



**Biological and Commercial Catch Statistics  
from the Chippewa Inter-Tribal Gill Net Fishery  
within Michigan Waters of Lake Superior  
During 1998**

by

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## ABSTRACT

The 1998 commercial inter-tribal fishery in the 1842 treaty-ceded waters of Michigan consisted of ten (10) large boats and 18 small boats, representing 28 tribal licensees from the Keweenaw Bay, Bad River and Red Cliff Bands of Lake Superior Chippewa. Gill nets were the only gear used in the fishery.

The fishing season for whitefish and lake trout was closed from November 1 through November 27 and commercial fishing was prohibited during October in seven seasonal refuges. Target fishing for lean lake trout (fishing in water < 35 fathoms) in areas outside the refuges was prohibited during October to reduce the impact of fishing on spawning stocks of lake trout. The Keweenaw Bay tribe managed their lake herring fishery through a quota system.

Fishermen reported lifting 5.5 million feet of gill net and harvesting 743,179 round pounds of fish. Whitefish was the primary target species, making up 71% of the total, followed by lake trout (17%), siscowet (8%), and lake herring (3%). Other species harvested either incidentally or through targeting efforts included salmon, walleye, smelt, chubs, and round whitefish (menominee).

## TABLE OF CONTENTS

	<u>PAGE</u>
FIGURES .....	iii
TABLES .....	iv
ACKNOWLEDGMENTS .....	vi
INTRODUCTION .....	1
Description of the Fishery .....	1
Quota Management System .....	2
METHODS .....	3
RESULTS AND DISCUSSION .....	4
Commercial Catch and Effort Statistics .....	4
Unit MI-2 .....	4
Unit MI-3 .....	5
Unit MI-4 .....	5
Unit MI-5 .....	7
Biological Statistics .....	8
Lake Trout MI-2 .....	8
Lake Trout MI-3 .....	8
Lake Trout MI-4 .....	9
Lake Trout MI-5 .....	9
Whitefish MI-2 .....	10
Whitefish MI-3 .....	10
Whitefish MI-4 .....	10
Whitefish MI-5 .....	10
Siscowet .....	11
Lake Herring and Menominee Whitefish .....	11
Coho and Chinook Salmon .....	11
REFERENCES CITED .....	12

## FIGURES

	<u>PAGE</u>
Figure 1. Management units and statistical grids in the 1842 ceded territory within Michigan waters of Lake Superior .....	14
Figure 2. Proportion of and total tribal gill net effort composed of 4 ½- 4 9/16 inch mesh nets by management unit, from 1986-1998 .....	15
Figure 3. Trends in average length (inches) hatchery and wild lake trout (ages 7 to 10) in Michigan management units MI-3 and MI-4 from 1985-1998 .....	16
Figure 4. Trends in average length (inches) of whitefish (ages 7 to 10) in Michigan management units MI-3 and MI-4 from 1985-1998 .....	17
Figure 5. Trends in harvests of lake herring and salmon in Michigan management units from 1986-1998 .....	18

## TABLES

	<u>PAGE</u>
Table 1.	Tribal commercial effort (feet) and harvest by management unit and grid from the 1842 ceded area within Michigan waters of Lake Superior in 1998 . . . . . 19
Table 2.	Total and target harvest and effort statistics by tribe for lake trout, whitefish, and siscowet in Michigan waters of Lake Superior in 1998 . . . . . 20
Table 3.	Tribal commercial harvest by management unit and gill net mesh size from the 1842 ceded area within Michigan waters of Lake Superior in 1998 . . . . . 21
Table 4.	Harvest and effort statistics for target species by grid and management unit in Michigan waters of Lake Superior in 1998 . . . . . 22
Table 5.	Tribal commercial effort (feet), harvest (dressed pounds), and catch per unit effort (CPE, pounds/1000 ft) statistics for whitefish, lake trout, and siscowet by management unit and year from the 1842 ceded area within Michigan waters of Lake Superior from 1984-1998 . . . . . 23
Table 6.	Age and size composition of hatchery and wild lake trout in tribal commercial harvests from unit MI-2 in 1998 . . . . . 25
Table 7.	Lamprey wounding and scarring rates (marks/100 fish) on lake trout captured in the tribal commercial harvests from management units in the 1842 ceded area within Michigan waters of Lake Superior, from January-December 1998 . 26
Table 8.	Age and size composition of hatchery and wild lake trout in tribal commercial harvests from unit MI-3, 1998 . . . . . 27
Table 9.	Catch curve mortality and survival rates on lake trout from management units in the 1842 ceded area within Michigan waters of Lake Superior for data collected January-December 1998 . . . . . 29
Table 10.	Age and size composition of hatchery and wild lake trout in tribal commercial harvests from unit MI-4, 1998 . . . . . 30
Table 11.	Age and size composition of hatchery and wild lake trout in tribal commercial harvests from unit MI-5, 1998 . . . . . 31

Table 12.	Age and size composition of whitefish in tribal commercial harvests from management units in the 1842 ceded area within Michigan waters of Lake Superior, January-December 1998 . . . . .	32
Table 13.	Age and size composition of siscowet in tribal commercial harvests from management units in the 1842 ceded area within Michigan waters of Lake Superior, January-December 1998 . . . . .	33
Table 14.	Age and size composition of lake herring and menominee in tribal commercial harvests from management units in the 1842 ceded area within Michigan waters of Lake Superior, January-December 1998 . . . . .	34
Table 15.	Age and size composition of chinook and coho salmon in tribal commercial harvest from management units in the 1842 ceded area within Michigan waters of Lake Superior, January-December 1998 . . . . .	35

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## INTRODUCTION

The Red Cliff, Bad River and Keweenaw Bay Bands of Lake Superior Chippewa entered into an agreement to establish an inter-tribal off-reservation assessment fishery in the western Michigan waters of Lake Superior (from the Wisconsin- Michigan state line to the West Entry in the Keweenaw Peninsula) on 23 August 1984. In 1988 tribal off-reservation commercial fishing expanded to include more fishermen and fishing in waters east of the Keweenaw Peninsula. An inter-tribal agreement was developed to manage this expanded fishery. Since 1990 Bad River and Red Cliff have managed their fishery within the guidelines of this inter-tribal agreement, while Keweenaw Bay manages their fishery through a fisheries management plan. Results of the early assessment fishery and the expanded commercial fishery have been reported annually (Ebener et al. 1985; Ebener and Bronte 1986, 1987, 1988; Ebener et al. 1989, 1990; Shively et al. 1992a, b, 1993, Mattes et al. 1994, Mattes et al. 1995, Mattes et al. 1996, Mattes et al. 1997, Mattes et al. 1998).

Biological and commercial fishery statistics were summarized for calendar year 1998 from the inter-tribal fishery in the 1842 treaty-ceded territory within Michigan waters of Lake Superior (Figure 1), and compared to those from previous years. Statistics were reported by management unit and grid, as indicated on individual catch reports.

## DESCRIPTION OF THE FISHERY

The commercial fishery consisted of ten (10) large boats and 18 small boats, representing 28 tribal licenses from the Keweenaw Bay, Bad River and Red Cliff Bands. As in previous years, the area south of a line from the East Entry of Keweenaw Peninsula to Point Abbaye (Figure 1) was open only to Keweenaw Bay small boat fishermen. Gill nets were the only gear used in the fishery.

The fishing season for whitefish and lake trout was closed from November 1 through November 27. Fishing for siscowet was prohibited in water less than 35 fathoms during the closed season for lake trout and whitefish. Commercial fishing was prohibited during October in seasonal refuges, of which four were created in 1988 and three in 1989 (Figure 1). Target fishing for lean lake trout in other areas was prohibited during October to reduce the impact of fishing on spawning stocks of lake trout. The Keweenaw Bay tribe employed a quota system for regulating lake herring harvest by its fishermen. The Bad River and Red Cliff tribes did not use this system for lake herring. Also, the three bands allowed fishing for lake herring year-round (i.e. no seasonal restriction).



## QUOTA MANAGEMENT SYSTEM

Since 1984, the tribes have used a quota management system to regulate harvest of lake trout to limit mortality on recovering lake trout stocks (Ebener and Bronte 1986). Total Allowable Catch (TAC's, expressed as number of fish) was estimated annually for each management unit with the exception of 1985, when each gill net tug was assigned a lake trout quota of 3,750 or 15,000 pounds depending on tribal affiliation. TAC's are calculated for each *fishing year*, beginning in November and running through October of the next year. Tribal quotas and TAC's by management unit and fishing year were as follows;

UNIT		YEARS		
		pre-1990 <sup>1</sup>	1990-1994 <sup>2</sup>	1995-1999 <sup>3</sup>
MI-2	TAC	19,800	10,400	9,700
	Tribal	9,900	5,200	4,850
MI-3	TAC	5,000	7,600	6,600
	Tribal	2,500	3,800	3,300
MI-4	TAC	20,600	53,400	46,920
	Tribal	10,300	26,700	23,460
MI-5	TAC	16,100	15,700	17,080
	Tribal	4,830	4,710	5,124
Total	TAC	61,500	87,100	80,300
	Tribal	27,530	40,410	36,734

<sup>1</sup> GLIFWC. 1987.

<sup>2</sup> Ebener et al. 1989b.

<sup>3</sup> Mattes. 1994.

Harvest quotas applied only to lean lake trout (referred to as "lake trout" in this report). Harvest of siscowet, a deep water form of lake trout, was not regulated by quotas.

## METHODS

Harvest and effort data were collected from mandatory daily catch reports filed bi-weekly by all fishermen who sold fish in their names, or by the boat captain who reported all catch and effort for his vessel. Harvest was reported in both round and dressed pounds. Species for which harvest was reported as dressed pounds and conversion factors used to calculate round pounds are given below. Harvest of all other species not listed below was reported in round pounds.

<b>Species</b>	<b>Conversion</b>
Whitefish	1.17
Lake trout	1.25
Siscowet	1.25
Salmon	1.25
Herring	1.20
Round whitefish	1.15
Chub	1.20

Biological statistics were derived from biological monitoring data. Biological monitoring of catches occurred several times a month by the Keweenaw Bay Department of Natural Resources, the Red Cliff Fisheries Department, and the Great Lakes Indian Fish and Wildlife Commission.

## RESULTS AND DISCUSSION

### COMMERCIAL CATCH AND EFFORT STATISTICS

Fishermen reported lifting 5.5 million feet of gill net and harvesting 623,969 dressed pounds (743,149 round pounds) of fish (Tables 1, 2, and 3). Lake whitefish, the primary target species, made up 71% of the total followed by lake trout (17%), siscowet (8%), and lake herring (3%). Other species harvested either incidentally or through targeting efforts included salmon, walleye, smelt, chubs, and round whitefish (menominee).

#### Unit MI-2

Effort. Seventeen percent of the total effort was expended in MI-2 (Table 1). Fishing effort was 0.91 million feet with gill nets of 4 ½ inch mesh accounting for 97% (0.88 million feet) of the unit effort (Table 3, Figure 2). Fishing occurred in ten grids grouped into four general areas: Misery Bay (grids 1119, 1120, 1219, and 1220), Union Bay (grid 1315), Black River (grids 1214, 1413 and 1414), and Saxon Harbor (grids 1511, 1512) (Figure 1). Ninety-one percent of the effort occurred around Misery Bay followed by Black River (3%), Union Bay (4%), and Saxon Harbor (2%).

Harvest. Twenty-five percent of the total harvest (153,701 dressed or 181,709 round pounds) was taken in MI-2. Whitefish made up 84% and lake trout 10% of this harvest (Tables 1 and 3). The majority of harvest occurred around Misery Bay. For whitefish, 92% of the harvest was from grids near Misery Bay followed by Union Bay (5%), Saxon Harbor (2%), and Black River (1%) (Table 1). Harvest of lake trout was highest around Misery Bay (80%) followed by Saxon Harbor (14%), Black River (4%) and Union Bay (2%). Siscowet were harvested near Misery Bay (97% of the total) and Black River (3%).

Target Effort and Harvest. All fishing effort in MI-2 was targeted for whitefish and lake trout (Table 4). Target effort (912,600 feet) and harvest (128,169 pounds) of whitefish was the highest since 1993 (Table 5). Target lake trout harvest (15,939) was within the range seen over the past five years (11,332-18,055), but remains much below the average level reported for the years 1987-1989 (32,816 pounds). No target fishing was directed at siscowet or lake herring.

Catch per effort (CPE or pounds harvested per 1,000 feet of gill net) for targeted fishing in the ten grids of MI-2 that were reportedly fished varied from 21-180 pounds for whitefish (average: 141 pounds) and 9-139 pounds for lake trout (average: 17 pounds) (Table 4). For whitefish, CPE in the grid fished near Union Bay was highest (180 pounds), followed by the grids fished at Misery Bay (average: 111 pounds), Saxon Harbor (average: 102 pounds), and Black River (average: 57 pounds). For lake trout, CPE was highest in grids near Saxon Harbor (average: 114 pounds) followed by Misery Bay (average: 40 pounds), Black River (average: 18 pounds), and Union Bay (9 pounds).

### Unit MI-3

Effort. Thirty-two percent of the total effort was expended in MI-3 (Table 1). Fishing effort was 1.74 million feet the highest level since 1986 (Table 5, Figure 2). All nets fished were 4 ½ inch mesh. Fishing occurred in four grids grouped into three general areas: Redridge/West Entry (grids 1121 and 1122), 5 Mile Point (grid 1023) and Eagle River (grid 1024) (Figure 1). The percent of total MI-3 effort fished in these respective areas was 78, 19, and 3. No fishing occurred around Copper Harbor (grids 925, 926, and 1027).

Harvest. Twenty-six percent of the total harvest (164,475 dressed or 193,631 round pounds) was taken in MI-3. Of harvest in this unit, whitefish made up 91%, lake trout 7%, and siscowet 2% (Tables 1 and 3). The percent of whitefish and lake trout taken from the three general areas followed the pattern for effort. For whitefish, 61% were taken from Redridge/West Entry, followed by 5 Mile Point (32%), and Eagle River (6%). For lake trout, respective percentages were 68%, 29%, and 3%. However, siscowet harvest did not follow the pattern for effort with 51% taken at Redridge/West Entry followed by 29% at Eagle River and 20% at 5 Mile Point.

Target Effort and Harvest. The majority of fishing (99%) was targeted at whitefish and lake trout; the remainder (1% or 9,500 feet) was targeted siscowet (Table 4). Target effort in 1998 (1.73 million feet) increased by 389,300 feet compared to 1997. In turn, target harvest of whitefish (149,192 pounds) increased by 48,107 pounds compared to 1997 and target harvest of lake trout (11,815 pounds) increased by 3,241 pounds. Target fishing for siscowet took 400 pounds.

Catch per effort. CPE for targeted fishing in the four grids of MI-3 that were reportedly fished varied from 41-191 pounds for whitefish (average: 86 pounds) and 4-10 pounds for lake trout (average: 7 pounds) (Table 4). For whitefish, CPE was highest near Eagle River (191 pounds) followed by 5 Mile Point (143 pounds) and Redridge/West Entry (65 pounds). For lake trout, CPE was also highest near Eagle River (10 pounds), followed by 5 Mile Point (7 pounds), and Redridge/West Entry (6 pounds).

## Unit MI-4

Effort. Since 1986 this unit has received the majority of tribal effort (1986-98 average: 64%). In 1998, 45% percent of the total tribal effort was fished in MI-4 (Table 1). Fishing effort was 2.5 million feet and continues to be stable since peaking in 1990 and then declining for the next 5 years (Figure 2). Large mesh gill nets of 4 ½ inch mesh accounted for 97% of the effort with various sized small mesh accounting for the remaining 3% (Table 3).

Fishing occurred in 12 grids grouped into four general areas: Traverse Bay to Bete Grise (grids 1026, 1124, 1125, and 1225), Traverse Island (grids 1223 and 1224), Keweenaw Bay (grids 1323, 1324, and 1423) and Huron Islands (1325, 1326, and 1424) (Figure 1). Most of the fishing effort occurred in Keweenaw Bay (36% or 0.90 million feet), followed by Huron Islands (25%), Traverse Island (20%), and the Traverse Bay to Bete Grise area (19%). A fifth general area, Keweenaw Point (grid 1028), was not fished in 1998.

Harvest. Forty-one percent of the total harvest (257,587 dressed or 309,716 round pounds) were taken in MI-4 (Table 1). Of this harvest, whitefish made up 54%, lake trout 25%, siscowet 13%, herring 7%, and salmon 1%. The majority of these five species were harvested in the Traverse Bay to Bete Grise and Keweenaw Bay areas. Percentages of whitefish taken from these two areas were 40% and 23%. Respective percentages were 6% and 46% for lake trout, 46% and 39% for siscowet, and 20% and 74% for herring. Eighty-two percent of the salmon harvest was from Keweenaw Bay (Table 3).

Target Effort and Harvest. The majority of fishing effort (89%) was targeted at whitefish and lake trout with the remainder directed at siscowet (8%) and lake herring (3%) (Table 4). Target effort in 1998 (2.20 million feet) was similar to that of 1997 (2.24 million feet). In turn, target harvest of both whitefish (136,100) and lake trout (60,014) was similar to 1997 (127,998 pounds and 54,929 pounds respectively). Target harvest for siscowet (19,377 pounds) decreased by 46% from 1997 (41,753 pounds).

Catch per effort. CPE for targeted fishing in the 12 grids of MI-4 varied from 28-309 pounds per 1000 feet for whitefish (average: 62 pounds) and 2-46 pounds for lake trout (average: 27 pounds). For the 8 grids where siscowet were targeted CPE ranged from 19-269 pounds (average: 98 pounds). For the 3 grids with effort directed at herring CPE ranged from 140-233 pounds (average: 145 pounds). For the 2 grids with effort directed at salmon CPE ranged from 57-64 pounds (average: 62 pounds).

For whitefish, CPE was highest from Traverse Bay to Bete Grise (average: 175 pounds) and lowest in Traverse Island grids (average: 34 pounds). For lake trout, CPE was in the 37-38 pound range for grids in two areas (Keweenaw Bay and Traverse Island) and from 12-21 pounds in two other areas (Traverse Bay to Bete Grise and the Huron Islands). CPE for siscowet was highest in grids near Traverse Island (144 pounds) where only 6% of the target harvest occurred, followed by the Keweenaw Bay area (69 pounds) with 55% of the target harvest.

Other Species. Herring and salmon continued to be important target species of the small boat fishery. Harvest of herring was 21,075 dressed pounds which was below the thirteen year average (1986-1998: 25,920 pounds) and over 20,000 pounds below the 1991 to 1994 average of 41,610 pounds (Figure 5). Salmon harvest was 3,154 dressed pounds only 1,300 pounds below the 1986 to 1998 average (4,419 pounds). Sixty-two percent of the herring and 80% of the salmon harvests were caught by the small boat fishery in grids 1323, 1324, and 1423 (Table 1).

#### Unit MI-5

Effort. Six percent of the total effort was fished in MI-5 (Table 1). Fishing effort was 355,180 feet (Table 1), and was primarily 4 ½ large mesh net targeted at whitefish, lake trout, and siscowet (Figure 2, Tables 3 and 5). Fishing occurred in four grids. Total effort in MI-5 has always been less than in other units because of limited docking space with direct access to fishing grounds.

Harvest. Eight percent of the total harvest (48,206 dressed or 58,123 round pounds) was taken from MI-5. Whitefish made up 51%, lake trout 34%, siscowet 8%, and herring 7% of the harvest (Table 1).

Target Effort and Harvest. Targeted whitefish harvest was 23,950 dressed pounds which was near the 1986-1998 average of 21,098 pounds (Table 5). Targeted lake trout harvest was 14,942 dressed pounds nearly 4,500 pounds above the 1986 to 1998 average (10,496 pounds). A total of 4,023 dressed pounds of siscowet and 3,417 dressed pounds of herring were harvested (Table 1).

Catch per effort. Catch per effort for targeted fishing in the four grids varied from 0-161 pounds per 1,000 feet for whitefish (average: 85 pounds) and 35-800 pounds for lake trout (average: 53 pounds). Siscowet were targeted in one grid with a CPE of 27 pounds and herring were targeted in one grid with a CPE 313 pounds (Table 4).

## **Biological Statistics**

### Lake Trout MI-2

Lake trout catch was composed of eight year classes of hatchery fish (1981-1994) and fifteen year classes of wild fish (1974-1994) (Table 6). Of the 273 fish samples 93% were wild trout. Mean age for hatchery and wild fish was 8.1 and 8.5 years, respectively. Fish ten years and older made up 27% of the wild component of the catch. Mean length and weight of all fish sampled was 23.6 in and 4.5 lbs round, respectively. The average size of hatchery fish was 22.9 inches and the average size of wild fish was 23.6 inches.

Average lamprey marking rates were 2 wounds and 10 scars/100 fish (Table 7), with fish greater than 25 inches exhibiting the highest scarring rates.

Annual total mortality was estimated to be 32% ( $\pm 11\%$ ) for wild fish of ages 7-13 (Table 8). Mortality of wild and hatchery fish combined for ages 7-13 was 32% ( $\pm 11\%$ ).

### Lake Trout MI-3

Two year classes of hatchery fish (1988 and 1991) and twelve year classes of wild fish (1982-1994) were represented in the 69 lake trout sampled (Table 9). Mean age for hatchery and wild fish was 7.8 and 9.3 years, respectively. Wild trout composed 94% of the catch. This is the highest percent composition in this management unit since sampling began in 1985. Percent wild fish ranged from 70 to 100% among year classes.

Mean length and weight of all fish sampled was 23.2 inches and 4.0 pounds round, respectively. Average size of wild fish (23.3 inches) was greater than that of hatchery fish (22.1 inches). Average size at age of 7-10 year old wild lake trout has decreased since 1985 (Figure 3). Average length of 7-10 year old hatchery fish has fluctuated since 1990 in MI-3, probably due to low sample sizes.

Overall lamprey marking rates were 1.4 wounds and 12 scars/100 fish (Table 7), with fish greater than 29 inches exhibiting the highest scarring rates. The number of total marks across all sizes was 13 marks/100 fish, compared to 11 marks/100 fish in 1989, 8 in 1990, 12 in 1991, 26 in 1992, 15 in 1993, 7 in 1994, 10 in 1995, 2 in 1996 and 7 in 1997.

Annual total mortality rates were not estimated due to the small sample size.

### Lake Trout MI-4

Twelve year classes of hatchery fish (1983-1996) and twelve year classes of wild trout (1983-1995) were represented in a sample of 367 lake trout (Table 10). Mean age of hatchery and wild fish was 6.8 and 7.1 years, respectively. Wild fish, age ten and older, composed 22% of all wild trout. Overall, wild fish composed 72% of all lake trout sampled. This proportion has increased from 41% in 1985 and remained relatively stable and near 80% from 1988 to 1994. The percentage of the wild component of the catch has decreased since 1995, most likely due to the continuation of stocking in this management unit. Percent wild fish ranged from 0 to 100% among year classes (Table 10).

Mean length and weight of all fish sampled was 21.3 inches and 3.4 pounds, similar to values for 1992-1997. Average length of wild and hatchery fish at ages 7-10 has been tracked since 1985 (Figure 3). The average length of wild fish ages 7-10 was similar in 1985 and 1998 but the variation among ages was somewhat narrower. Average length of hatchery fish has fluctuated greatly primarily due to low numbers of fish sampled.

Lamprey marking rates were 0.8 wounds and 5 scars/100 fish (Table 7), with the larger, older fish exhibiting the greatest occurrence of scars. The number of total marks across all sizes of trout were 5 marks/100 fish, compared to total marking rates of 13 in MI-3.

Annual total mortality was estimated to be 20% ( $\pm 17\%$ ) for wild fish ages 7-12 (Table 8), a decrease from 37% ( $\pm 18\%$ ) in 1997. Mortality rates have declined steadily from the rate of 60% ( $\pm 13\%$ ) calculated in 1988. Mortality of ages 7-12 wild and hatchery fish combined was 26% ( $\pm 13\%$ ), compared with 29% ( $\pm 12\%$ ) in 1997, 43% ( $\pm 15\%$ ) in 1996, 22% ( $\pm 17\%$ ) in 1995, 27% ( $\pm 9\%$ ) in 1994, 26% ( $\pm 24\%$ ) in 1993, 36% ( $\pm 8\%$ ) in 1992, 44% ( $\pm 10\%$ ) in 1991, 45% ( $\pm 9\%$ ) in 1990, 51% ( $\pm 22\%$ ) in 1989 and 42% ( $\pm 28\%$ ) in 1988 (Table 9).

### Lake Trout MI-5

Of the 111 lake trout sampled, six year classes of hatchery fish (1988-1995) and eleven year classes of wild fish (1985-1995) were identified (Table 11). Mean age of hatchery and wild fish was 5.4 and 8.0 years, respectively. Wild trout composed 79% of the sample. Fish ten years and older made up 38% of the wild component. Mean length and weight of all fish sampled was 22.7 and 3.5 pounds, respectively. Average length of hatchery and wild fish was 20.8 and 22.4 inches, respectively.

Overall lamprey marking rates were 0 wounds and 1 scar/100 fish (Table 7). Annual mortality was not estimated due to the small sample size.



### Whitefish MI-2

Eleven year classes (1982-1992) were represented in the 574 fish aged (Table 12). The 1987-89 year classes were dominant (ages 9-11) and comprised 70% of the aged samples. The mean age was 9.9 years. Average length and weight of whitefish was 19.2 inches and 2.6 pounds. Annual total mortality was estimated at 53% for ages 10-14.

### Whitefish MI-3

Nine year classes (1985-1993) were represented in the 1438 fish aged (Table 12). The 1989-91 year classes were also dominant (ages 7-9) in MI-3 and composed 75% of the aged sample. The mean age was 8.7 years from a sample size of 870. Average length and weight of whitefish was 19.4 inches and 2.5 pounds round based on a sample size of 1,438 fish. Annual total mortality was estimated at 58% for ages 8-13.

### Whitefish MI-4

Nine year classes (1985-1993) were represented in the 943 fish aged. The 1989-91 year classes were also dominant (ages 7-9) in MI-4 and composed 76% of the aged sample. The mean age was 7.6 years from a sample of 797 fish. Average length and weight were 19.4 inches and 2.9 pounds based on a sample size of 943 fish. Mean length during the 10 year period of 1989-1998 has varied by about 1 inch. Mean age has varied by about 1.0 year during the same 10 year period with the 1998 mean age higher than any other year. Mortality was estimated to be 52% for ages 7-12.

Statistic	1989	1990	1991	1992	1993	1993	1995	1996	1997	1998
Mean Age	6.6	6.7	6.8	6.7	7.0	6.6	7.3	6.8	7.0	7.6
Mean Length	19.6	20.1	20.1	20.1	19.7	20.2	20.4	19.3	19.3	19.4

### Whitefish MI-5

Twelve year classes (1979, 1982-1992) were represented in the 220 fish aged from grids 1327 and 1328 (Table 12). The mean age was 8.7 years for a sample size of 167. Average length and weight were 21.3 inches and 3.5 pounds based on a sample size of 220. Mortality was estimated to be 50% for ages 8-13.

### Siscowet

Seventeen year classes (1978-1994) were represented in the harvest from MI-2, MI-3, and MI-4 (Table 13). The mean age for siscowet in MI-2 was 12.2 years compared to 11.2 years in MI-3, and 11.9 years in MI-4. No siscowet were sampled in MI-5. The mean size for siscowets was 23.6 inches and 4.5 pounds in MI-2, 21.4 inches and 3.0 pounds in MI-3, 20.1 inches and 2.5 pounds in MI-4. A mortality rate could not be calculated for siscowets from any of the management units.

### Lake Herring and Menominee Whitefish

Lake herring were only sampled in MI-4, where nine year classes (1987-1995) were represented in the 468 fish aged (Table 14). The 1990 and 1991 year classes were dominant (66.6%) in the samples. The previously dominant 1984 year class was not detected in 1997 or 1998. The mean age was 7.3 years. The mean size of herring was 15.1 inches and 1.1 pounds. The total annual mortality was calculated at 59% for ages 7-10. One menominee whitefish was sampled in 1998 representing the 1990 year class. It was 8 years old, 15.3 inches long, and weighed 1.1 pounds.

### Coho and Chinook Salmon

All eleven salmon sampled in the tribal harvest were taken from MI-4 (Table 15). Two year classes (1996-97) of coho salmon were represented in the 11 samples with a mean age of 1.6 years. The mean size was 14.7 inches and 1.1 pounds. No chinook salmon were sampled.

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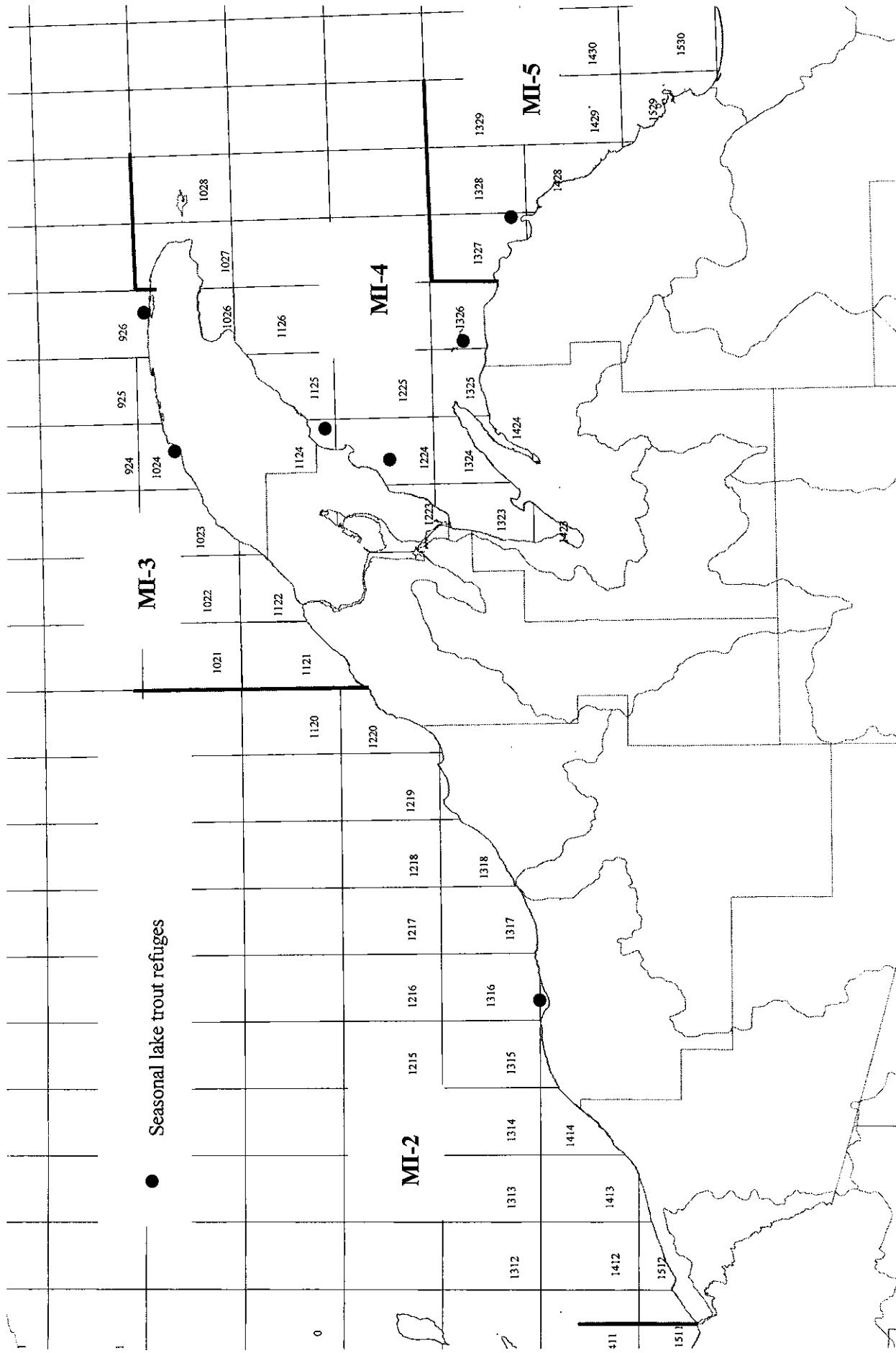


Figure 1. Management units and statistical grids in the 1842 treaty ceded area within Michigan waters of Lake Superior.

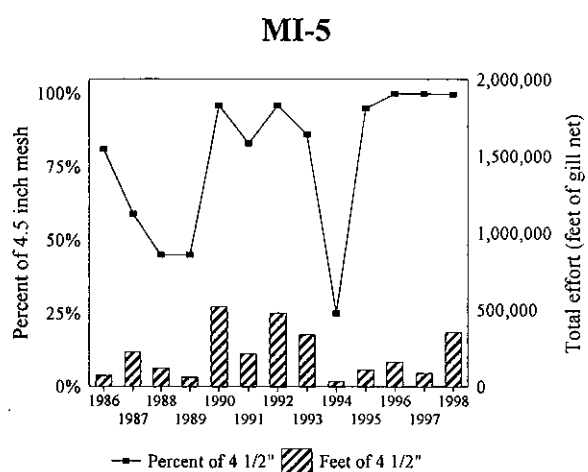
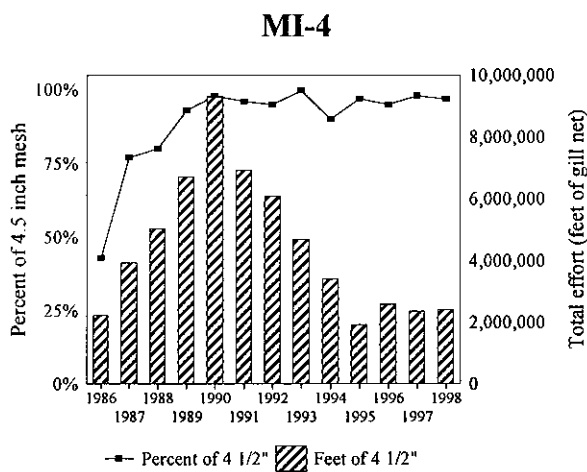
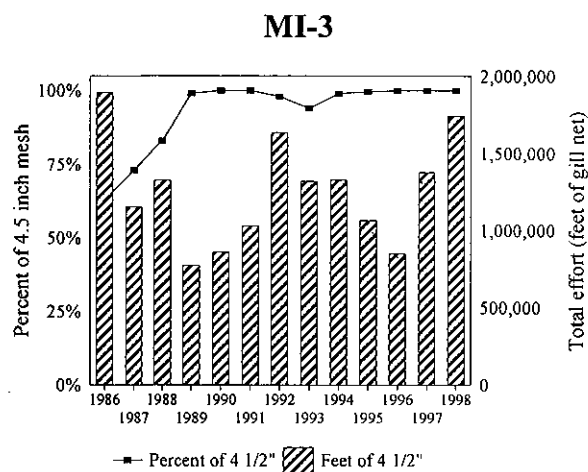
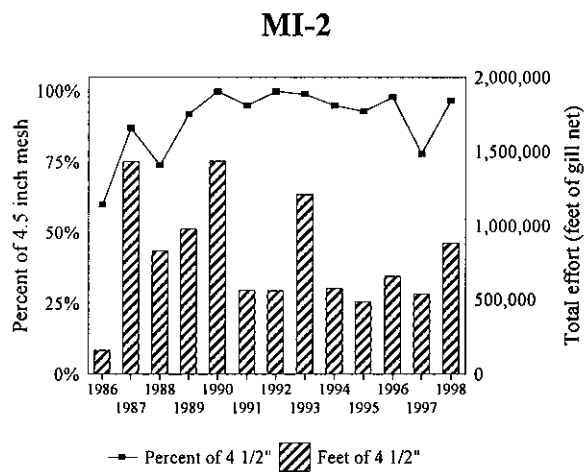
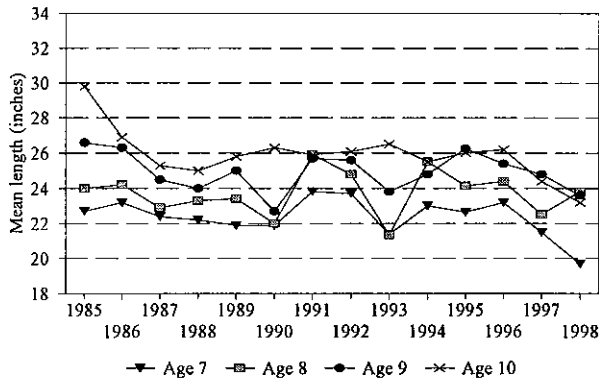
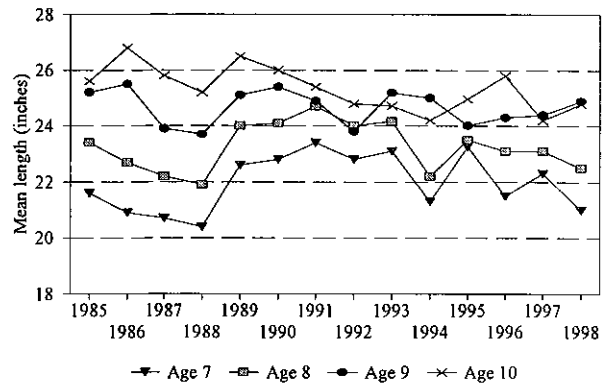


Figure 2. Proportion and total tribal gill net effort composed of 4 1/2 inch mesh by management unit, 1986 to 1998.

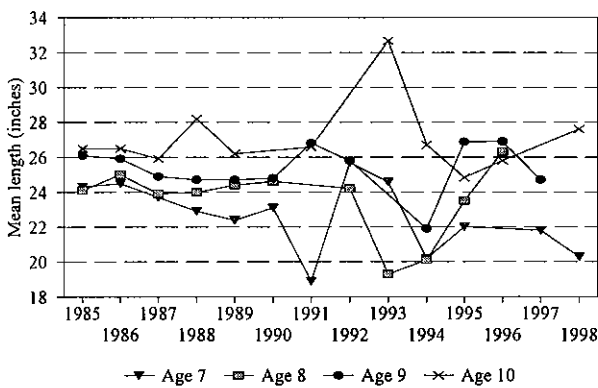
**Wild Lake Trout MI-3**



**Wild Lake Trout MI-4**



**Hatchery Lake Trout MI-3**



**Hatchery Lake Trout MI-4**

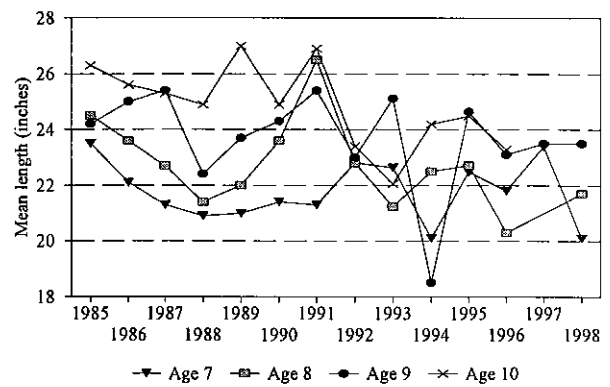
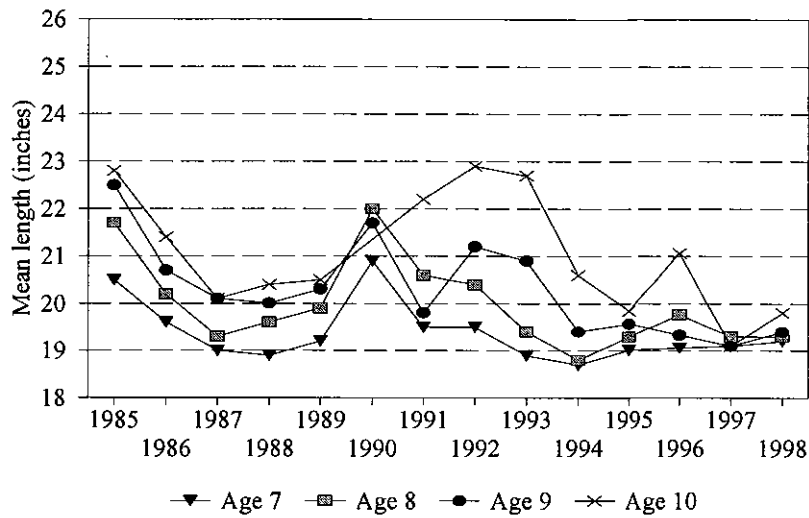


Figure 3. Trends in average length (inches) of hatchery and wild lake trout (ages 7-10) in Michigan management units MI-3 and MI-4, from 1985-1998.

### Whitefish MI-3



### Whitefish MI-4

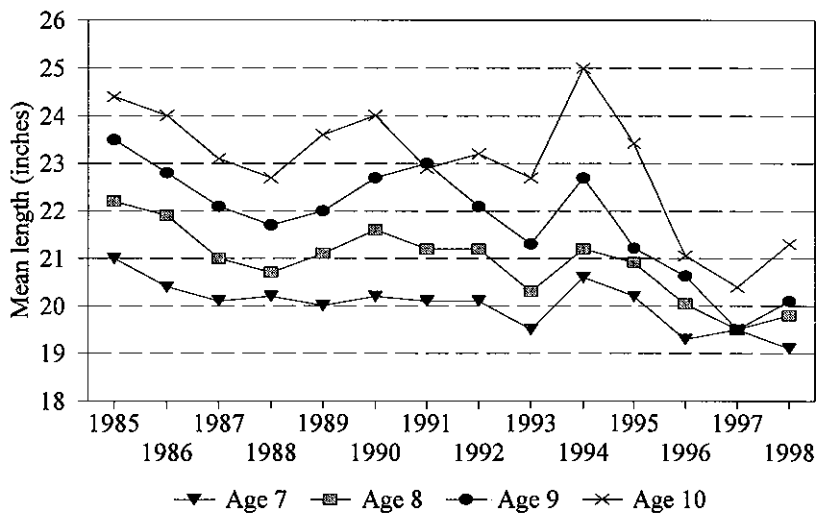


Figure 4. Trends in average length (inches) of whitefish (ages 7-10) in Michigan management units MI-3 and MI-4, from 1985-1998.



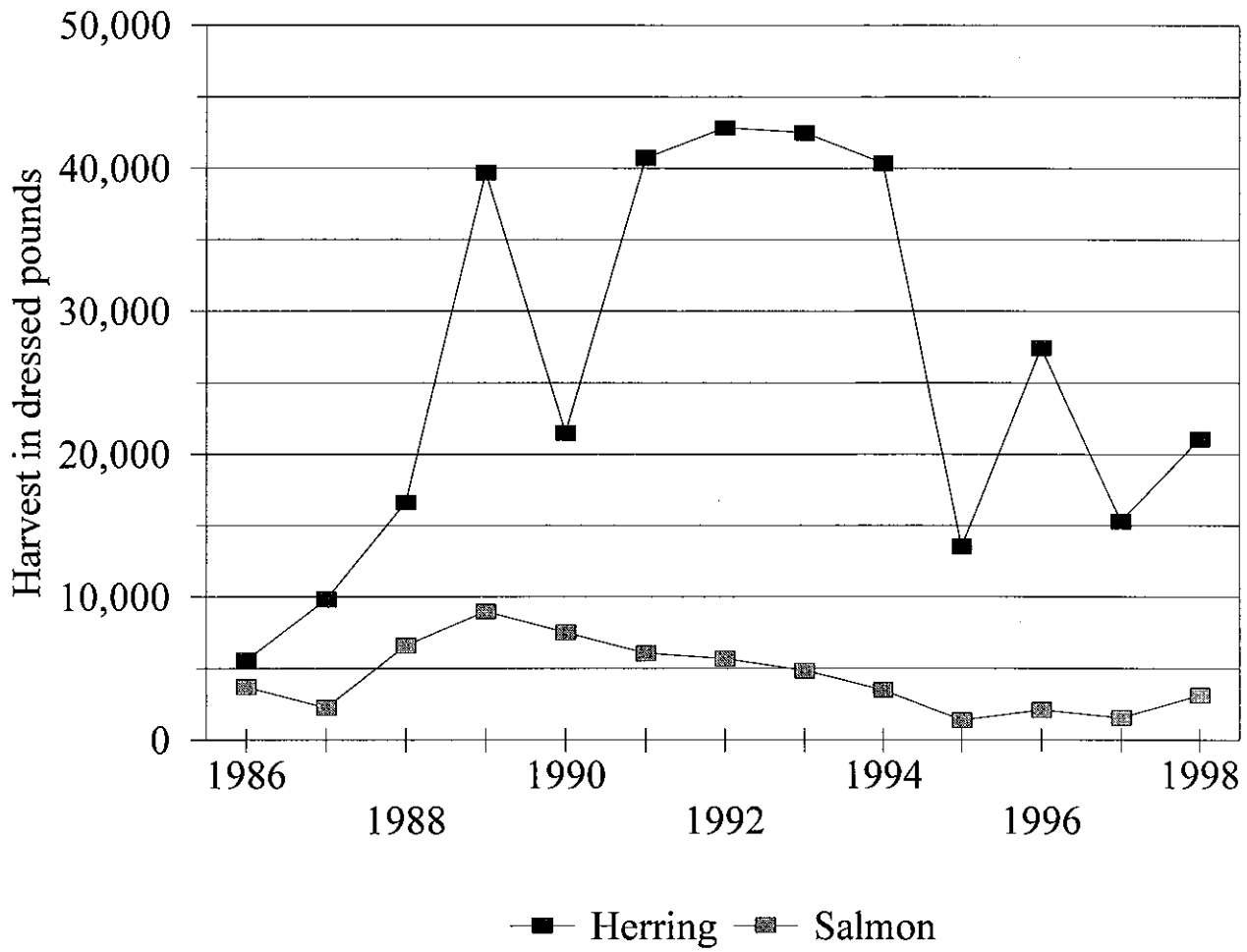


Figure 5. Trends in harvests of lake herring and salmon in Michigan management units from 1986-1998.

Table 1. Tribal commercial effort (feet) and harvest by management unit and grid from the 1842 ceded area within Michigan waters of Lake Superior in 1998. Lake trout, whitefish, siscowet, herring, salmon menominee, and chubs are dressed pounds, all others are round.

Unit	Grid	Effort	Lake trout	Whitefish	Siscowet	Herring	Salmon	Menominee	Chub	Burbot	Walleye	Smelt
MI-2	1119	19,000	1,790	1,075	0	0	0	0	0	0	0	0
	1120	23,900	865	1,962	0	0	0	0	0	0	0	0
	1214	8,000	90	700	250	0	0	0	0	0	0	0
	1219	569,800	6,226	79,806	4,247	0	0	0	0	0	0	0
	1220	214,500	3,933	35,376	4,238	0	0	0	0	0	17	0
	1315	34,800	310	6,260	0	0	0	0	0	0	0	0
	1413	12,000	215	750	0	0	0	0	0	0	0	0
	1414	12,600	310	270	0	0	0	0	0	0	0	0
	1511	12,000	1,669	2,096	0	0	0	0	0	0	0	0
1512	6,000	531	174	0	0	0	0	0	0	0	0	
Subtotal		912,600	15,939	128,469	8,735	0	0	0	0	0	17	0
MI-3	1023	334,000	3,479	47,914	651	0	8	0	0	0	12	0
	1024	50,000	342	9,567	922	0	0	0	0	0	0	0
	1121	591,000	5,352	23,704	1,568	0	0	0	0	0	0	0
	1122	764,000	2,772	68,007	80	0	0	0	0	0	14	0
Subtotal		1,739,000	11,945	149,192	3,221	0	8	0	0	0	26	0
MI-4	1026	84,000	288	6,158	0	0	0	0	0	0	0	0
	1124	55,000	119	11,924	321	0	0	0	0	0	0	0
	1125	296,500	1,895	25,331	14,963	2,677	0	0	0	0	3	0
	1223	69,500	2,489	1,763	390	56	37	0	0	0	0	0
	1224	427,100	15,329	17,382	2,089	246	0	0	0	0	0	0
	1225	38,500	1,287	11,900	0	850	0	0	0	0	89	0
	1323	216,100	6,869	6,819	3,718	1,508	756	0	0	0	0	0
	1324	173,800	6,845	6,528	5,171	1,245	92	0	0	0	0	0
	1325	364,800	5,354	17,804	1,571	681	517	0	0	0	0	0
	1326	239,000	7,049	14,794	901	24	17	0	0	0	0	0
	1423	513,070	15,649	18,556	3,914	10,371	1,690	22	6	0	0	2
	1424	14,400	246	425	0	0	0	0	0	0	0	0
	Subtotal		2,491,770	63,419	139,384	33,038	17,658	3,109	22	6	0	92
MI-5	1327	220,800	7,018	10,417	3,258	3,142	0	0	0	0	0	0
	1328	22,000	769	3,550	30	0	0	0	0	0	0	0
	1428	110,380	6,860	10,485	735	275	37	0	0	0	0	0
	1438	2,000	1,600	0	0	0	0	0	0	0	0	0
Subtotal		355,180	16,247	24,452	4,023	3,417	37	0	0	0	0	0
Grand Total		5,498,550	107,550	441,497	49,017	21,075	3,154	22	6	0	135	2

Table 2. Total and target harvest and effort statistics by tribe for lake trout, whitefish, and siscowet in Michigan waters of Lake Superior in 1998. Pounds are in dressed weight, effort is feet of net lifted and CPE is pounds/1000 ft of net lifted. Target species was assigned to each lift based on reported target species from individual catch reports. Target effort for whitefish and lake trout was combined.

Unit	Tribe	TOTAL HARVEST						TARGET HARVEST							
		Effort	Whitefish pounds	Whitefish CPE	Lake trout pounds	Lake trout CPE	Siscowet pounds	Siscowet CPE	Effort	Whitefish pounds	Whitefish CPE	Lake trout pounds	Lake trout CPE	Siscowet pounds	Siscowet CPE
MI-2	Bad River	211,800	31,970	151	6,490	31	1,509	7	211,800	31,970	151	6,490	31	0	0
	Keweenaw Bay	57,300	3,172	55	2,756	48	0	0	57,300	3,172	55	2,756	48	0	0
	Red Cliff	643,500	93,327	145	6,693	10	7,226	11	643,500	93,327	145	6,693	10	0	0
	subtotal	912,600	128,469	141	15,939	17	8,735	10	912,600	128,469	141	15,939	17	0	0
MI-3	Bad River	212,000	25,958	122	1,733	8	576	3	212,000	25,958	122	1,733	8	0	0
	Keweenaw Bay	212,000	18,692	88	5,172	24	1,565	7	202,500	18,617	92	5,042	25	9,500	400
	Red Cliff	1,315,000	104,542	79	5,040	4	1,080	1	1,315,000	104,542	79	5,040	4	0	0
	subtotal	1,739,000	149,192	86	11,945	7	3,221	2	1,729,500	149,117	86	11,815	7	9,500	400
MI-4	Bad River	422,000	24,206	57	14,930	35	3,361	8	406,000	23,999	59	14,680	36	16,000	2,246
	Keweenaw Bay	1,595,770	59,865	38	44,900	28	14,393	9	1,364,200	56,788	42	41,745	31	139,370	5,968
	Red Cliff	474,000	55,313	117	3,589	8	15,284	32	432,500	55,313	128	3,589	8	41,500	11,163
	subtotal	2,491,770	139,384	56	63,419	25	33,038	13	2,202,700	136,100	62	60,014	27	196,870	19,377
MI-5	Bad River	101,800	10,504	103	6,107	60	100	1	101,800	10,504	103	6,107	60	0	0
	Keweenaw Bay	244,380	12,948	53	9,323	38	3,123	13	169,500	12,446	73	8,018	47	74,000	1,989
	Red Cliff	9,000	1,000	0	817	0	800	0	9,000	1,000	0	817	0	0	0
	subtotal	355,180	24,452	69	16,247	46	4,023	11	280,300	23,950	85	14,942	53	74,000	1,989
Total	Bad River	947,600	92,638	98	29,260	31	5,546	6	931,600	92,431	99	29,010	31	16,000	2,246
	Keweenaw Bay	2,109,450	94,677	45	62,151	29	19,081	9	1,793,500	91,023	51	57,561	32	222,870	8,357
	Red Cliff	2,441,500	254,182	104	16,139	7	24,390	10	2,400,000	254,182	106	16,139	7	41,500	11,163
	All Tribes	5,498,550	441,497	80	107,550	20	49,017	9	5,125,100	437,636	85	102,710	20	280,370	21,766

Table 3. Tribal commercial harvest by management unit and gill net mesh size from the 1842 ceded area within Michigan waters of Lake Superior in 1998. Lake trout, whitefish, siscowet, herring, salmon, menominee, and chubs are dressed weight, all others are round.

Unit	Mesh Size (in)	Effort (ft)	Lake trout	Whitefish	Siscowet	Herring	Salmon	Menominee	Chub	Burbot	Walleye	Other
MI-2												
large mesh	4.5	882,600	13,524	125,449	8,735	0	0	0	0	0	17	541
	5	18,000	2,200	2,270	0	0	0	0	0	0	0	0
	5.5	12,000	215	750	0	0	0	0	0	0	0	0
	subtotal	912,600	15,939	128,469	8,735	0	0	0	0	0	17	541
MI-3												
large mesh	4.5	1,739,000	11,945	149,192	3,221	0	8	0	0	0	26	83
MI-4												
small mesh	1.0	300	0	0	0	0	0	0	0	0	0	0
	2.5	6,300	11	10	5	150	0	10	0	0	0	0
	2.75	4,800	0	0	0	882	82	0	0	0	0	0
	2.875	800	84	0	0	220	0	0	0	0	0	0
	3.0	66,200	356	36	0	10,273	1,088	2	0	0	0	0
	subtotal	78,400	451	46	5	11,525	1,170	12	0	0	0	0
large mesh	4.5	2,403,770	62,388	138,709	32,959	6,125	1,939	9	2	0	92	832
	4.5625	9,600	580	629	74	8	0	1	4	0	0	0
	subtotal	2,413,370	62,968	139,338	33,033	6,133	1,939	10	6	0	92	832
MI-5												
small mesh	3.0	880	0	0	0	275	0	0	0	0	0	0
large mesh	4.5	328,500	15,047	23,402	4,023	1,227	37	0	0	0	0	30
	4.5-3	25,800	1,200	1,050	0	1,915	0	0	0	0	0	0
	subtotal	354,300	16,247	24,452	4,023	3,142	37	0	0	0	0	30
Total		5,498,550	107,550	441,497	49,017	21,075	3,154	22	6	0	135	1,486

Table 4. Harvest and effort statistics for target species by grid and management unit in Michigan waters of Lake Superior in 1998. Pounds are in dressed weight, effort is feet of net lifted and CPE is pounds/1,000 ft of net lifted. Target species was assigned to each lift based on reported target species from individual catch reports. Target effort for whitefish and lake trout was combined.

Unit	Grid	Whitefish			Lake trout			Siscowet			Herring			Salmon		
		Effort	pounds	CPE	Effort	pounds	CPE	Effort	pounds	CPE	Effort	pounds	CPE	Effort	pounds	CPE
MI-2	1119	19,000	1,075	57	19,000	1,790	94									
	1120	23,900	1,962	82	23,900	865	36									
	1214	8,000	700	88	8,000	90	11									
	1219	569,800	79,806	140	569,800	6,226	11									
	1220	214,500	35,376	165	214,500	3,933	18									
	1315	34,800	6,260	180	34,800	310	9									
	1413	12,000	750	63	12,000	215	18									
1414	12,600	270	21	12,600	310	25										
1511	12,000	2,096	175	12,000	1,669	139										
1512	6,000	174	29	6,000	531	89										
	subtotal	912,600	128,469	141	912,600	15,939	17	0	0	0	0	0	0	0	0	0
MI-3	1023	334,000	47,914	143	334,000	3,479	10									
	1024	50,000	9,567	191	50,000	342	7									
	1121	581,500	23,629	41	581,500	5,222	9	9,500	400	42						
	1122	764,000	68,007	89	764,000	2,772	4									
	subtotal	1,729,500	149,117	86	1,729,500	11,815	7	9,500	400	42	0	0	0	0	0	0
MI-4	1026	84,000	6,158	73	84,000	288	3									
	1124	55,000	11,924	217	55,000	119	2									
	1125	255,000	25,331	99	255,000	1,895	7	41,500	11,163	269						
	1223	61,500	1,713	28	61,500	2,389	39	8,000	150	19						
	1224	423,100	17,282	41	423,100	15,254	36	4,000	200	50						
	1225	38,500	11,900	309	38,500	1,287	33									
	1323	162,200	5,777	36	162,200	5,451	34	45,900	2,871	63	6,600	996	151	1,400	80	57
	1324	140,500	6,101	43	140,500	6,421	46	27,000	2,511	93	6,300	880	140			
	1325	342,200	17,541	51	342,200	5,172	15	16,600	339	20	600	140	233	5,400	343	64
	1326	220,400	14,555	66	220,400	6,962	32	18,600	351	19						
1423	405,900	17,393	43	405,900	14,530	36	35,270	1,792	51	68,000	9,814	144				
1424	14,400	425	30	14,400	246	17										
subtotal	2,202,700	136,100	62	2,202,700	60,014	27	196,870	19,377	98	81,500	11,830	145	6,800	423	62	
MI-5	1327	146,800	9,915	68	146,800	5,713	39	74,000	1,989	27						
	1328	22,000	3,550	161	22,000	769	35									
	1428	109,500	10,485	96	109,500	6,860	63				880	275	313			
	1438	2,000	0	0	2,000	1,600	800									
subtotal	280,300	23,950	85	280,300	14,942	53	74,000	1,989	27	880	275	313	0	0	0	
Grand Total		5,125,100	437,636	85	5,125,100	102,710	20	280,370	21,766	78	82,380	12,105	147	6,800	423	62

Table 5. Tribal commercial effort (feet), harvest (dressed pounds), and catch per unit effort (CPE, pounds/1,000') statistics for whitefish, lake trout and siscowet by management unit and year from the 1842 ceded area within Michigan waters of Lake Superior from 1984-1998. Target effort for whitefish and lake trout was combined.

Unit	Year	Whitefish				Lake trout				Siscowet			
		Target effort	Target harvest	CPE	Total Harvest	Target effort	Target harvest	CPE	Total Harvest	Target effort	Target harvest	CPE	Total Harvest
MI-2	1984	214,400	10,066	47	10,066	214,400	8,580	40	8,580	0	0	0	0
	1985	263,100	39,163	149	39,163	263,100	9,488	36	9,488	0	0	0	0
	1986	265,000	30,938	117	30,938	265,000	15,339	58	15,339	0	0	0	0
	1987	1,520,800	163,821	108	165,774	1,520,800	36,634	24	36,634	61,800	5,274	85	15,851
	1988	1,081,500	116,105	107	116,105	1,081,500	29,860	28	29,860	42,000	6,470	154	11,878
	1989	1,038,400	90,225	87	90,225	1,038,400	31,955	31	31,964	24,000	4,243	177	12,377
	1990	1,339,500	90,812	68	93,631	755,300	12,805	17	19,963	28,000	8,145	291	22,093
	1991	564,200	44,286	78	44,286	564,200	10,422	18	10,422	0	0	0	6,930
	1992	393,800	52,250	133	52,813	393,800	4,693	12	4,735	166,000	25,946	156	27,509
	1993	1,143,900	134,320	117	134,573	1,143,900	12,022	11	12,505	67,400	10,988	163	22,385
	1994	599,200	48,612	81	48,612	599,200	11,332	19	11,332	33,000	1,847	56	6,809
	1995	497,000	45,429	91	46,353	497,000	11,961	24	12,336	15,000	3,307	220	8,738
	1996	657,300	70,882	108	70,882	657,300	14,820	23	14,820	1,200	3	3	2,754
	1997	710,200	54,723	77	55,473	710,200	18,055	25	19,047	17,000	2,928	172	9,092
1998	912,600	128,469	141	128,469	912,600	15,939	17	15,939	0	0	0	8,735	
MI-3	1984	501,000	74,961	150	74,961	501,000	13,468	27	13,468	0	0	0	0
	1985	2,305,700	248,920	108	248,920	2,305,700	24,702	11	24,702	0	0	0	0
	1986	2,828,000	251,548	89	253,198	2,828,000	32,017	11	32,017	161,000	26,172	163	44,382
	1987	975,300	50,925	52	59,717	975,300	19,339	20	19,339	480,200	53,523	111	64,528
	1988	1,461,800	109,025	75	112,144	1,461,800	20,191	14	20,672	158,400	20,409	129	27,788
	1989	735,600	77,364	105	78,107	735,600	9,748	13	9,858	44,000	6,417	146	14,350
	1990	776,600	40,600	52	41,169	565,000	8,863	16	11,677	75,000	6,484	86	19,992
	1991	905,200	50,474	56	52,981	905,200	17,408	19	18,641	123,400	14,458	117	23,887
	1992	1,559,400	116,269	75	117,154	1,559,400	17,382	11	17,757	84,600	8,272	98	28,279
	1993	1,375,300	112,170	82	112,388	1,375,300	12,716	9	13,013	48,700	4,974	102	18,347
	1994	1,267,800	43,681	34	44,757	1,267,800	9,279	7	10,061	602,000	11,990	20	17,400
	1995	1,066,400	57,165	54	57,165	1,066,400	5,781	5	5,781	0	0	-	7,718
	1996	792,000	69,358	88	70,158	792,000	2,800	4	3,755	56,000	2,750	49	3,712
	1997	1,340,200	101,010	75	101,010	1,340,200	8,574	6	8,690	6,000	226	38	6,489
1998	1,729,500	149,117	86	149,192	1,729,500	11,815	7	11,945	9,500	400	42	3,221	
MI-4	1984	0	0	0	102,759	0	0	0	91,725	0	0	0	0
	1985	1,362,275	233,824	172	233,824	1,362,275	49,132	36	49,132	0	0	0	0
	1986	4,871,300	535,969	110	540,674	4,871,300	135,821	28	135,821	105,800	25,924	245	32,347
	1987	3,353,100	291,067	87	310,727	3,353,100	75,330	22	75,330	768,200	136,596	178	160,676
	1988	5,709,515	264,759	46	268,496	5,709,515	127,436	22	130,756	272,000	34,986	129	57,107
	1989	6,872,775	388,497	57	389,290	6,872,775	117,726	17	119,173	70,000	21,721	310	39,130
	1990	6,696,400	369,916	55	402,084	3,206,700	76,030	24	144,899	600,500	38,606	64	84,121
	1991	6,171,400	291,352	47	298,517	6,171,400	98,899	16	108,305	789,300	55,800	71	102,460
	1992	5,143,350	295,795	58	309,431	5,143,350	75,149	15	86,671	962,750	47,679	50	96,778
	1993	3,962,825	167,129	42	178,046	3,962,825	66,231	17	77,152	747,500	55,090	74	92,678
	1994	2,868,725	90,028	31	96,257	2,868,725	67,078	23	76,295	571,050	38,828	68	60,496
	1995	1,529,225	74,466	49	84,682	1,529,225	47,471	31	61,986	376,000	35,363	94	51,510
	1996	2,096,400	101,931	49	108,219	2,096,400	43,737	21	50,828	336,900	23,662	70	38,361
	1997	2,238,988	127,998	57	129,103	2,238,988	54,929	25	56,300	137,986	41,753	303	65,555
1998	2,202,700	136,100	62	139,384	2,202,700	60,014	27	63,419	196,870	19,377	98	33,038	

Note: 1984 data for MI-2 and MI-3 was for August-October only, whereas data for MI-4 was based on January-December samples but effort was not reported. 1990 target effort for whitefish and lake trout was not combined.

Table 5. Continued.

Unit	Year	Whitefish				Lake trout				Siscowet			
		Target effort	Target harvest	CPE	Total Harvest	Target effort	Target harvest	CPE	Total Harvest	Target effort	Target harvest	CPE	Total Harvest
MI-5	1984	0	0	0	0	0	0	0	0	0	0	0	0
	1985	0	0	0	0	0	0	0	0	0	0	0	0
	1986	84,000	10,696	127	10,696	84,000	4,287	51	4,287	4,000	750	188	1,437
	1987	330,000	22,058	67	24,275	330,000	11,027	33	11,027	48,000	2,502	52	5,890
	1988	292,000	25,721	88	25,721	292,000	20,630	71	20,630	0	0	0	2,031
	1989	132,000	25,517	193	25,517	132,000	7,731	59	7,731	0	0	0	2,345
	1990	538,000	60,976	113	60,976	320,000	9,232	29	12,853	0	0	0	7,801
	1991	142,500	11,884	83	12,069	142,500	3,965	28	4,075	36,000	405	11	4,026
	1992	420,000	35,793	85	36,694	420,000	7,597	18	8,132	60,000	1,780	30	7,482
	1993	392,000	19,686	50	19,833	392,000	24,508	63	24,550	4,500	206	46	2,673
	1994	127,000	3,038	24	3,108	127,000	10,799	85	10,799	26,000	1,582	61	2,657
	1995	113,400	9,288	82	9,288	113,400	8,445	74	8,445	0	0	-	1,839
	1996	161,400	7,672	48	7,672	161,400	8,040	50	8,040	0	0	-	1,033
	1997	102,300	17,997	176	18,831	102,300	5,249	51	6,105	8,000	200	61	1,855
1998	280,300	23,950	85	24,452	280,300	14,942	53	16,247	74,000	1,989	27	4,023	
All units	1984	0	0	0	187,786	0	0	0	113,773	0	0	0	0
	1985	3,931,075	521,907	133	521,907	3,931,075	83,322	21	83,322	0	0	0	0
	1986	8,048,300	829,151	103	835,506	8,048,300	187,464	23	187,464	270,800	52,846	195	78,166
	1987	6,179,200	527,871	85	560,493	6,179,200	142,330	23	142,330	1,358,200	197,895	146	246,945
	1988	8,544,815	449,080	53	522,466	8,544,815	198,117	23	201,918	472,400	61,865	131	98,804
	1989	8,778,775	581,603	66	583,139	8,778,775	167,160	19	168,726	138,000	32,381	235	68,202
	1990	9,350,500	562,304	60	597,860	4,847,000	106,930	22	189,392	703,500	53,235	76	134,007
	1991	7,783,300	397,996	51	407,853	7,783,300	130,694	17	141,443	948,700	70,663	74	137,303
	1992	7,516,550	500,107	67	516,092	7,516,550	104,821	14	117,295	1,273,350	83,677	66	160,048
	1993	6,874,025	433,305	63	444,840	6,874,025	115,477	17	127,220	868,100	71,258	82	136,083
	1994	4,862,725	185,359	38	192,734	4,862,725	98,488	20	108,487	1,232,050	54,247	44	87,362
	1995	3,206,025	186,348	58	197,488	3,206,025	73,658	23	88,548	391,000	38,670	99	69,805
	1996	3,707,100	249,843	67	256,931	3,707,100	69,397	19	77,443	394,100	26,415	67	45,860
	1997	4,391,688	301,728	69	304,417	4,391,688	86,807	20	90,142	168,986	45,107	267	82,991
1998	5,125,100	437,636	85	441,497	5,125,100	102,710	20	107,550	280,370	21,766	78	49,017	

Table 6. Age and size composition of hatchery and wild lake trout in tribal commercial harvests from unit MI-2, 1998. Weight is in round pounds, sd=standard deviation. (Totals include 35 unaged wild fish).

Year	Hatchery						Wild						Total		Percent wild			
	Class	Age	N	length (in)	weight (lb)	sd	N	length (in)	weight (lb)	sd	N	length (in)	weight (lb)	sd		sd		
1994		4	2	21.3	0.2	3.2	0.0	3	19.7	0.4	2.5	0.2	5	20.3	0.9	2.8	0.3	60
1993		5	1	20.0	0.0	3.3	0.0	11	20.9	1.8	3.1	0.8	12	20.8	1.7	3.1	0.8	92
1992		6	3	21.3	0.4	3.4	0.1	27	22.2	2.5	3.8	1.5	30	22.1	2.4	3.8	1.5	90
1991		7	3	21.8	0.2	3.4	0.3	47	21.8	2.1	3.4	0.8	50	21.8	2.1	3.4	0.8	94
1990		8	2	25.2	3.5	6.2	3.0	39	23.2	1.9	4.2	0.8	41	23.3	2.0	4.3	1.1	95
1989		9	3	20.2	2.9	2.6	0.6	34	24.3	2.8	4.9	1.8	37	24.0	3.0	4.7	1.8	92
1988		10	0	---	---	---	---	27	25.8	2.4	5.6	1.7	27	25.8	2.4	5.6	1.7	100
1987		11	3	26.2	2.1	5.8	1.5	11	24.4	3.0	4.8	2.1	14	24.8	3.0	5.0	2.0	79
1986		12	0	---	---	---	---	9	26.7	2.6	6.3	1.7	9	26.7	2.6	6.3	1.7	100
1985		13	0	---	---	---	---	5	26.0	3.6	7.8	2.0	5	26.0	3.6	7.8	2.0	100
1984		14	0	---	---	---	---	1	25.4	0.0	4.8	0.0	1	25.4	0.0	4.8	0.0	100
1983		15	0	---	---	---	---	3	26.1	3.3	6.1	1.6	3	26.1	3.3	6.1	1.6	100
1982		16	0	---	---	---	---	1	24.8	0.0	5.1	0.0	1	24.8	0.0	5.1	0.0	100
1981		17	1	29.7	0.0	8.0	0.0	0	---	---	---	---	1	29.7	0.0	8.0	0.0	0
1980		18	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1979		19	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1978		20	0	---	---	---	---	1	34.0	0.0	9.8	0.0	1	34.0	0.0	9.8	0.0	100
1977		21	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1976		22	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1975		23	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1974		24	0	---	---	---	---	1	33.4	0.0	7.9	0.0	1	33.4	0.0	7.9	0.0	100
Sample Size			18					255					273					
Means				22.9	3.3	4.2	1.8		23.6	3.1	4.5	1.6		23.6	3.1	4.5	1.6	93
Mean Age			8.1					8.5					8.4					



Table 7. Lamprey wounding and scarring rates (marks/100 fish) on lake trout captured in the tribal commercial harvests from management units in the 1842 ceded area within Michigan waters of Lake Superior, January to December 1998.

Unit	Type AI, AII, AIII Wounds						Scars				Total	
	<17.0	17-20.9	21-24.9	25-28.9	>29.0	Total	<17.0	17-20.9	21-24.9	25-28.9		>29.0
MI-2												
Marks observed	0	0	0	5	1	6	0	0	11	13	2	26
No. fish examined	1	51	146	56	19	273	1	51	146	56	19	273
No. marks/100 fish	0.0	0.0	0.0	8.9	5.3	2.2	0.0	0.0	7.5	23.2	10.5	9.5
MI-3												
Marks observed	0	0	1	0	0	1	0	0	1	6	1	8
No. fish examined	0	17	33	17	2	69	0	17	33	17	2	69
No. marks/100 fish	0.0	0.0	3.0	0.0	0.0	1.4	0.0	0.0	3.0	35.3	50.0	11.6
MI-4												
Marks observed	0	0	1	1	1	3	0	0	4	9	4	17
No. fish examined	40	123	159	39	6	367	40	123	159	39	6	367
No. marks/100 fish	0.0	0.0	0.6	2.6	16.7	0.8	0.0	0.0	2.5	23.1	66.7	4.6
MI-5												
Marks observed	0	0	0	0	0	0	0	0	1	0	0	1
No. fish examined	0	34	50	24	3	111	0	34	50	24	3	111
No. marks/100 fish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.9

Table 8. Catch curve mortality and survival rates on lake trout from management units in the 1842 ceded area within Michigan waters of Lake Superior for data collected January-December 1988-1998.

Management Unit		Year	Ages	Instantaneous total mortality Z	95% confidence limit for Z	Annual total mortality A	Annual Survival S
<u>Wild Lake Trout</u>							
MI-2	1998	1998	7-13	0.385	+/- 0.111	0.316	0.684
	1990	1990	8-11	0.750	+/- 0.416	0.528	0.472
	1988	1988	9-13	0.406	+/- 0.306	0.334	0.666
MI-3	1997	1997	7-11	0.176	+/- 0.212	0.165	0.835
	1996	1996	8-13	0.238	+/- 0.267	0.213	0.787
	1995	1995	8-11	0.522	+/- 0.325	0.405	0.595
	1991	1991	8-11	0.469	+/- 0.353	0.375	0.625
	1989	1989	8-12	0.723	+/- 0.084	0.513	0.487
	1988	1988	9-13	0.651	+/- 0.396	0.478	0.522
MI-4	1998	1998	7-12	0.220	+/- 0.166	0.197	0.803
	1997	1997	7-12	0.455	+/- 0.182	0.369	0.631
	1996	1996	7-12	0.556	+/- 0.162	0.429	0.571
	1995	1995	7-12	0.200	+/- 0.226	0.181	0.819
	1994	1994	7-12	0.281	+/- 0.103	0.244	0.756
	1993	1993	6-11	0.349	+/- 0.334	0.295	0.705
	1992	1992	5-11	0.430	+/- 0.105	0.349	0.651
	1991	1991	6-11	0.592	+/- 0.130	0.446	0.554
	1990	1990	6-11	0.723	+/- 0.153	0.513	0.487
	1989	1989	7-11	0.786	+/- 0.395	0.546	0.454
	1988	1988	9-13	0.912	+/- 0.134	0.598	0.402
MI-5	1991	1991	5-8	0.744	+/- 0.563	0.523	0.477

Table 8. Continued.

Management Unit	Year	Ages	Instantaneous total mortality Z	95% confidence limit for Z	Annual total mortality A	Annual Survival S
<u>Wild and Hatchery Lake Trout Combined</u>						
MI-2	1998	7-13	0.389	+/- 0.106	0.323	0.677
	1990	8-12	0.706	+/- 0.247	0.508	0.492
MI-3	1997	7-11	0.208	+/- 0.196	0.189	0.811
	1996	8-13	0.276	+/- 0.190	0.244	0.756
	1995	8-11	0.563	+/- 0.328	0.429	0.571
	1992	7-13	0.372	+/- 0.355	0.309	0.691
	1991	8-11	0.396	+/- 0.334	0.330	0.670
	1989	8-11	0.642	+/- 0.094	0.473	0.527
	1988	11-13	0.779	+/- 0.445	0.541	0.459
MI-4	1998	7-12	0.299	+/- 0.129	0.259	0.741
	1997	7-12	0.339	+/- 0.115	0.288	0.712
	1996	7-12	0.572	+/- 0.154	0.434	0.566
	1995	7-12	0.252	+/- 0.170	0.221	0.779
	1994	7-12	0.305	+/- 0.094	0.267	0.733
	1993	6-11	0.300	+/- 0.242	0.259	0.741
	1992	5-11	0.448	+/- 0.081	0.362	0.638
	1991	6-11	0.577	+/- 0.104	0.440	0.560
	1990	6-11	0.591	+/- 0.088	0.446	0.554
	1989	7-11	0.705	+/- 0.218	0.508	0.492
1988	8-13	0.540	+/- 0.276	0.417	0.583	
MI-5	1991	5-8	0.602	+/- 0.452	0.451	0.549

Table 9. Age and size composition of hatchery and wild lake trout in tribal commercial harvests from unit MI-3, 1998. Weight is in round pounds, sd=standard deviation. (Totals include 6 unaged wild fish).

Year	Class	Age	Hatchery						Wild						Total						
			N	length (in)	sd	weight (lb)	mean	sd	N	length (in)	sd	weight (lb)	mean	sd	N	length (in)	sd	weight (lb)	mean	sd	Percent wild
1994		4	0	---	---	---	---	1	21.0	0.0	2.2	0.0	1	21.0	0.0	2.2	0.0	0.0	2.2	0.0	100
1993		5	0	---	---	---	---	1	20.9	0.0	2.2	0.0	1	20.9	0.0	2.2	0.0	0.0	2.2	0.0	100
1992		6	0	---	---	---	---	6	20.8	2.1	2.3	0.9	6	20.8	2.1	2.3	0.9	2.1	2.3	0.9	100
1991		7	3	20.3	1.2	2.6	0.4	7	19.7	1.7	2.4	0.7	10	19.9	1.6	2.5	0.7	1.6	2.5	0.7	70
1990		8	0	---	---	---	---	7	23.8	2.2	4.5	1.2	7	23.8	2.2	4.5	1.2	2.2	4.5	1.2	100
1989		9	0	---	---	---	---	10	23.6	1.3	4.3	0.7	10	23.6	1.3	4.3	0.7	1.3	4.3	0.7	100
1988		10	1	27.6	0.0	2.8	0.0	11	23.2	2.4	3.9	1.2	12	23.6	2.6	3.8	1.2	2.6	3.8	1.2	92
1987		11	0	---	---	---	---	8	26.1	1.9	6.1	1.3	8	26.1	1.9	6.1	1.3	1.9	6.1	1.3	100
1986		12	0	---	---	---	---	2	26.6	2.8	6.4	2.0	2	26.6	2.8	6.4	2.0	2.8	6.4	2.0	100
1985		13	0	---	---	---	---	3	25.9	2.6	5.5	1.5	3	25.9	2.6	5.5	1.5	2.6	5.5	1.5	100
1984		14	0	---	---	---	---	1	21.3	0.0	3.3	0.0	1	21.3	0.0	3.3	0.0	0.0	3.3	0.0	100
1983		15	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---	---	---	---
1982		16	0	---	---	---	---	2	22.9	2.5	3.5	0.7	2	22.9	2.5	3.5	0.7	2.5	3.5	0.7	100
Sample Size			4					65					69								
Means				22.1	3.3	2.6	0.4		23.3	2.8	4.1	1.4		23.2	2.8	4.0	1.4		4.0	1.4	94
Mean Age			7.8					9.3					9.2								

Table 10. Age and size composition of hatchery and wild lake trout in tribal commercial harvests from MI-4, 1998. Weight is in round pounds, sd = standard deviation. (Totals include 4 unaged hatchery fish and 18 unaged wild fish).

Year	Class	Age	Hatchery						Wild						Total						
			N	length (in)	sd	weight (lb)	mean	sd	N	length (in)	sd	weight (lb)	mean	sd	N	length (in)	sd	weight (lb)	mean	sd	Percent wild
1996	2	1	13.5	0.0	0.6	0.0	0	---	---	---	---	0	---	---	---	1	13.5	0.0	0.6	0.0	0
1995	3	2	14.8	1.8	0.8	0.3	6	15.3	1.7	1.1	0.4	6	15.3	1.7	1.1	8	15.2	1.7	1.0	0.4	75
1994	4	6	16.4	1.9	1.5	0.6	39	19.0	1.9	2.5	0.7	39	19.0	1.9	2.5	45	18.7	2.1	2.3	0.7	87
1993	5	17	20.1	1.6	2.7	0.6	47	19.7	1.5	2.5	0.5	47	19.7	1.5	2.5	64	19.8	1.5	2.5	0.6	73
1992	6	21	20.0	2.0	2.8	0.6	28	19.6	2.6	2.6	1.0	28	19.6	2.6	2.6	49	19.8	2.4	2.7	0.9	57
1991	7	26	20.1	2.6	2.8	0.9	29	21.0	2.7	3.2	1.0	29	21.0	2.7	3.2	55	20.6	2.7	3.0	1.0	53
1990	8	12	21.7	2.8	3.3	1.2	28	22.5	1.6	3.6	1.1	28	22.5	1.6	3.6	40	22.2	2.1	3.5	1.1	70
1989	9	5	23.5	1.2	4.3	0.9	16	24.9	2.0	5.0	1.5	16	24.9	2.0	5.0	21	24.5	2.0	4.9	1.4	76
1988	10	0	---	---	---	---	25	24.8	2.9	5.3	2.0	25	24.8	2.9	5.3	25	24.8	2.9	5.3	2.0	100
1987	11	2	25.7	0.5	5.4	0.2	11	25.2	2.5	5.1	1.6	11	25.2	2.5	5.1	13	25.3	2.4	5.1	1.5	85
1986	12	3	24.4	2.2	5.3	2.2	10	26.4	2.7	6.2	1.5	10	26.4	2.7	6.2	13	26.0	2.8	6.0	1.7	77
1985	13	2	23.5	0.5	4.1	0.7	0	---	---	---	---	0	---	---	---	2	23.5	0.5	4.1	0.7	0
1984	14	0	---	---	---	---	5	27.0	2.7	6.2	2.6	5	27.0	2.7	6.2	5	27.0	2.7	6.2	2.6	100
1983	15	1	26.1	0.0	7.0	0.0	3	26.9	4.8	6.6	2.7	3	26.9	4.8	6.6	4	26.7	4.2	6.7	2.3	75
Sample Size			102				265					265				367					
Means			20.5	3.0	3.0	1.2		21.6	3.5	3.5	1.6		21.6	3.5	3.5	21.3	3.4	3.4	1.5		72
Mean Age		6.8					7.1					7.1				7.0					

Table 11. Age and size composition of hatchery and wild lake trout in tribal commercial harvests from MI-5, 1998. Weight is in round pounds, sd = standard deviation. (Totals include 6 unaged wild fish and 54 fish with unknown finclips added for total length at age).

Year	Hatchery						Wild						Total							
	Age	N	length (in)	sd	weight (lb)	sd	length (in)	sd	weight (lb)	sd	length (in)	sd	weight (lb)	sd	length (in)	sd	weight (lb)	sd	Percent wild	
1995	3	2	18.5	1.1	2.0	0.3	17.7	0.1	1.7	0.1	18.1	0.9	1.9	0.3	4	18.1	0.9	1.9	0.3	50
1994	4	5	20.2	1.0	2.7	0.5	19.2	1.2	2.5	0.6	19.7	1.2	2.6	0.6	9	19.7	1.2	2.6	0.6	44
1993	5	0	---	---	---	---	20.6	0.3	3.0	0.3	20.6	0.3	3.0	0.3	4	20.6	0.3	3.0	0.3	100
1992	6	2	19.7	0.0	2.4	0.2	20.4	1.3	2.7	0.8	20.4	1.1	2.6	1.3	10	20.4	1.1	2.6	1.3	71
1991	7	0	---	---	---	---	21.5	1.4	3.1	0.7	21.5	1.9	3.1	1.5	9	21.5	1.9	3.1	1.5	100
1990	8	1	24.0	0.0	4.0	0.0	20.7	0.2	2.5	0.2	22.9	1.5	3.0	1.3	11	22.9	1.5	3.0	1.3	67
1989	9	1	22.9	0.0	2.9	0.0	23.3	1.6	3.7	0.9	23.7	1.4	3.5	1.6	13	23.7	1.4	3.5	1.6	75
1988	10	1	25.0	0.0	4.5	0.0	23.1	1.9	3.6	0.8	23.9	1.9	3.8	1.8	12	23.9	1.9	3.8	1.8	80
1987	11	0	---	---	---	---	25.3	1.8	5.1	1.0	25.2	1.6	5.1	2.1	8	25.2	1.6	5.1	2.1	100
1986	12	0	---	---	---	---	25.2	2.8	5.8	2.5	27.8	4.3	5.8	3.3	3	27.8	4.3	5.8	3.3	100
1985	13	0	---	---	---	---	26.1	0.7	5.5	0.7	25.6	1.1	5.5	2.3	4	25.6	1.1	5.5	2.3	100
1984	14	0	---	---	---	---	---	---	---	---	---	---	---	---	0	---	---	---	---	---
1983	15	0	---	---	---	---	---	---	---	---	---	---	---	---	1	30.9	0.0	---	---	---
Sample Size		12													45					111
Means			20.8	2.1	2.8	0.8	22.4	2.8	3.7	1.4	22.7	2.9	3.5	1.8		22.7	2.9	3.5	1.8	79
Mean Age		5.4													8.0					8.0

Table 12. Age and size composition of whitefish in tribal commercial harvests from management units in the 1842 ceded area within Michigan waters of Lake Superior, January-December 1998. Weight is in round pounds, sd = standard deviation.

Year class	Age	MI-2				MI-3				MI-4				MI-5								
		N	length (in)	weight (lb)	sd	N	length (in)	weight (lb)	sd	N	length (in)	weight (lb)	sd	N	length (in)	weight (lb)	sd					
1993	5	0	---	---	---	1	17.7	0.0	1.9	0.0	17	17.5	1.6	2.0	0.9	0	---	---	---			
1992	6	2	18.0	0.2	2.2	0.1	15	18.6	1.4	2.2	0.4	112	18.5	1.3	2.5	1.1	6	19.1	1.0	2.3	0.3	
1991	7	15	18.4	0.6	2.4	0.5	136	19.2	1.1	2.4	0.4	283	19.1	1.3	2.7	1.1	30	20.3	1.1	2.7	0.6	
1990	8	31	18.8	0.8	2.4	0.3	268	19.3	1.1	2.5	0.4	234	19.8	1.5	3.0	1.2	59	20.7	1.2	3.0	0.7	
1989	9	68	19.1	1.0	2.6	0.6	249	19.4	1.1	2.5	0.4	88	20.1	1.6	3.3	1.4	35	21.8	1.1	3.7	0.7	
1988	10	84	19.2	0.9	2.6	0.5	123	19.8	1.2	2.6	0.5	33	21.3	1.8	3.6	0.9	18	22.5	1.2	4.0	0.9	
1987	11	52	19.6	0.8	2.7	0.4	59	19.6	1.2	2.5	0.5	19	21.3	1.7	3.4	1.2	8	23.7	0.6	4.9	0.7	
1986	12	22	19.6	1.0	2.7	0.4	15	20.5	1.4	2.8	0.6	9	22.7	1.9	4.3	1.9	4	25.8	0.5	5.1	1.4	
1985	13	12	20.2	0.6	3.1	0.3	4	19.5	0.4	2.2	0.2	2	23.5	1.5	4.9	0.3	3	26.1	0.7	6.4	0.9	
1984	14	4	19.3	1.2	2.5	0.3	0	---	---	---	---	0	---	---	---	---	1	28.8	0.0	8.9	0.0	
1983	15	2	21.1	0.1	3.3	0.2	0	---	---	---	---	0	---	---	---	---	1	28.5	0.0	8.3	0.0	
1982	16	1	21.9	0.0	3.9	0.0	0	---	---	---	---	0	---	---	---	---	1	26.3	0.0	6.1	0.0	
1981	17	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	
1980	18	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	
1979	19	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	1	27.8	0.0	7.8	0.0	
1978	20	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	
1977	21	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	
1976	22	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	
Sample size		574				1,438					943					220						
Means			19.2	1.0	2.6	1.2		19.4	1.2	2.5	1.2		19.4	1.6	2.9	1.4		21.3	1.9	3.5	1.8	
Sample size-age		293				870					797					167						
Mean Age		9.9				8.7					7.6				8.7							

Table 13. Age and size composition of siscowets in tribal commercial harvests from management units in the 1842 ceded area within Michigan waters of Lake Superior, January-December 1998. Weight is in round pounds, sd = standard deviation.

Year class	Age	MI-2				MI-3				MI-4						
		N	length (in) mean	sd	weight (lb) mean	N	length (in) mean	sd	weight (lb) mean	N	length (in) mean	sd	weight (lb) mean			
1994	4	0	---	---	---	1	21.3	0.0	2.2	0.0	6	14.7	2.0	1.2	0.5	
1993	5	0	---	---	---	2	20.5	0.8	2.3	0.1	7	15.8	1.9	1.2	0.4	
1992	6	0	---	---	---	2	20.4	1.2	1.9	0.3	9	18.6	3.4	2.3	1.4	
1991	7	1	18.9	0.0	2.2	0.0	1	21.7	0.0	2.2	0.0	13	16.6	2.5	1.4	0.6
1990	8	2	21.7	0.8	3.5	0.3	0	---	---	---	---	11	17.2	1.8	1.5	0.6
1989	9	2	22.5	0.4	3.6	0.4	5	18.0	1.0	1.6	0.3	7	17.5	3.3	1.5	0.9
1988	10	4	23.9	1.7	5.2	1.3	4	18.5	1.3	1.9	0.5	13	17.3	1.5	1.5	0.4
1987	11	2	20.1	2.2	2.6	0.7	3	19.8	0.5	2.5	0.2	15	19.5	3.4	2.4	1.1
1986	12	4	23.0	1.1	4.2	0.6	4	21.3	5.0	3.8	2.6	9	20.3	2.3	2.6	0.9
1985	13	4	23.2	2.3	4.0	0.8	2	22.7	1.9	3.6	1.1	9	22.0	2.6	3.1	1.1
1984	14	5	26.9	3.6	7.0	3.1	1	25.7	0.0	5.6	0.0	13	22.4	1.4	3.5	1.1
1983	15	4	23.8	2.9	4.4	1.4	2	23.4	1.9	3.4	0.9	16	23.1	1.8	3.6	1.6
1982	16	2	23.3	0.5	3.6	0.5	0	---	---	---	---	19	23.0	1.9	3.7	1.5
1981	17	0	---	---	---	---	2	26.5	4.1	5.2	2.7	13	22.3	1.8	3.3	1.0
1980	18	0	---	---	---	---	2	25.6	1.2	5.6	0.1	7	23.4	1.6	4.0	2.3
1979	19	0	---	---	---	---	0	---	---	---	---	2	24.8	2.7	5.0	1.6
1978	20	0	---	---	---	---	1	24.7	0.0	4.4	0.0	4	23.3	0.6	3.7	1.5
Sample size		35				36					197					
Means			23.6	2.9	4.5	1.8		21.4	3.6	3.0	1.8		20.1	3.6	2.5	1.4
Sample size-age		30				32										
Mean Age		12.2				11.2										



Table 14. Age and size composition of lake herring and menominee whitefish in tribal commercial harvest from management units in the 1842 treaty area within Michigan waters of Lake Superior, January-December 1998. Weight is in round pounds, sd = standard deviation.

Year class	Age	N	Herring MI-4				Menominee MI-4				
			length (in) mean	sd	length (in) sd	weight (lb) mean	sd	length (in) mean	sd	weight (lb) mean	sd
1995	3	1	10.2	0.0	0.3	0.0	0	--	--	--	--
1994	4	5	13.8	0.4	0.8	0.2	0	--	--	--	--
1993	5	16	13.7	1.1	0.9	0.3	0	--	--	--	--
1992	6	82	14.2	1.5	0.9	0.4	0	--	--	--	--
1991	7	168	15.0	1.5	1.0	0.4	0	--	--	--	--
1990	8	144	15.7	1.4	1.2	0.5	1	15.3	0.0	1.1	0.0
1989	9	37	15.5	1.5	1.2	0.4	0	--	--	--	--
1988	10	13	17.3	1.8	1.5	0.6	0	--	--	--	--
1987	11	2	18.3	0.1	1.3	0.0	0	--	--	--	--
1986	12	0	--	--	--	--	0	--	--	--	--
1985	13	0	--	--	--	--	0	--	--	--	--
Sample size		468					1				
Means			15.1	1.7	1.1	0.5		15.3	0.0	1.1	0.0
Mean Age		7.3					8.0				

Table 15. Age and size composition of chinook and coho salmon in tribal commercial harvest from management units in the 1842 treaty area within Michigan waters of Lake Superior, January-December 1998. Weight is in round pounds, sd = standard deviation.

Year class	Age	Chinook Salmon MI-4				Coho Salmon MI-4			
		N	length (in) mean	sd	weight (lb) mean	N	length (in) mean	sd	weight (lb) mean
1997	1	0	0.0	0.0	0.0	4	13.4	1.8	0.9
1996	2	0	0.0	0.0	0.0	7	15.4	0.3	1.2
Sample size		0				11			
Means			0.0	0.0	0.0		14.7	1.5	1.1
Mean Age		0.0				1.6			0.2