The return of the 1984 year class of chinook salmon to all Lake Huron fisheries during its life cycle (1985-88) was estimated to be 60 fish per 1,000 stocked. The mean total length and weight of fin-clipped chinook salmon at the end of their life cycle (age 0.4) in Lake Huron was 34.2 inches and 14.8 pounds. The importance of coho salmon to the Lake Huron sport fishery was much less than chinook salmon. The coho salmon harvest ranged from 4,900 to 7,500 fish. Twenty-four percent of the coho salmon harvested by Lake Huron anglers during 1987 were of hatchery origin. The return of marked coho salmon to the Lake Huron sport fishery was estimated to be 2.6 fish per 1,000 stocked. Coho salmon stocked at Tawas made the greatest contribution to the Lake Huron sport fishery (5.9 fish per 1,000 stocked), while coho stocked at Seymour Creek made the least contribution (1.2 fish per 1,000 stocked). Coho were also found to reside in southern Lake Huron during the spring (April-June) and moved north later during the sportfishing season (July-September). The mean total length and weight of fin-clipped coho salmon at the end of their life cycle (age 1.1) in Lake Huron was 22.1 inches and 4.0 pounds.

The Michigan Department of Natural Resources (MDNR) first stocked Pacific salmon into Lake Huron during 1967 and 1968. Adult coho salmon (*Oncorhynchus kisutch*) were planted into two Lake Huron

tributary streams (Au Gres and Carp rivers) in 1967, and yearlings were planted into two tributaries (Carp and Thunder Bay rivers) in 1968 (Borgeson 1970). Also during 1968, the first introductions of fingerling chinook

salmon (*Oncorhynchus tshawytscha*) were made into two Lake Huron tributary streams, the Ocqueoc and Thunder Bay rivers. By the middle 1980s, MDNR was annually stocking approximately 3 million fingerling chinook salmon and 500,000 yearling coho salmon into Lake Huron. MDNR's annual target stocking rates for Lake Huron through 1993 are 3.3 million chinook salmon and 450,000 coho salmon.

While sportfishing for salmon at some Lake Huron ports has been excellent during some years, the numbers of fish harvested was not known. Also, little was known about the movement and growth of salmon throughout their life cycle or how much each stocking location contributed to local fisheries or to the total sport fishery. The objectives of this study were to: (1) determine the sport harvest of chinook and coho salmon in the Michigan waters of Lake Huron for 1986-88; (2) describe the length, weight, and age of salmon in the sport harvest; and (3) determine the movement, return to the creel, and growth of marked lots of chinook salmon stocked in 1984 and of all coho salmon stocked in 1986.

Methods

Creel surveys were conducted at all important ports and sportfishing areas (18 sites) on Lake Huron between Port Huron and St. Ignace during 1986-88. Creel clerks interviewed over 110,000 anglers during the study. In 1986-87, open-water creel surveys were conducted from April through October. The 1988 open-water creel survey covered the period April through September. October data therefore, was not considered in analyses comparing estimated catch, catch rates, or angler effort. Winter ice fishing creel surveys were conducted on Saginaw Bay (Port Austin to Tawas) during 1987 and 1988. Detailed creel survey methods were reported by Rakoczy and Rogers 1987, 1988, and 1990. Error bounds for all catch and effort estimates were defined as two standard errors of the mean (2 times the square root of the variance of an estimate). This approximates

95% confidence limits, when sample size is greater than 15, but could be as low as 70% confidence limits for low sample sizes.

Creel clerks obtained biological data from all fin-clipped salmon and a random sample of non-clipped salmon from the 1986-88 sport catch. Data collected included total length, round weight, sex, fin clip, date, location of capture, and a scale sample for age determination. Clerks sampled nearly 3,700 salmon. The ages of chinook and coho salmon referred to in this report utilize the years in stream/lake terminology (Seelbach and Whelan 1988).

Four lots of 100,000 spring fingerling chinook salmon were fin clipped at the Platte River Hatchery during April and May, 1984. The four fin clips used were left pectoral (LP), left ventral (LV), right pectoral (RP), and right ventral (RV). Mortalities of the clipped and unclipped fingerlings were recorded during the approximately 30-day period at the hatchery prior to plant-out. At the time of stocking, samples of 100 marked fingerlings from each of the four lots were collected and examined to measure the accuracy and quality of the fin clips. The fin clip on each fish was evaluated and was assigned to one of five categories: no fin regeneration, moderate fin regeneration (recognizable on adult chinook), much fin regeneration (probably not recognizable on adult fish), not clipped, and wrong clip.

MDNR stocked 3,143,000 chinook salmon at 13 Lake Huron sites during the spring of 1984. The 400,000 fin-clipped chinook were stocked, along with lots of unmarked chinook between May 22 and May 25, 1984. The clipped chinook made up 12.7% of all chinook salmon stocked into Lake Huron by all governmental agencies in 1984. The four lots of 100,000 fin-clipped chinook salmon were stocked at the following locations: Swan River located at Rogers City (RP clip), Van Etten Creek located at Oscoda (RV clip), Harbor Beach Harbor (LP clip), and Lexington Harbor (LV clip) (Figure 1). The State of Illinois stocked 79,000 RV-clipped fingerling chinook salmon in Lake Michigan at Chicago in 1984. It is possible that some of these fish moved into Lake Huron during the study and

were mistaken for the chinook stocked at Oscoda.

Four unequal lots of coho salmon totaling 447,000 fish were fin clipped at the Platte River Hatchery during October, 1985. The fin clips used were adipose (AD), RV, RP, and LP. These fish were not examined after fin clipping to determine the accuracy and quality of the clips. The marked coho were stocked into Lake Huron during April, 1986 and represented 100% of all the coho planted in the lake during that year by all governmental agencies. The stocking locations and number stocked were: Seymour Creek, 50,000 (LP clip) and 186,000 (AD clip), Tawas, 110,000 (RV clip), and Port Hope, 101,000 (RP clip) (Figure 1). The State of Illinois stocked 77,000 LP-clipped coho salmon in southern Lake Michigan at Waukegan, and the MDNR stocked 50,000 LP-clipped coho in Lake Superior at Munising in 1986. It is possible that some of these fish moved into Lake Huron during the study and were mistaken for coho stocked at Seymour Creek.

Return to the creel and movements of the marked salmon were determined from the creel surveys, harvest weirs, and assessment netting. Estimates of total angler harvest of chinook salmon for boat, shore, and pier fisheries combined for all sites (14) and all years (1986-88), along with age distributions, were used to calculate the return of the 1984 year class of chinook salmon to the sport fishery. This analysis did not address possible contributions to the sport fishery from natural reproduction and migration of chinook into Lake Huron from other Great Lakes. For coho salmon, the return to the sport fishery of hatchery versus naturally reproduce fish could be determined since all coho stocked in 1986 (1985 year class) were fin clipped.

Chinook salmon returning to harvest weirs at Swan River and Van Etten creeks were sampled in 1985-89. Biological data, such as total length, round weight, sex, and fin clip, were collected from a random sample of approximately 100 chinook salmon per week during operation of the weirs.

Assessment netting data were solicited in 1985-89 from the U. S. Fish and Wildlife Service (USFWS), Ohio Department of

Natural Resources (ODNR), Ontario Ministry of Natural Resources (OMNR), Pennsylvania Fish Commission (PFC), and New York Department of Environmental Conservation (NYDEC). These agencies were contacted in order to alert them to the possibility that they may encounter marked salmon during their routine survey operations on lakes Huron or Erie. In addition to assessment netting data, OMNR was solicited for information regarding the incidental catch of salmon in the Ontario commercial fishery, as well as the occurrence of marked salmon in their sport fishery.

Results

Angler Effort and Sport Harvest

Angler effort at the 14 Lake Huron sample areas where salmon were observed in the sport catch ranged from 2,734,441 angler hours in 1988 to 3,414,230 hours in 1986 (Table 1). Salmon were not observed in the catch at four sample areas within Saginaw Bay. In 1986, the Port Austin to Sand Point sample area had the most angler effort of all 14 creel survey areas. During 1987-88, the Au Gres area was estimated to have the most sportfishing pressure of all areas sampled. Both of these areas are in Saginaw Bay, where most anglers (64%) seek yellow perch or walleye (Rakoczy and Rogers 1990). The waters of Saginaw Bay are on the fringe of the deeper waters of Lake Huron which are more associated with salmonid fishing. The Harbor Beach-Grindstone City sample area had the most angler effort of the "salmonid" fishing areas outside of Saginaw Bay during 1986-88. Approximately 12% of all angler effort occurred annually in this area, also known as Michigan's "Thumb". Other important salmonid fishing areas ranked by average angler effort for 1986-88 were Tawas, Lexington-Port Sanilac, Oscoda, and Harrisville. The sport fishery at Tawas was diverse with yellow perch and walleye as important in the catch as salmonids.

The sport harvest of chinook salmon ranged from 84,390 fish in 1986 to 105,406 in

1988 (Table 1). Chinook harvest estimates were greatest at the Harbor Beach-Grindstone City area (12,777-17,286 fish) and at Rogers City (7,272-15,820 fish). Anglers fishing southern Lake Huron (Port Austin to Port Huron) took 50% of total chinook salmon harvest in 1986, but only about 30% of the total harvest in 1987-88. During this same period (1986-88) angler effort in southern Lake Huron remained fairly consistent, making up approximately 37% of total angler effort. The chinook harvest was more evenly distributed in 1987-88 with approximately 30% of the harvest being taken by anglers in southern, central (Tawas to Harrisville) and northern (Alpena to St. Ignace) Lake Huron. The proportion of angler effort in central and northern Lake Huron during this period (1986-88) increased slightly, and comprised approximately 20% and 7% of total angler effort in 1986, respectively, and 26% and 12% in 1988.

Comparisons of the lake-wide chinook salmon harvest, catch rate, and angler effort for 1986-88 indicated that the harvest and catch rate increased while angler effort declined (Table 2). During this 3-year period the lake-wide chinook harvest and catch rate increased by 25% and 56%, respectively, while total angler effort declined by 20%.

The Rockport area had the greatest catch rate (point estimate) for chinook salmon of all areas sampled each year (Table 3). Catch rates at Rockport ranged from 0.1337 (± 0.0246) fish per hour in 1988 to 0.1575 (± 0.0450) in 1987. Chinook catch rates at Rogers City, which is approximately 30 miles north of Rockport, were also greater than most other survey areas each year. In general, catch rates for chinook in the Lake Huron sport fishery tended to be greater in areas of abundant bottom structure, such as Rockport, Rogers City and St. Ignace, than in areas with relatively featureless bottoms, such as Oscoda, Tawas, and Lexington-Port Sanilac.

The mean lake age of chinook salmon harvested by the Lake Huron sport fishery ranged from 2.8 to 2.9 years (Table 4). Age-0.3 chinook were the most important age group to the sport fishery, making up from

40-45% of the total harvest. Age-0.2 and age-0.4 chinook made up on the average approximately 24% and 25% of the harvest, respectively. The percentage of age-0.1 chinook in the sport catch increased from 6-7% in 1986-1987 to 12% in 1988.

Mean total lengths of chinook salmon harvested by Lake Huron anglers for all age groups combined ranged from 30.4 to 31.3 inches (Table 5). Mean round weights ranged from 12.0 to 12.4 pounds. The largest mean size of chinook occurred during the 1986 season. Mean total lengths and weights of age-0.1 and age-0.2 chinook declined during 1986-88, while the size of age-0.3 and age-0.4 fish remained virtually unchanged. The mean length and weight of age-0.1 chinook declined from 21.4 (± 1.0) inches and 4.1 (± 0.9) pounds to 18.6 (± 0.6) inches and 2.4 (± 0.3) pounds, respectively, during 1986-88 (Table 5). Mean length and weight of age-0.2 chinook declined from 28.1 (± 0.5) inches and 9.2 (± 0.5) pounds to 26.2 (± 0.5) inches and 6.9 (± 0.4) pounds, respectively. The modal length of chinook salmon in the sport catch ranged from 33 to 34 inches (Figure 2). The majority of chinook harvested were greater than 28 inches in total length. Slightly larger numbers of small chinook (<25 inches) occurred in the sport catch during 1988 compared to the 1986-87 seasons. Presumably, some of these small fish were the age-0.1 chinook referred to earlier regarding age distributions.

The importance of coho salmon to the Lake Huron sport fishery was found to be much less than chinook salmon. The total coho harvest for all sample areas combined ranged from 4,897 fish in 1987 to 7,475 fish in 1986 (Table 1). The greatest harvests of coho were taken by southern Lake Huron anglers in the Lexington-Port Sanilac area during 1986-88. Estimated sport harvest in that area ranged from 1,874 fish in 1987 to 3,047 in 1986. Approximately 50% of the coho harvest in this area (Lexington-Port Sanilac) occurred during April and May. Although the Les Cheneaux Island sample area had an estimated harvest of 2,866 ($\pm 5,127$) coho in 1988, the error bounds indicated that the estimate was not precise. Also, the harvest

estimates for previous years (1986-1987) were quite low.

Comparisons of the lake-wide coho salmon harvest and catch rate for the period April through September, 1986-88 indicated the relatively low occurrence of coho in the Lake Huron sport fishery. Catch rates for coho ranged from 0.0030 fish per hour in 1988 to 0.0018 in 1987 (Table 2). In general, anglers in the Lexington-Port Sanilac area experienced the greatest catch rates for coho salmon of all areas sampled (Table 3).

During the study period all coho which were sampled from the sport fishery were age 1.1. The mean total length and round weight of coho in the Lake Huron sport fishery ranged from 21.0 inches and 3.7 pounds in 1986 to 23.0 inches and 4.8 pounds in 1987 (Table 6).

Movement and Return of Chinook Salmon

Mortality of the fingerling chinook salmon following clipping at the Platte River Hatchery was negligible, one or two fish per lot per day, and was equivalent to the mortality of the unclipped fish. Of the 400 fin-clipped chinook examined prior to stocking, only two were not clipped and none of the fingerlings had a wrong clip. The percentage of chinook with fin clips that would likely be recognizable throughout the fish's life (moderate to no fin regeneration) were 97% for Rogers City (RP), 96% for Oscoda (RV), 92% for Lexington (LV), and 86% for Harbor Beach (LP) fish.

Data from 366 chinook salmon with the fin clips used in this study were collected during 1985-88 from the harvest weirs (185), the creel survey (166), and from outside Michigan waters (15). The recovery rate for fin-clipped chinook in this study was 0.92 fish per 1,000 stocked. Thirty-seven percent of all fin-clipped chinook salmon observed by the Lake Huron creel survey originated from the Rogers City stocking location, 28% were from Oscoda, 24% were from Harbor Beach, and 11% were stocked at Lexington (Table 7).

Of the marked chinook salmon stocked at Rogers City, 64 were collected in the creel

survey (Figure 3), 56 were captured at the Swan River weir (Table 8), and 7 were reported from the Ontario waters of Lake Huron (Figures 3 and 4) (D. R. Hughson, and B. Payne, OMNR, personal communication). Chinook salmon stocked at Rogers City contributed most to the Lake Huron sport fishery during the study with a return of 46.0 fish per 1,000 stocked (Table 7).

Chinook salmon stocked at Rogers City contributed to the sport fishery throughout the Michigan waters of Lake Huron, but the greatest contribution (18%) was at Rogers City (Figure 3). Also, four Rogers City-stocked chinook were harvested in the Lake Michigan sport fishery, one each at Muskegon, Charlevoix, Menominee, and Manistique. During April-June, 60% of the Rogers City-stocked chinook came from southern Lake Huron (Port Austin to Port Huron). During July-September, most Rogers City-stocked chinook moved north, with the majority (59%) being observed in the sport fishery at Rogers City.

All 56 Rogers City stocked chinook captured by Lake Huron weir operations were collected at the Swan River weir (Table 8). Chinook stocked at Rogers City did not stray to the Van Etten Creek weir.

Of the marked chinook salmon stocked at Oscoda, 126 were captured at the harvest weirs (Table 8), 46 were collected by Lake Huron creel census clerks (Figure 5), and 1 chinook was reported in a Lake Erie tributary stream (P. McKeown, NYDEC, personal communication). The fish reported by the NYDEC had moved a distance of approximately 500 miles over a period of 18 months.

The distribution of chinook stocked at Oscoda in the sport fishery was similar to that noted for the Rogers City fish, in that they contributed to the Lake Huron fishery over a wide area, Rogers City to Port Huron (Figure 5). Oscoda fish were not reported north of Rogers City in Lake Huron, or in Lake Michigan. The greatest number of Oscoda-stocked chinook observed in the sport fishery were landed at Alpena. Most of these fish were taken from the Middle Island Reef area, which lies between Alpena and Rockport, and

the Black River area, which lies between Alpena and Harrisville. These two areas are popular chinook fishing sites because of the abundant bottom structure (sharp drop-offs) found at both locations (J. Weber, MDNR, personal communication). The seasonal distribution of Oscoda-stocked fish in the sport fishery also followed a similar pattern to that noted for Rogers City chinook. Seventy percent of the Oscoda fish observed in the spring sport fishery were collected in southern Lake Huron (Port Austin to Port Huron). As the season progressed into July-September, the Oscoda chinook moved to the north.

Only one chinook stocked at Oscoda strayed to the Swan River weir (Table 8).

Of the marked chinook salmon stocked at Harbor Beach, Great Lakes creel clerks collected 38 fish (Figure 6), 6 fish were reported in the Ontario commercial gill net fishery (Figure 4), and 3 fish were captured at the Rogers City harvest weir (Table 8). Most (68%) of the Harbor Beach chinook collected in the creel survey came from southern Lake Huron (Port Austin to Port Huron). One Harbor Beach chinook was collected from the Lake Michigan sport fishery at Menominee.

The spring (April-June) distribution of Harbor Beach chinook was similar to fish from the other two stocking locations (Rogers City and Oscoda), in that the majority (80%) were observed in southern Lake Huron (Figure 6). In July-September, Harbor Beach-stocked chinook were observed along the entire western shore of Lake Huron. However, the largest concentration (58%) of the Harbor Beach chinook still remained south of Port Austin during that period.

Only 19 marked chinook salmon stocked at Lexington were reported during the study. Eighteen fish were observed by Great Lakes creel census clerks (Figure 7), and one fish was reported in the Ontario commercial gill-net fishery (Figure 4). The chinook stocked at Lexington made the least contribution of the four locations evaluated and had a return of 13.7 fish per 1,000 stocked (Table 7). During the spring sport fishery, the majority (75%) of Lexington stocked chinook were in southern Lake Huron (Figure 7). In July-September, Lexington fish also moved north

along the Lake Huron shoreline. One fish was harvested in the St. Marys River at Sault Ste. Marie, Michigan.

In general, the return of chinook to the sport fishery declined the further south a stocking site was located (Table 7). Also, marked chinook contributed most to the sport fishery in the area where they were stocked. For example, 54% of the fin-clipped chinook observed during the study in northern Lake Huron (Alpena to St. Ignace) were stocked at Rogers City (Table 9). Fifty-seven percent of the clipped chinook observed in the central portion of the lake (Tawas to Harrisville) were stocked at Oscoda, and 56% of the marked chinook in southern Lake Huron (Port Austin to Port Huron) were stocked at Harbor Beach or Lexington. The Rogers City and Oscoda stocked chinook, also made substantial contributions to the sport fishery in other areas of the lake. Chinook salmon stocked at Rogers City made up 19% and 29% of the total number of fin-clipped fish observed in southern and central Lake Huron, respectively. Oscoda fish made up 26% and 25% of the total number of chinook observed in northern and southern Lake Huron, respectively. Chinook salmon stocked in the southern part of Lake Huron, Harbor Beach, and Lexington, contributed the least to sport fisheries in other areas of the lake. In fact, chinook stocked at Rogers City (19%) and Oscoda (25%) contributed more to the southern Lake Huron fishery than the fish stocked at Lexington (18%).

The return of the 1984 year class of chinook salmon to all fisheries by age was estimated to be 16 per 1,000 stocked for age 0.1, 11 per 1,000 for age 0.2, 20 per 1,000 for age 0.3, and 13 per 1,000 for age 0.4 (Table 10). The return to all sources during the life cycle (1985-88) of this year class was 60 per 1,000 stocked. The sport fishery in the Michigan waters of Lake Huron accounted for approximately 50% (31 per 1,000) of the total return. In addition to providing a return to the sport and weir fisheries on Lake Huron, chinook salmon return to (were harvested by) commercial fisheries. In most cases, chinook salmon occurred as by-catch in Michigan

Tribal and Canadian commercial fisheries which were targeted toward other species.

Growth of Chinook Salmon

The fin-clipped chinook salmon stocked into Lake Huron during May 1984 at 3.0 inches (total length), attained mean lengths and weights of 19.4 inches and 3.4 pounds in 1985, 26.1 inches and 8.5 pounds in 1986, 33.5 inches and 13.3 pounds in 1987, and 34.2 inches and 14.8 pounds in 1988 (Table 11). A total of 239 chinook salmon were sexed, 55% were males and 45% were females. Mean size (length or weight) by sex did not differ appreciably for age 0.2 and age 0.4 fish (Table 12). Age 0.3 male chinook were longer than females. The largest marked chinook in length (41.3 inches) during the study was collected at one of the harvest weirs in 1988. The largest marked chinook salmon by weight (26.5 pounds) was taken in the 1988 sport fishery.

Movement and Return of Coho Salmon

A total of 77 fin-clipped coho salmon corresponding to the fish stocked by MDNR in 1986 were observed during 1986-87. Data from 69 fish were collected from the 1987 sport fishery on Michigan's waters of the Great Lakes, 2 fish were captured at the Swan River weir, and 6 fish were reported outside Michigan waters by other agencies. The recovery rate for the clipped coho was 0.18 fish per 1,000 stocked. Even though all coho stocked into Lake Huron were marked with fin clips during 1986, creel clerks working on Lake Huron and the St. Marys River in 1987 found that only 24% of all coho observed (67 of 275) in the sport fishery had fin clips.

Only 20 coho salmon stocked at Seymour Creek (LP and AD) were observed during the study, 18 were observed by Great Lakes creel clerks (Figure 8), and 2 fish were collected by the NYDEC during a September-October, 1986 stream shocking survey in lower Cattaraugus Creek, New York (P. McKeown, NYDEC, personal communication). To reach

Cattaraugus Creek these coho would of traveled a distance of approximately 550 miles in 6 months. Most (75%) of the Seymour Creek-stocked coho observed in the Lake Huron creel survey were harvested in southern Lake Huron at Port Sanilac-Lexington. Two Seymour Creek stocked fish were observed in the Lake Michigan sport fishery at Frankfort.

Data from 43 coho stocked at Tawas (RV) were collected during the study, 37 were observed by Great Lakes census clerks (Figure 9), 2 were captured at the Swan River weir (Table 8), and 4 were reported from Lake Erie (R. Kenyon, PFC, personal communication). Three of the 4 fish reported by the PFC were caught by fishermen near Erie, Pennsylvania. Sixty-seven percent of the Tawas-stocked coho in the 1987 Lake Huron sport fishery came from the Port Sanilac-Lexington area. One fish was harvested in the St. Marys River at Sault Ste. Marie.

Data from 14 coho stocked at Port Hope were recovered during 1987 (Figure 10). All recoveries came from Lake Huron. Most (79%) of the Port Hope coho were observed in the southern Lake Huron sport fishery.

The seasonal distribution of fin-clipped coho salmon in the sport fishery was similar to that noted for chinook salmon. During the spring (April-June) of 1987, 96% of all coho observed by Great Lakes creel clerks were found in southern Lake Huron (Figure 11). During July-September of 1987 some coho salmon moved north and fish were found along the entire western Lake Huron shoreline from Drummond Island to Port Sanilac-Lexington.

Return to the creel of the fin-clipped coho salmon was very low. In 1987, an estimated 4,897 ($\pm 1,358$) coho were harvested by anglers fishing the Michigan waters of Lake Huron (Table 1). Based on the number of marked fish creel clerks observed in 1987, only 1,175 (24%) of the total harvest would have been coho stocked the previous year. Therefore, return to the creel of planted coho was 2.6 fish per 1,000 stocked. The numbers of coho returning to weirs were very small and were considered insignificant.

Coho salmon stocked at Tawas had the greatest contribution and return (5.9 fish per 1,000 stocked) to the sport fishery of fish stocked at the three locations (Table 13). Fifty-five percent of the fin-clipped coho observed by Lake Huron creel clerks during 1987 were stocked at Tawas, 24% were stocked at Seymour Creek, and 21% were stocked at Port Hope. Coho stocked at Seymour Creek had smallest return (1.2 fish per 1,000 stocked) to the sport fishery.

Growth of Coho Salmon

The mean total length of coho salmon stocked during April 1986 was 4.8 inches. One year later (April 1987), coho collected from the Lake Huron sport fishery had a mean and maximum length of 19.7 and 21.6 inches, and mean and maximum round weight of 2.8 and 3.7 pounds, respectively (Table 14). By the end of their life cycle (September 1987) in Lake Huron, some coho reached a maximum size of 30.0 inches and 9.7 pounds. The mean total length and weight for all marked coho sampled during 1987 was 22.1 inches and 4.0 pounds.

Discussion

Angler effort at Lake Huron salmonid fishing areas was relatively light compared to Lake Michigan ports. The average (1986-88) estimated angler effort for the area from Oscoda to Rogers City on Lake Huron (5 ports) for instance, was approximately equal to the average angler effort for the port of Ludington on Lake Michigan during that same period (Rakoczy and Rogers 1987, 1988, and 1990). The estimated harvest of chinook salmon (84,000-105,000) for the Michigan waters of Lake Huron during the study (1986-88) was also much less than that reported for the Michigan waters of Lake Michigan (212,000-514,000 fish) for the same period (Rakoczy and Rogers 1987, 1988, and 1990). In 1986-88, the chinook harvest and catch rate on Lake Huron increased by 25% and 56%, respectively. During this same period, the

Lake Michigan chinook harvest and catch rate at nine index ports declined sharply by 74% and 56%, respectively (Rakoczy and Rogers 1990).

The contribution and importance of age-0.3 chinook to the Lake Huron sport fishery was similar to Lake Michigan, where this age group also dominated the harvest (Keller et al. 1990). Mean length and weight of age-0.1 and age-0.2 chinook salmon in the Lake Huron sport harvest declined during this study. Keller et al. (1990) postulated that year-to-year changes in size at age of chinook salmon in Lake Michigan may be dependent on seasonal weather patterns and annual fluctuations of the forage base. This may also be true for Lake Huron chinook.

Coho salmon were not a significant part of the Lake Huron sport harvest. Coho only made up 3-4% of the salmonid harvest in 1986-88 (Rakoczy and Rogers 1987, 1988, and 1990). The annual average number of coho harvested (6,500) on Lake Huron was less than 5% of the annual average harvest (136,000) estimated for Lake Michigan during 1986-88 (Rakoczy and Rogers 1987, 1988, and 1990). The mean size (21-23 inches) of Lake Huron coho in the sport fishery was very similar to that reported for Lake Michigan coho (Patriarche 1980, Rakoczy and Rogers 1990).

The major sources of withdrawal of chinook salmon stocked in Lake Huron, other than natural mortality, were the sport fishery in both Michigan and Ontario, MDNR's harvest weirs, the Tribal commercial fishery in Michigan, and the Ontario commercial fishery. Harvest data for the sport fishery in Ontario was not available, however, it was known that Ontario sport fishermen do harvest chinook salmon in the North Channel, Manitoulin Island, and Bruce Peninsula areas of Lake Huron (Figure 1) (D. R. Hughson and S. Kerr, OMNR, personal communication).

The return of chinook salmon by stocking site was found to decline the further south in Lake Huron the site was located. The Ontario commercial gill-net fishery, which is very active in southern Lake Huron, was a large source of mortality for age 0.1 chinook

salmon. McNeil and deLaplante (1989) estimated that 45,365 Pacific salmon were harvested in the Ontario gill-net fishery during 1985. These fish occurred as incidental catch in fisheries that primarily seek lake whitefish and yellow perch. Eighty-two percent of the Pacific salmon were taken in southern Lake Huron. McNeil and deLaplante (1989) also reported that 95% (43,412) of the Pacific salmon harvested were chinook. They reported that these fish had average weights of 2.1 and 0.5 pounds in large and small-mesh gill nets, respectively. Most (94.5%) of the salmon encountered in these gill-net fisheries were dead, and only 0.7% were released alive.

The average weight of chinook salmon which were killed during 1985 by the Ontario commercial fishery would indicate that the majority of fish were probably from the 1984 year class. The movement of fin-clipped chinook salmon stocked in 1984 indicates that a substantial number of chinook stocked by MDNR were present in southern Lake Huron during the spring. Undoubtedly, many Michigan stocked chinook were harvested by Ontario commercial fishermen before they were large enough to enter the sport fishery. It was also interesting to note that the Lexington stocking location contributed the least to the sport fishery of the four lots of fin-clipped chinook. The Lexington stocking location was the closest in proximity of the four stocking sites to the Ontario gill-net fishery, lying only 14 miles west of Canadian waters.

The return to all fisheries during the life cycle (1985-88) of the 1984 year class of chinook stocked in Lake Huron was 60 per 1,000 stocked or 6%. The total return of the 1984 year class of chinook salmon stocked by MDNR in Lake Michigan was estimated to be 13% (Keller et al. 1990). The difference between the two estimates for these lakes could be attributed to several factors: (1) the large numbers (4.4 million) of chinook salmon stocked by other state agencies in Lake Michigan might have contributed to the estimated return for Michigan; (2) differences in the amount of natural reproduction might have occurred in the tributary stream systems

of each lake; and (3) differences in the amount of migration into or out of each lake might have occurred. Carl (1982) reported that natural reproduction from Michigan streams tributary to Lake Michigan may produce as many as 630,000 chinook smolts per year. No chinook natural reproduction was reported by Carl (1982) for Lake Huron tributary streams, however, large numbers (up to 10,000) of adult chinook salmon have been reported in tributary streams on the east and west sides of Manitoulin Island, Ontario (D.R. Hughson, OMNR, personal communication). In addition, chinook have been observed spawning in some of Michigan's Lake Huron tributaries (J. W. Peck, MDNR, personal communication).

A substantial amount (76%) of the coho salmon harvested by anglers in Lake Huron were either naturally reproduced or strayed into Lake Huron from other locations. Patriarche (1980) estimated that the 1978-79 Lake Michigan coho harvest consisted of about 9% naturally produced fish. Naturally produced coho contributed 95% to the total 1986 harvest in Lake Superior at Marquette, Michigan, and some hatchery-origin coho salmon from Lake Superior strayed into Lake Michigan and Lake Erie (J. W. Peck, MDNR, personal communication). Borgeson (1970), Peck (1970), Parsons (1973), Rybicki (1973), Taube (1975), and Patriarche (1980) also referred to the propensity of coho to stray in the Great Lakes and their tributary systems.

The return of fin-clipped coho salmon to the Lake Huron sport fishery was very small (2.6 fish per 1,000 stocked). The major sources of mortality, other than natural, for Lake Huron coho were the sport fishery in Michigan and Ontario waters and the Ontario commercial fishery. McNeil and deLaplante (1989) reported that 4.7% (2,100 fish) of all Pacific salmon killed in the Ontario gill-net fishery in 1985 were coho. Based on this, the estimated number of coho killed by the Ontario commercial fishery in 1987 may have been as much as 43% of the estimated sport harvest in the Michigan waters of Lake Huron. Most of these fish would have been age 1.1 based on the mean weight (3.1

pounds) reported for small- and large-mesh gill nets by McNeil and deLaplante (1989).

Recommendations

1. Stocking of chinook salmon should be discontinued at the Lexington Harbor location. Fish allocated for this stocking site should be moved further north to increase the return to the sport fishery. For example, if the Lexington chinook were moved to Harbor Beach, the rate of return to the sport fishery may be enhanced twofold, from approximately 14 fish per 1,000 stocked to 30.
2. MDNR should discontinue stocking coho salmon in Lake Huron due to the very low rate of return of hatchery fish. Results from this study indicated that implementation of this recommendation would reduce the sport harvest of coho by less than 25%.
3. The Great Lakes Fishery Commission, who is in charge of reserving fin clips for Great Lakes fish plants, should not issue the same fin clip for any species of salmon to more than one Great Lakes agency during a calendar year. This action would eliminate speculation as to the origin of marked salmon which stray into other Great Lakes or tributary streams.

4. Future Great Lakes marking studies conducted on Lake Huron should be designed to mark all chinook salmon stocked over a period of several years by all agencies. Suggested objectives for future studies would include determining the contribution of natural reproduction to the sport fishery, and to evaluate the performance of all lots of stocked salmon with respect to planting site, stocking date, and culture history.

Acknowledgments

The author wishes to thank George Beyerle, retired MDNR Fisheries Research Biologist, who designed the original study plan for this project, and also the staffs of the fisheries districts and research stations who participated in the census program. These field units did the day-to-day work of angler interviews, fishing pressure counts, and supervision of seasonal workers. Jim Peck, Fisheries Research Biologist at MDNR's Marquette Research Station, edited the manuscript.



Figure 1.—Lake Huron study area.

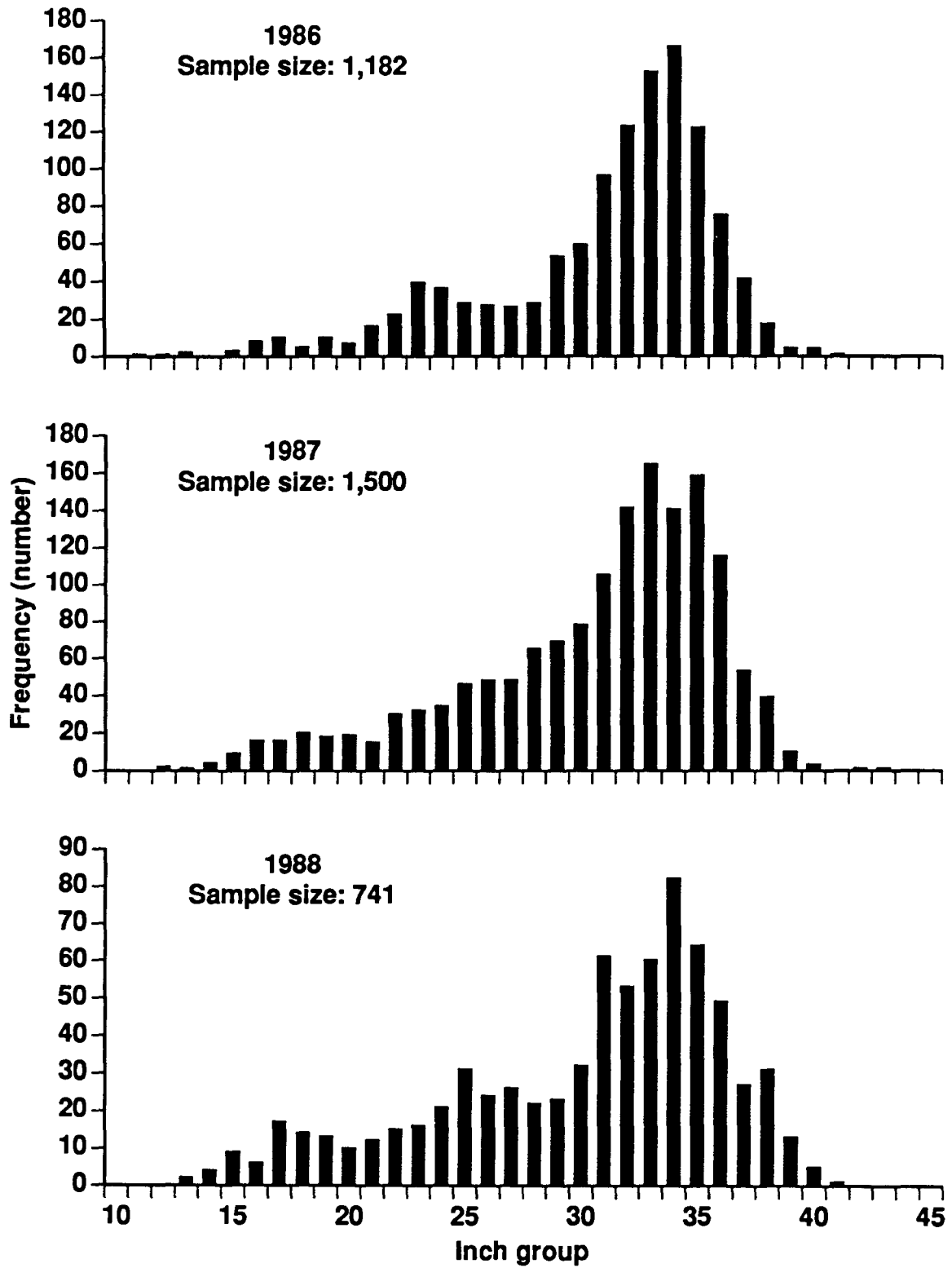


Figure 2.—Length-frequency distributions of chinook salmon harvested in Lake Huron sport fishery, 1986-88.



Figure 3.—Distribution of chinook salmon stocked at Rogers City (RP clip) in the sport fishery during April-June and July-October, 1986-88. Circles denote April-June data and squares denote July-October data.

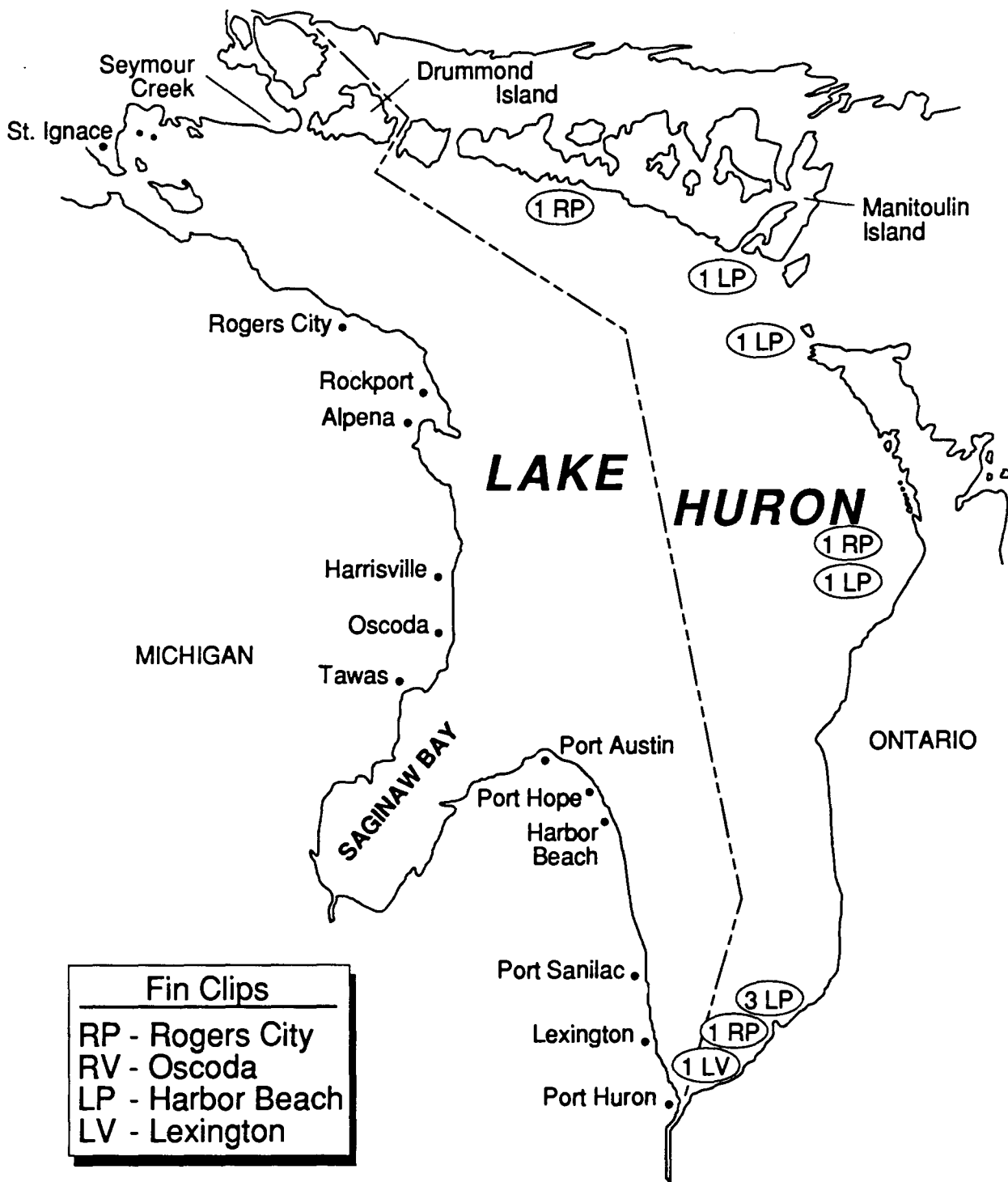


Figure 4.—Distribution of fin-clipped chinook salmon in the Lake Huron commercial fishery in Ontario, Canada, 1985-87.



Figure 5.—Distribution of chinook salmon stocked at Oscoda (RV clip) in the sport fishery during April-June and July-October, 1986-88. Circles denote April-June data and squares denote July-October data.



Figure 6.—Distribution of chinook salmon stocked at Harbor Beach (LP clip) in the sport fishery during April-June and July-October, 1986-88. Circles denote April-June data and squares denote July-October data.



Figure 7.—Distribution of chinook salmon stocked at Lexington (LV clip) in the sport fishery during April-June and July-October, 1986-88. Circles denote April-June data and squares denote July-October data.



Figure 8.—Distribution of coho salmon stocked at Seymour Creek (AD and LV clip) in the sport fishery, 1987.



Figure 9.—Distribution of coho salmon stocked at Tawas (RV clip) in the sport fishery, 1987.



Figure 10.—Distribution of coho salmon stocked at Port Hope (RP clip) in the sport fishery, 1987.

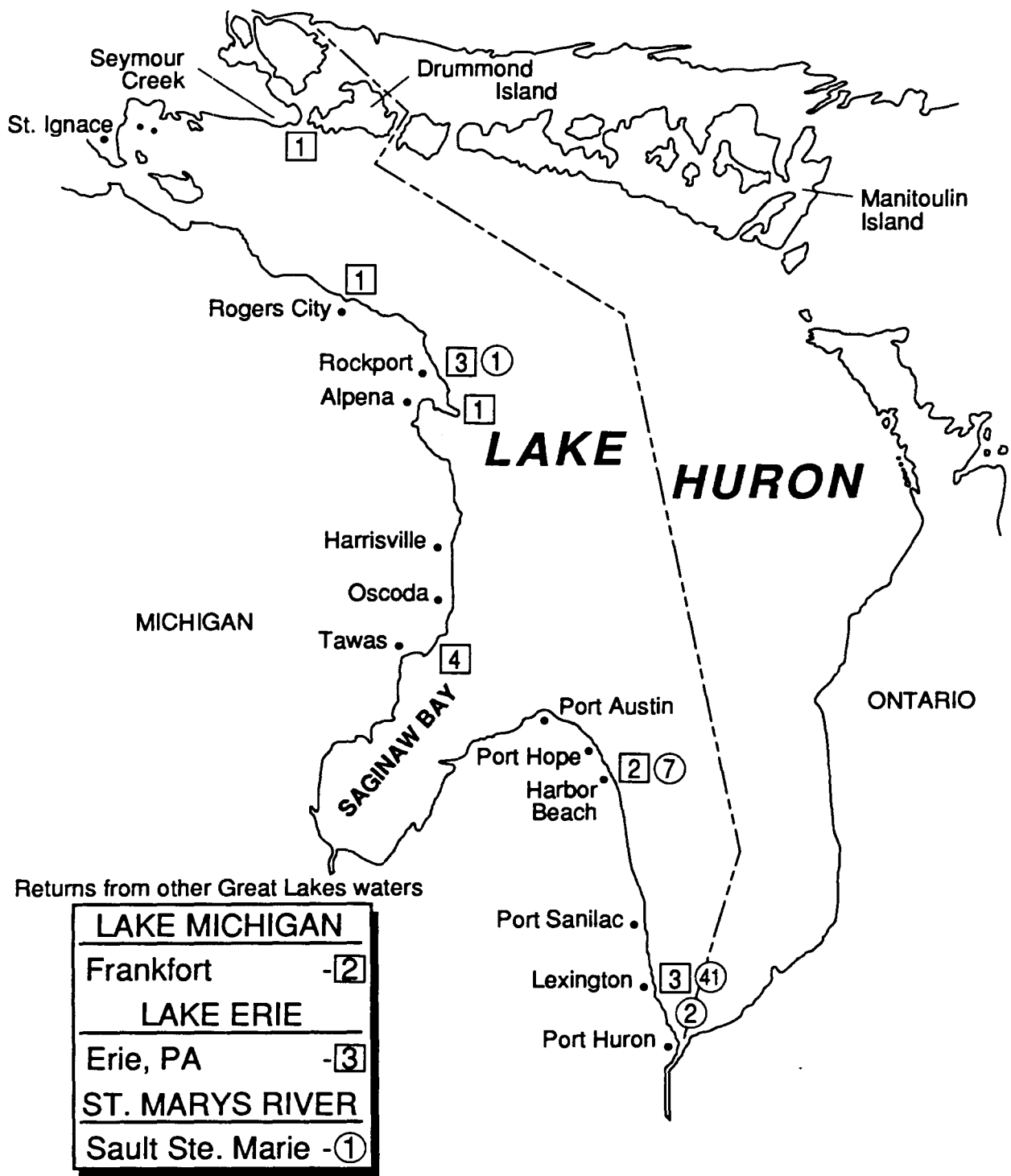


Figure 11.—Distribution of fin-clipped coho salmon stocked at Seymour Creek, Tawas, and Port Hope in the sport fishery during April-June and July-October, 1987. Circles denote April-June data and squares denote July-October data.

Table 1.—Estimated angler effort and harvest of chinook and coho salmon by Lake Huron sample area, 1986-88. Two standard errors in parentheses.

Area	Angler hours			Chinook salmon			Coho salmon		
	1986	1987	1988	1986	1987	1988	1986	1987	1988
Port Huron	99,916 (11,424)	165,030 (27,148)	97,184 (13,800)	1,400 (842)	926 (979)	2,815 (1,277)	62 (75)	248 (203)	7 (15)
Lexington to Port Sanilac	338,189 (67,523)	313,067 (52,403)	225,893 (49,145)	16,743 (6,027)	6,951 (1,616)	12,990 (4,828)	3,047 (1,836)	1,874 (993)	2,328 (1,032)
Harbor Beach to Grindstone City	405,603 (87,305)	374,267 (55,473)	320,748 (75,974)	17,286 (5,742)	15,257 (3,674)	12,777 (5,370)	1,593 (1,247)	520 (378)	617 (477)
Port Austin to Sand Point	446,012 (88,587)	367,158 (52,214)	263,640 (44,102)	6,709 (4,115)	6,720 (2,151)	6,129 (2,435)	776 (1,333)	67 (91)	174 (168)
Au Gres	353,863 (54,652)	418,651 (58,005)	321,858 (81,675)	0 (0)	31 (65)	50 (79)	303 (453)	0 (0)	0 (0)
Tawas	370,596 (64,812)	280,523 (36,564)	233,411 (44,044)	4,089 (1,417)	4,788 (1,074)	5,032 (1,860)	658 (581)	308 (208)	251 (177)
Oscoda	218,329 (58,765)	231,882 (51,100)	307,386 (102,982)	6,136 (2,629)	9,203 (4,089)	10,327 (3,904)	84 (111)	107 (143)	71 (112)
Harrisville	134,190 (35,495)	180,130 (39,416)	160,018 (32,472)	6,077 (2,291)	13,458 (13,564)	12,348 (2,870)	360 (297)	111 (115)	163 (153)
Alpena	56,501 (4,815)	72,306 (5,463)	69,577 (5,551)	1,996 (362)	4,194 (677)	4,788 (731)	94 (49)	106 (55)	141 (107)
Rockport	55,590 (9,038)	48,649 (7,042)	74,237 (7,559)	7,580 (2,607)	7,662 (1,886)	9,923 (1,528)	91 (164)	360 (282)	143 (79)
Rogers City	62,314 (7,169)	82,698 (24,124)	153,954 (14,976)	7,272 (1,485)	11,739 (3,924)	15,820 (2,969)	98 (72)	71 (61)	238 (252)
Drummond Island Detour	394,971 (69,192)	370,306 (52,212)	273,209 (44,960)	914 (791)	3,016 (1,685)	2,674 (1,153)	54 (90)	326 (363)	85 (77)
Les Cheneaux	420,916 (47,063)	182,508 (44,451)	202,703 (24,579)	3,129 (1,618)	1,171 (569)	7,695 (8,572)	0 (0)	175 (210)	2,866 (5,127)
St. Ignace	57,240 (13,344)	74,540 (14,704)	30,623 (6,208)	5,059 (1,927)	7,522 (2,426)	2,038 (867)	255 (395)	624 (572)	74 (149)
Total	3,414,230 (198,422)	3,161,715 (154,080)	2,734,441 (183,220)	84,390 (10,826)	92,638 (8,985)	105,406 (13,190)	7,475 (2,470)	4,897 (1,358)	7,158 (5,271)

Table 2.—Estimated chinook and coho salmon catch per hour, number harvested, and angler effort (hours) for Lake Huron excluding inner Saginaw Bay (Au Gres to Sand Point), April through September, 1986-88. Two standard errors in parentheses.

Year	Total catch per hour		Number harvested		Angler effort
	Chinook salmon	Coho salmon	Chinook salmon	Coho salmon	
1986	0.0279 (0.0036)	0.0024 (0.0008)	83,285 (10,803)	7,155 (2,453)	2,985,861 (189,595)
1987	0.0329 (0.0033)	0.0018 (0.0005)	87,615 (8,737)	4,779 (1,344)	2,663,386 (142,404)
1988	0.0435 (0.0055)	0.0030 (0.0022)	104,237 (13,174)	7,158 (5,271)	2,393,676 (163,911)

Table 3.—Catch rates (fish per angler hour) of chinook and coho salmon by Lake Huron survey area, 1986-88. Two standard errors in parentheses.

Area	Chinook salmon			Coho salmon		
	1986	1987	1988	1986	1987	1988
Port Huron	0.0140 (0.0086)	0.0056 (0.0060)	0.0290 (0.0138)	0.0006 (0.0008)	0.0015 (0.0013)	0.0001 (0.0002)
Lexington to Port Sanilac	0.0495 (0.0204)	0.0222 (0.0064)	0.0575 (0.0248)	0.0090 (0.0045)	0.0060 (0.0033)	0.0103 (0.0051)
Harbor Beach to Grindstone City	0.0426 (0.0169)	0.0408 (0.0115)	0.0398 (0.0192)	0.0039 (0.0032)	0.0014 (0.0010)	0.0019 (0.0016)
Port Austin to Sand Point	0.0150 (0.0097)	0.0183 (0.0064)	0.0232 (0.0100)	0.0017 (0.0030)	0.0002 (0.0002)	0.0007 (0.0006)
Au Gres	0.0 (0.0)	0.0001 (0.0002)	0.0002 (0.0002)	0.0009 (0.0013)	0.0 (0.0)	0.0 (0.0)
Tawas	0.0110 (0.0043)	0.0171 (0.0044)	0.0216 (0.0089)	0.0018 (0.0016)	0.0011 (0.0008)	0.0011 (0.0008)
Oscoda	0.0281 (0.0142)	0.0397 (0.0197)	0.0336 (0.0170)	0.0004 (0.0005)	0.0005 (0.0006)	0.0002 (0.0004)
Harrisville	0.0453 (0.0209)	0.0747 (0.0257)	0.0772 (0.0238)	0.0027 (0.0023)	0.0006 (0.0007)	0.0010 (0.0010)
Alpena	0.0353 (0.0071)	0.0580 (0.0103)	0.0688 (0.0119)	0.0017 (0.0009)	0.0015 (0.0008)	0.0020 (0.0015)
Rockport	0.1364 (0.0519)	0.1575 (0.0450)	0.1337 (0.0246)	0.0016 (0.0030)	0.0074 (0.0059)	0.0019 (0.0011)
Rogers City	0.1167 (0.0274)	0.1420 (0.0630)	0.1028 (0.0217)	0.0016 (0.0012)	0.0009 (0.0007)	0.0015 (0.0016)
Drummond Island	0.0023 (0.0020)	0.0081 (0.0047)	0.0098 (0.0045)	0.0001 (0.0002)	0.0009 (0.0010)	0.0003 (0.0003)
Les Cheneaux	0.0074 (0.0039)	0.0064 (0.0035)	0.0380 (0.0425)	0.0 (0.0)	0.0010 (0.0012)	0.0141 (0.0254)
St. Ignace	0.0884 (0.0387)	0.1009 (0.0382)	0.0666 (0.0314)	0.0045 (0.0070)	0.0084 (0.0078)	0.0024 (0.0049)

Table 4.—Age distribution of chinook salmon in the Lake Huron sport fishery, 1986-88.

Age	Year		
	1986	1987	1988
0.1	7%	6%	12%
0.2	25%	24%	23%
0.3	45%	41%	40%
0.4	24%	29%	23%
0.5	—	<1%	2%
Mean lake age	2.9	2.9	2.8
Number sampled	1,180	1,500	744

Table 5.—Mean total length (inches) and round weight (pounds) of chinook salmon by age from the Lake Huron sport fishery, 1986-88. Ninety-five percent confidence limits in parentheses.

Year	Age	Mean length	Mean weight	Number sampled
1986	0.1	21.4 (1.0)	4.1 (0.9)	79
	0.2	28.1 (0.5)	9.2 (0.5)	296
	0.3	32.8 (0.2)	13.5 (0.3)	525
	0.4	34.6 (0.2)	16.0 (0.3)	280
	All	31.3 (0.2)	12.4 (0.3)	1,180
1987	0.1	19.2 (0.3)	3.0 (0.3)	91
	0.2	26.6 (0.5)	8.0 (0.5)	352
	0.3	32.3 (0.3)	12.8 (0.3)	613
	0.4	34.7 (0.2)	15.9 (0.3)	438
	0.5	37.8 (2.9)	19.5 (2.8)	6
	All	30.9 (0.3)	12.0 (0.3)	1,500
1988	0.1	18.6 (0.6)	2.4 (0.3)	86
	0.2	26.2 (0.5)	6.9 (0.4)	158
	0.3	32.8 (0.3)	13.8 (0.4)	315
	0.4	35.4 (0.3)	17.3 (0.5)	167
	0.5	37.9 (1.1)	22.6 (1.7)	15
	All	30.4 (0.4)	12.0 (0.4)	741

Table 6.—Mean total length (inches) and round weight (pounds) of coho salmon from the Lake Huron sport fishery, 1986-88. Ninety-five confidence limits in parentheses.

Year	Age	Mean length	Mean weight	Number sampled
1986	1.1	21.0 (1.1)	3.7 (0.7)	39
1987	1.1	23.0 (0.6)	4.8 (0.4)	117
1988	1.1	22.2 (0.6)	4.7 (0.4)	107

Table 7.—Total number of chinook salmon stocked, number fin clipped, estimated harvest of marked fish, number and percent observed and number returned (fish per 1,000 stocked) in the Lake Huron sport fishery 1986-88.

Location	Total number stocked	Number clipped	Clip	Estimated harvest	Number (%) of clipped fish observed	Return
Rogers City (Swan River)	900,000	100,000	RP	4,596	60 (37%)	46.0
Oscoda (Van Etten Creek)	600,000	100,000	RV	3,478	46 (28%)	34.8
Harbor Beach	300,000	100,000	LP	2,982	38 (24%)	29.8
Lexington	270,000	100,000	LV	1,366	18 (11%)	13.7
Other areas	1,073,000	0				
Total	3,143,000	400,000		12,422	162 (100%)	31.1

Table 8.—Number of marked chinook and coho salmon captured at Lake Huron weirs, 1986-88.

Weir location	Year	Number, fin clip, and species
Rogers City (Swan River)	1986	3 LP chinook salmon 1 RP chinook salmon
	1987	43 RP chinook salmon 2 RV coho salmon
	1988	12 RP chinook salmon 1 RV chinook salmon
Oscoda (Van Etten Creek)	1986	4 RV chinook salmon
	1987	116 RV chinook salmon
	1988	5 RV chinook salmon

Table 9.—Location, number, and percentage of fin-clipped chinook salmon observed in the Lake Huron sport fishery, 1986-88.

Location ¹	Fin clip	Number observed	Percent
North	RP (Rogers City)	43	54
	RV (Oscoda)	21	26
	LP (Harbor Beach)	11	14
	LV (Lexington)	5	6
Central	RP (Rogers City)	4	29
	RV (Oscoda)	8	57
	LP (Harbor Beach)	1	7
	LV (Lexington)	1	7
South	RP (Rogers City)	13	19
	RV (Oscoda)	17	25
	LP (Harbor Beach)	26	38
	LV (Lexington)	12	18

¹North (Alpena to St. Ignace); Central (Tawas to Harrisville); and South (Port Austin to Port Huron).

Table 10.—Estimated harvest and return (fish per 1,000 stocked) of the 1984 year class of chinook salmon to various Lake Huron fisheries, 1985-88.

Year	Estimated harvest					Return				
	Sport	Weir	Tribal	Canadian commercial ¹	Total	Sport	Weir	Tribal	Canadian commercial	Total
1985	5,907 ²	2,197 ³	— ⁴	43,412	51,516	2	<1	— ⁴	14	16
1986	21,098	12,878	144	0	34,120	7	4	<1	0	11
1987	37,982	26,207	438	0	64,627	12	8	<1	0	20
1988	30,568	7,031	1,777	0	39,376	10	2	1	0	13
Total	95,555	48,313	2,359	43,412	189,639	31	14	1	14	60

¹McNeil and deLaplante 1989.

²Estimated based on 1986 catch and age distribution.

³Estimate based on percentage of 0.1 year old fish at Van Etten weir.

⁴Not available.

Table 11.—Mean, minimum, maximum, and sample sizes (N) for total length (inches) and round weight (pounds) of fin-clipped chinook salmon by month from the Lake Huron sport fishery and weirs, 1985-88. Ninety-five percent confidence limits in parentheses.

Year and age		Month							Season	
		Apr	May	Jun	Jul	Aug	Sep	Oct		
1985 Age 0.1	Length									
	Mean	14.4 (0.0)	15.5 (0.0)	21.7 (11.4)	18.2 (0.9)	—	—	26.3 (0.0)	19.4 (4.0)	
	Minimum	—	—	17.9	18.1	—	—	—	14.4	
	Maximum	—	—	25.4	18.3	—	—	—	26.3	
	N	1	1	2	2	0	0	1	7	
	Weight									
	Mean	1.0 (0.0)	1.4 (0.0)	3.6 (4.6)	2.2 (0.0)	—	—	8.5 (0.0)	3.4 (2.8)	
	Minimum	—	—	2.1	—	—	—	—	1.0	
	Maximum	—	—	5.1	—	—	—	—	8.5	
	N	1	1	2	1	0	0	1	6	
	1986 Age 0.2	Length								
		Mean	21.4 (0.6)	25.3 (2.3)	25.9 (3.0)	22.3 (7.0)	27.8 (7.8)	30.4 (1.6)	—	26.1 (1.4)
Minimum		20.5	20.9	22.1	20.0	18.0	27.7	—	18.0	
Maximum		22.1	35.3	32.0	24.6	33.6	33.8	—	35.3	
N		5	14	7	2	4	9	—	41	
Weight										
Mean		3.5 (0.4)	9.9 (12.2)	6.2 (2.4)	5.0 (0.0)	11.7 (5.1)	11.4 (1.5)	—	8.5 (1.5)	
Minimum		3.0	3.4	3.8	—	8.9	8.5	—	3.0	
Maximum		4.1	15.4	11.9	—	14.7	14.4	—	15.4	
N		5	3	7	1	3	10	0	29	
1987 Age 0.3		Length								
		Mean	30.7 (0.1)	30.9 (1.2)	33.9 (7.8)	29.1 (2.1)	33.7 (1.1)	34.1 (0.4)	34.8 (0.9)	33.5 (0.4)
	Minimum	30.3	26.0	29.5	21.5	25.4	24.0	28.8	21.5	
	Maximum	31.2	34.3	36.3	36.0	37.0	41.2	39.0	41.2	
	N	3	15	3	17	23	151	30	242	
	Weight									
	Mean	9.4 (0.2)	11.7 (1.4)	15.1 (7.0)	10.0 (1.9)	14.4 (1.4)	13.6 (0.4)	13.5 (1.2)	13.3 (0.4)	
	Minimum	8.3	7.5	11.1	4.9	5.6	7.2	7.0	4.9	
	Maximum	10.3	16.4	17.1	18.0	18.0	22.0	20.0	22.0	
	N	3	15	3	19	25	153	31	249	

Table 11.—Continued:

Year and age		Month							Season
		Apr	May	Jun	Jul	Aug	Sep	Oct	
1988 Age 0.4	Length								
	Mean	25.7 (0.0)	32.9 (4.0)	33.4 (5.8)	34.9 (1.7)	33.0 (1.1)	35.4 (1.4)	37.7 (4.1)	34.2 (0.9)
	Minimum	—	27.8	30.2	28.0	27.2	31.5	34.1	25.7
	Maximum	—	36.8	39.0	39.5	36.0	40.0	41.3	41.3
	N	1	5	4	12	15	13	4	54
	Weight								
	Mean	6.0 (0.0)	15.1 (4.7)	15.3 (10.5)	16.3 (2.3)	13.1 (1.8)	15.0 (2.1)	16.8 (6.4)	14.8 (1.1)
	Minimum	—	8.0	10.4	10.5	6.3	10.5	11.5	6.0
	Maximum	—	19.0	26.5	24.1	19.0	21.4	22.6	26.5
	N	1	5	4	12	15	13	4	54

Table 12.—Mean total length (inches) and round weight (pounds), and number sampled (N) by age and sex for fin-clipped chinook salmon stocked in Lake Huron during 1984. Ninety-five percent confidence limits in parentheses.

Year	Age	Males			Females		
		Length	Weight	Number	Length	Weight	Number
1985	0.1	22.3 (12.2)	5.4 (9.6)	3	—	—	0
1986	0.2	30.1 (3.3)	10.4 (3.0)	4	30.8 (3.5)	12.2 (3.5)	4
1987	0.3	34.7 (0.5)	13.6 (0.5)	113	33.6 (0.4)	13.8 (0.6)	75
1988	0.4	34.9 (1.8)	15.2 (2.4)	11	34.7 (1.0)	14.8 (1.5)	29

Table 13.—Total number of fin-clipped coho salmon stocked, number and percent observed and the number returned (fish per 1,000 stocked) for the Lake Huron sport fishery, 1987.

Location	Total number stocked	Fin clip	Estimated harvest	Number (percent) of fish observed	Return
Seymour Creek	50,000 186,000	LP AD	282	16 (24%)	1.2
Tawas	110,000	RV	646	36 (55%)	5.9
Port Hope	101,000	RP	247	14 (21%)	2.4

Table 14.—Mean, minimum, maximum total length (inches) and round weight (pounds) of fin-clipped coho salmon sampled by month from the Lake Huron sport fishery and weirs, 1987. All fish were age 1.1. Ninety-five percent confidence limits in parentheses.

	Month							Season
	Apr	May	Jun	Jul	Aug	Sep	Oct	
Length								
Mean	18.6 (0.7)	19.7 (1.1)	21.4 (0.8)	23.1 (0.7)	24.6 (1.4)	24.4 (1.6)	27.2 (1.4)	22.1 (0.7)
Minimum	17.2	13.5	17.7	21.6	21.1	21.0	25.0	13.5
Maximum	19.8	21.6	27.2	24.0	27.0	26.5	30.0	30.0
N	8	14	23	7	9	7	7	75
Weight								
Mean	2.1 (0.2)	2.8 (0.4)	3.5 (0.4)	4.3 (0.3)	4.8 (1.1)	5.5 (1.6)	7.5 (1.6)	4.0 (0.4)
Minimum	1.7	1.0	1.8	3.7	3.3	3.5	5.0	1.0
Maximum	2.5	3.7	6.7	4.8	6.8	7.0	9.7	9.7
N	8	14	23	7	7	5	7	71

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Report approved by W. C. Latta
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